



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

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AIA Edits

Vermont Act 47 Building Energy Code Study Committee Report

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List of Acronyms

AG	Vermont Attorney General
AHJ	Authority Having Jurisdiction
BECS	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

Vermont's Residential Building Energy Standards (RBES) and Commercial Building Energy Standards (CBES) were established in 1997 and 2006. Though following these energy codes is mandatory, compliance has been decreasing over time.

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 RBES and CBES. 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 non-energy 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, in response to the charges, recommends these actions to put Vermont back on a path to meet the state's goal of "net zero ready" and safe construction by 2030 for both RBES and CBES:

- 1. The Committee found that, unlike most other states, Vermont has no unified authority over building and energy codes.** In Vermont, three separate state agencies have partial authority over single family homes. This lack of unified authority has a profound effect on Vermont's ability to ensure safe, energy efficient construction.

The Committee recommends naming the Division of Fire Safety (DFS) as Vermont's comprehensive authority over all construction, including 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 the state's "net zero ready" goal by 2030.

While it is beyond the scope of this report, the Committee recognizes that a statewide residential *building* code would provide the "scaffolding" of building science and code administration that most other states have to ground their energy codes. The Committee recommends further exploration to establish a residential building code for Vermont.

- 2. The Committee recommends a comprehensive list of strategies to increase awareness and compliance with the energy codes,** including the following. ****** indicates immediate action items (2024 Legislative Session); ***** indicates a 2-3 year window for action.
 - A. Make structural, statutory and policy changes to Vermont's energy code environment.**
 - **** A.1. Designate DFS as *the* statewide authority over *all* building construction.
 - **** A.2. Clarify the chain of authority from the General Assembly, through DFS, to

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municipalities, so they may enforce energy codes locally if they wish to do so.

****** A.3. Amend the energy code update cycle.

****** A.4. Establish an advisory committee to DFS that will advise the overall transition, help with future code revisions, and examine building failure cases to improve building science and future codes.

B. Improve administration of the energy codes.

* B.1. Direct DFS to establish a statewide, central, publicly accessible database for all Vermont buildings that includes energy code data.

* B.2. Establish a certificate application process for both CBES and RBES that is part of the database.

****** B.3. Require homebuilder-owner agreements (overseen by OPR) to include a clause referring to the RBES application.

****** B.4. Eliminate filing certificates in town records and the notarization requirement.

C. Improve workforce training and support.

****** C.1. Give DFS authority over all building trades certification and energy code training, with an advisory council representing all trades.

* C.2. Develop on-site services statewide under DFS.

* C.3. Increase training for and support of Energy Consultants.

* C.4. Increase and coordinate training for Weatherizers.

****** C.5. Support the Weatherization Training Center (WxTC) Initiative.

* C.6. Move the Building Code Assistance Center (call center) under DFS.

D. Increase awareness that energy codes are mandatory.

****** D.1. Bill Stuffers

****** D.2. Loan Closing Checklists

****** D.3. Contractor Training Certification on Agency Websites

****** D.4. State, Regional and Municipal Websites

* D.5. Radio Show (Bob Duncan's new suggestion)

E. * Increase support of and funding for above-base code projects (stretch codes).

F. ** Encourage DFS to use the U.S. Department of Energy's (DOE) grant to Energy Futures Group for the "Vermont Energy Code Administration Project" to support these strategies.

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 a positive cash flow from energy code improvements that surpass 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 below.

Findings

The Findings stated by the General Assembly in Act 47 are as follows:

Additional commentary by the Committee is included below in italics.

- 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 authority or 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.
Vermont lacks a single state agency as a unified authority over all construction. All other states have a path to a unified authority at either the state or local level.¹
- 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 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. *See further assessment below in Analysis section.*
- 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.”²

The Committee identified three additional findings:

- 6) **Vermont is the only state in the nation that has no pathway to establish authority over owner-occupied single family homes.** All other states have either a statewide residential building code or enables municipalities to adopt a building code.
- 7) **Vermont is the only state that has no pathway to consumer protection for owner-occupied single family homeowners.** All other states protect homeowners by certifying or licensing homebuilders, or they have a statewide standard of care for residential construction (a building code)... or both. 29 states have statewide certification or licensure requirements for homebuilders. Of the remaining 21 states, 12 have a statewide building code. 8 do everything by municipality.³
- 8) **The number of residential energy-code-related failures is increasing in Vermont.** Vermont homeowners are being harmed to a degree that would be considered significant by any reasonable observer.⁴

¹See Appendix: “Comparison for all States for Building and Energy Codes.”

² <https://legislature.vermont.gov/Documents/2024/Docs/ACTS/ACT047/ACT047%20As%20Enacted.pdf>

³ See chart... put in Appendix.

⁴ “Vermont Secretary of State Office of Professional Regulation, Preliminary Sunrise Assessment: Home Improvement and Construction Contractors (2017/18),” 2018, page 6.

Analysis of Findings 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 without sacrificing the health or welfare of occupants and owners. Though following these energy codes is mandatory, compliance has been decreasing over time.

Figure 1. RBES code compliance in relation to Energy Use Intensity (EUI or MMBtu/sq. ft.) requirement improving over time.⁵

The lack of compliance with the energy codes and the rising number of building failures are detrimental to Vermont property owners and occupants, and they underscore larger problems, including the lack of a single, unified authority over all construction in Vermont.

The Vermont Energy Action Network (EAN) 2023 report shows that Vermont is lagging in meeting its energy and climate goals, making the least progress towards the Paris Climate Accord targets of any state in the region.⁶ Failure to resolve the flaws of Vermont's building energy codes - and thereby increasing compliance - could have legal and financial implications for Vermont taxpayers if we fail to meet Vermont's Global Warming Solutions Act (GWSA) of 2020 for statewide GHG emissions reductions by 2025, 2030, and 2050.⁷

Residential construction is likely less compliant than the NMR report estimates.

As noted above, compliance with RBES is currently estimated at 54 percent.

Residential code compliance is difficult to quantify in a state where certificates of occupancy are not required in most towns. Clearly there are higher rates of compliance in towns with municipal ordinances and building inspectors. It is interesting to note that municipalities with MOU agreements with the Division of Fire Safety have relatively high levels of certificate submission.

It's also noteworthy that the number of certificates is far higher in Chittenden, Franklin, and Addison counties than the rest of Vermont. This is where builder training is concentrated and the majority of new housing is multi-family (overseen by DFS). Site inspections are also concentrated in Chittenden County.

One measure is the number of RBES certificates filed compared with the number of building permits filed. According to the PSD: 5,850 RBES certificates were filed from 1997 to 2022,⁸ many of which are multi-family homes regulated by DFS. In that period 54,833 residential building permits were filed in Vermont.⁹ That means, very roughly, on average 10 permits were filed for every 100 residential units statewide.

⁵ EUI: Each energy code update results in more stringent energy efficiency requirements, and therefore lower building energy use intensity (EUI, or MMBtu/sq. ft.). RBES source: "2020 Vermont Single-Family Residential New Construction Baseline and Code Compliance Study," NMR Group Inc, 2023. CBES source: "2021 Vermont Business Sector Market Characterization and Assessment Study," Cadmus, 2021.

⁶ "2023 Annual Progress Report for Vermont, Energy Action Network: <https://www.eanvt.org/annual-report/>

⁷ Ibid

⁸ Spreadsheet provided by Kelly Launder, Department of Public Service.

⁹ Data from <https://housingdata.org/profile/housing-stock/building-permits>

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(left) Figure 2. Number of RBES Certificates filed by town 1997-2022 (green) with location of municipalities that have DFS-supervised building departments (red outlines).¹⁰

(right) Figure 3. Number of filed RBES certificates per 100 Residential Permits filed, by County between 1997 and 2022, with overlay of NMR site inspections (blue X's).¹¹

There is no definitive, unified statewide authority over buildings.

The decrease in code compliance reflects a structural problem: the lack of unified statewide authority, with the PSD developing and updating energy codes, the Division of Fire Safety (DFS) at the Department of Public Safety administering building safety codes for commercial, multifamily and rental buildings (but not owner-occupied single-family residences except plumbing and smoke detectors), the Secretary of State's Office of Professional Regulation (OPR) managing Vermont's new homebuilder registry, and the Division of Historic Preservation overseeing changes to historic buildings.

There is currently no statute or statewide mechanism that establishes a comprehensive 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 in many ways.

Figure 4. Authority over single family homes as organized in most other states vs. Vermont's dispersed arrangement. Can someone tidy up these circles?

Commercial construction authority is better coordinated in Vermont: DFS has authority over all building codes except the energy code. No one has authority over commercial contractors, but DFS does oversee a number of building trades.

Many states establish authority – such as a standard of care (a building code or licensure/certification) with optional enforcement at the local level. As long as it's clear what the right thing to do is, and a contractor can be held to that standard, enforcement is not necessary.

There is no clear chain of authority from the General Assembly to municipalities to administer building (including energy) codes.

At the same time, a handful of municipalities administer building and energy codes locally without a clear chain of command back to the Legislature. There is a clear chain of authority building code oversight – for public buildings – in 25 VSA 173 through DFS to municipalities that sign a memorandum of understanding (MOU). This chain works in reverse; DFS reviews and can reverse decisions made by those municipalities. There is no clear chain of authority either for either energy code or for single family homes at this time:

¹⁰ Information collected from Department of Public Services' database of RBES certificates, all years, and the Vermont Fire and Building Safety Code, Appendix A.

¹¹ Sources: PSD RBES certificate database and <https://housingdata.org/profile/housing-stock/building-permits>. Locations of site inspections are in the NMR report, op. cit., page 13.

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30 V.S.A. 51 and 53 establish Public Service (PSD) authority over building energy codes (including owner-occupied single-family homes and accessory dwelling units) except they have no clear authority to interpret, give variance, hear appeals, or enforce.

24 V.S.A. 83 gives municipalities authority to create building regulations as long as they are consistent with DFS, as well as authority to appoint building inspectors with right of enforcement. The relationship of municipal authority with DFS authority is not clear. This authority does not clearly extend to private buildings.

24 V.S.A. 123 extends municipal authority to housing conditions, again without reference to a standard of care or chain of authority.

Lack of training and oversight contributes to rising energy-code-related building failures.

The Vermont Attorney General's Consumer Assistance Program (CAP) and the Secretary of State's Office of Professional Regulation have been recording reported construction-related complaints since 2012.¹² They documented 85 defect-related complaints, with 52 specifying damages totaling \$543,000, or an average of about \$10,000 each.¹³

For example, according to an article dated May 22, 2023 in VTDigger, an increasing number of Vermont homes are suffering from building failures including moisture damage and mold, due to improper installations of spray foam insulation.¹⁴

Many cases are not made public, especially large failures that settle through insurance companies. This makes it difficult to quantify the scope and statewide cost of the failures.¹⁵

The rising number of building failures in Vermont is due to two major factors: lack of training and lack of oversight. While the Secretary of State's Office of Professional Regulation (OPR) now registers homebuilders and oversees the execution of owner-builder agreements for service, OPR only regulates for fraud. Because there is no standard of care for residential construction in Vermont and no certification or licensure of builders, OPR has no ability to regulate for competence. Vermont has a clear need both for an authority over workforce competence standards but also significant training, statewide, to bring our workforce up to par with neighboring states.

Figure 5. See this and other examples of building failures in the Appendix.

The small number of reported building failure cases reflects the lack of authority in Vermont for single family homes. There is no clear path, as there is in other states, for homeowners to report failures early in the process of remediation. For all other

¹² Data provided by the Assistant Attorney General by email, 9/6/23.

¹³ 1 to 3 cases annually 2012-2016, 6 cases in 2017, 8 cases in 2018, 10 cases 2019, (COVID 2020-2021), 13 cases in 2022, 10 in the first nine months of 2023.

¹⁴ "I Wanted to Cry: Devastating Risks of Spray Foam Insulation Hidden from Vermont Homeowners," VT Digger, 5/22/23.

¹⁵ OPR Sunrise Report, op. cit., page 6.

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building types, DFS examines failures and can modify the Vermont Building Code to improve future construction.. DFS can further pass on recommended changes to the International Code Council, the entity that creates base building codes in the United States. If DFS had authority over the building trades, it could also modify training standards. Vermont is one of the coldest states with one of the largest inventories of historic buildings; this coordination of analysis and improvement would benefit not only Vermont but also other states.

Training of Vermont's construction workforce is lacking and uncoordinated.

Without energy code oversight or consumer demand for code compliant construction, and in a time of urgent construction demand due to flood recovery and a housing shortage, many builders do not take the time to get trained. There is no statewide incentive or requirement for continuing builder education and training, which likely contributes to the problem.

DFS currently certifies and regulates the following trades: Electricians, Plumbers, Elevator Installers, Gas, Oil, Sprinkler, Fire Alarms, Chemical Suppression, Fire Sprinklers, Chimney Sweeps, Generator Installers. DFS has a robust continuing education program with approved providers around the state.

OPR regulates property inspectors.

Currently a number of providers train Vermont's construction workforce about energy codes, building science, and weatherization:

- 1) **Efficiency Vermont.** 12-24 trainings a year typically reaching 65-245 participants depending on the code update cycle. EVT also hosts a two-day Building Better by Design conference in Burlington which typically sees 900-1000 participants of which **xx%** are builders. **Add approximate distribution of courses over Vermont (a map would be great for this)** EVT also budgets about \$70,000/year to subsidize coursework, field training, and exam fees for Building Performance Institute certifications.
- 2) **Vermont Builders and Remodelers Association (VBRA).** Typically offers six courses per year, usually in partnership with Efficiency Vermont. Participation in other courses is very low.
- 3) **Association of General Contractors (AGC)** **add # courses, # participants**
- 4) **Vermont Retail Lumber Dealers' Association (VRLDA):** primarily commercial training. **add # courses, # participants**
- 5) **Building Safety Association of Vermont (BSAVT):** 2-4 trainings a year, both commercial and residential. Typically 80 - 120 participants a year focused in central and southeastern Vermont.
- 6) **Vermont's seventeen technical and career centers:** at least three-quarters of these facilities have building trades programs. They are eager to teach professionals, but there is no demand now because there is no incentive (like certification) for participants. The centers do currently host training for electricians and plumbers.

Figure 6. Vermont technical and career centers.¹⁶

¹⁶ Vermont Association of Career and Technical Directors, <https://vacted.org/>

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- 7) **Weatherization.** EVT currently teaches some courses, but Vermont's Office of Economic Opportunity handles most of Vermont's weatherization training. There is minimal coordination of retrofit and weatherization training with experts such as the Division for Historic Preservation. There are no state-recognized certifications that providers can teach to. The majority of courses are in the west side of the state; more effort must be made to reach contractors in the east side of the state.
- 8) **Community Training.** There are 140 Vermont Energy Committees across the state: volunteer groups working with municipal officials, schools, businesses, and neighbors to get buildings weatherized, solar projects electrified, heat pumps installed, transportation options expanded and far more.¹⁷

Figure 7. Locations of Vermont's Energy Committees¹⁸

VECAN, the Vermont Energy Committee Action Network, office of Vermont Natural Resources Council, supports the committees with training, communication forums, and advocacy in state government. VECAN partners with the state's eleven regional planning commissions and the Vermont League of Cities and Towns. Together, this passionate, nearly statewide network is a powerful channel for training homeowners and local experts.

Some of these committees may have established local building energy code ordinances or even adopted Vermont's stretch codes. At this time, it is not known how many municipal ordinances Vermont has, or how many towns with stretch codes.

Builders who comply with energy codes are at a competitive disadvantage.

The Committee discussed the negative impact that RBES compliance disparity has on builders. With less than half of new Vermont houses being built to code, builders who build to the energy code are at a disadvantage and feel that they are operating on an unlevel playing field. The Committee heard testimony 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 and the entire state's progress towards its energy goals.

Documentation of energy code compliance is inconsistent.

The Committee also discussed a lack of documentation as an issue negatively impacting Vermont energy code administration and caused by a lack of authority. This includes inconsistent filing of both CBES and RBES certificates, which are intended to document compliance with energy codes. 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.

¹⁷ VECAN website: <https://vecan.net/energy-committees/>

¹⁸ Ibid.

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Vermont would benefit from a process that requires the builder (either commercial or residential) and owner to agree *before construction* on the specific methods and assemblies the project will use to meet energy code requirements. For example, the DFS currently requires that a commercial building have a CBES certificate in order to issue a certificate of occupancy. No one reviews either the project's energy code details or the certificate, however.

While written contracts are now required in Vermont for residential construction projects over \$10,000, there is no requirement for the builder and owner to formalize how the project will comply with RBES. It would be very helpful if this initial agreement could become the first step in a statewide database as an online application. For instance, New Hampshire, has a simple, graphic application for residential projects:

This clear, graphic approach could easily be made into an online application with a pass/fail evaluation. A statewide database could further record amendments to the project specifications, and generate certificates as a project is closed out.

Municipalities are currently 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). Municipalities are also required to collect an RBES or CBES certificate before a CO is issued. There is no process in place for ensuring this happens, and many municipalities are understaffed and overburdened. Further, 20% of municipalities representing 8% of Vermonters have no subdivision regulations or zoning.¹⁹ Some towns share part-time zoning administrators who cannot do much more than collect permit applications.

Figure 9. Ratios of Towns without zoning regulations by number of towns and by population; Map of Vermont showing concentration of areas with no zoning regulations by county.²⁰

Additionally, Agency of Natural Resources' Act 250 Project Review sheets and their Permit Guidebook notify property owners and design professionals of mandatory energy code requirements. Act 250 projects are required to conform to CBES and RBES stretch codes; but Act 250 has no provision for assurance of compliance.

¹⁹ "VT Zoning Statistics," Vermont League of Cities & Towns, 7/26/23.

²⁰ Ibid.

Vermont Energy Code Background

Energy Code History and Current Status

Vermont statute 30 V.S.A. § 51 established residential building energy standards.²¹ 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.²²

Vermont 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 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, 2007.²³ It is the energy code for all commercial buildings and residential buildings 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).

Measuring Vermont’s Progress Towards Safe, Energy-Efficient Buildings

While energy efficiency technical standards have been updated according to plan, supporting actions such as establishing authority and training builders were not initially mapped out or addressed. One reason may have been Vermonters’ lack of awareness that occupant safety was at risk. It is hard to create regulations when a need is not clearly necessary. However, the need is becoming apparent.

Figure 10. Representation of energy code goals, milestones, and progress

The lack of progress towards “Z” or safe, energy-efficient buildings has been reported and analyzed. In 2012, the PSD published the “Vermont Energy Code Compliance Report” to provide a roadmap to “achieve 90% compliance with Vermont’s then current commercial and residential building energy codes by February 1, 2017.”²⁴ 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

²¹ <https://legislature.vermont.gov/statutes/section/30/002/00051>

²² https://publicservice.vermont.gov/sites/dps/files/documents/2020-VT_Residential_Energy_Code_Handbook_v8.pdf

²³ <https://legislature.vermont.gov/statutes/section/30/002/00053>

²⁴ https://publicservice.vermont.gov/sites/dps/files/documents/Vermont_Energy_Code_Compliance_Plan%20FINAL.pdf

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to evaluate and report annual rates of energy code compliance.”²⁵ 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.²⁶ The most recent reports, “2020 Vermont Single-Family Residential New Construction Baseline and Code Compliance Study” conducted by NMR Group and “2021 Vermont Business Sector Market Characterization and Assessment Study” conducted by Cadmus have already been cited.

While the issue of administrative authority has been discussed in the last two decades, there has never been enough pressure – now coming from building failures and a lack of a clear trajectory to meet our Global Warming Solution Act (GWSA) requirements – to face difficult, structural statutory change.

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 2022,²⁷ was established in April 2023. OPR requires that contractors who perform residential construction for a homeowner to register with OPR when the estimated value of the contract is \$10,000 or more. 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. The builder registry must evolve to allow contractors to list voluntary approved certifications, giving contractors an incentive to get certified. 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.²⁸

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). Supporters include AIAVT and VBRA. In July 2023, the team was awarded \$1 million through this FOA.²⁹

The overall goal for the project is to assist the State’s development and implementation of an energy code administration system for Vermont that will result in significant and sustained improvement in

²⁵https://publicservice.vermont.gov/sites/dps/files/documents/Vermont_Energy_Code_Compliance_Plan%20FINAL.pdf

²⁶ <https://publicservice.vermont.gov/efficiency/building-energy-standards/building-energy-code-study-committee>

²⁷ <https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT182/ACT182%20As%20Enacted.pdf#page=19>

²⁸

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

²⁹ <https://www.energy.gov/eere/buildings/articles/meet-btos-newest-projects-support-more-resilient-and-efficient-building>

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energy code compliance. The intent of the funding available through this grant is to take what has been accomplished by this Committee and support further efforts towards improved Vermont energy code administration. This will include helping the new authority develop a timeline and funding plan, support 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.

DRAFT

Response to Legislative Directive

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. Through 20 V.S.A. 173, the Division of Fire Safety (DFS) has jurisdiction over public buildings, multifamily buildings, and rental properties. They currently do not have any jurisdiction over owner-occupied single-family homes.

The DFS has adopted and amended a number of nationally recognized safety standards to protect certain buildings and systems in those buildings. Vermont's building codes³⁰ include:

- Vermont Fire and Building Safety Code (based on ICC's International Building Code and NFPA's Life Safety Codes)
- 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."³¹ Their mission is accomplished by the following for the buildings over which they have jurisdiction:

- Code Review
- Permits
- 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

DFS does not oversee energy code compliance in commercial buildings because they have no established authority in that area. They do check to ensure a CBES certificate is filed at the completion of a project, in compliance with Act 89. Given their building code authority over public and multifamily buildings, DFS theoretically has a role in conflict resolution between the energy code and other building codes.

³⁰ https://firesafety.vermont.gov/sites/firesafety/files/documents/dfs_codesheet_codes%20.pdf

³¹ <https://firesafety.vermont.gov/>

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As described earlier, 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). The PSD has responsibility for RBES and CBES promulgation, certificate collection, and education. While they provide some energy code interpretation, the PSD is explicitly not 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) became peripherally involved with energy codes in 2023 when it began to register and minimally regulate homebuilders. Currently their primary function is to adjudicate for fraud.

And finally, the Agency of Commerce and Community Development's Division of Historic Preservation (DHP) interacts with both DFS and PSD to protect historic buildings. DHP has in the past worked with DFS on variances, and they review and validate 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. The number of requested variances coming from either program is minimal.

Charge 2: Recommend strategies to increase awareness of and compliance with 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's existing jurisdiction over building codes.

The Committee has six broad recommendations with more suggestions and details. Note that in the details below, **** IMMEDIATE ACTION ITEMS (2024)** and *** 2-3 YEAR ACTION ITEMS** are identified.

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

**** A.1 The most significant structural change that can be made to positively impact Vermont's energy code environment: Designate the DFS as the statewide authority over 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. It would bring Vermont's practice in line with other states. In line with this new expanded role, the Committee recommends changing the division's name to: "Division of Fire *and Building* Safety". It will be important to phase in the authority over time commensurate with available budgets and staffing, but as quickly as restraints allow.

A unified authority 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. As AHJ, DFS 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.

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There will 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 because they will be able to claim the resulting energy savings.

**** A.2. Clarify the chain of authority from the General Assembly, through DFS, to municipalities.** This Committee recommends increasing the memorandum of understanding (MOU) provision in DFS statute (25 VSA 173) to include oversight of municipality administration to owner-occupied single family homes.

**** A.3. Amend the energy code update cycle.** 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. *The Committee should recommend new language.*

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 2030.³² 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.

**** A.4. Establish an advisory committee to DFS that will advise the overall transition, help with future code revisions, and examine building failure cases to improve building science and future codes.**

B. Improve administration of the energy codes.

*** B.1. Direct DFS to establish a statewide, central, publicly accessible database for all Vermont buildings that includes energy code data.**

*** B.2. Establish a certificate application process for both CBES and RBES that is part of the database.** Commercial and multi-family projects can simply add energy code review to the existing building permit application. The builder would close out the energy code application as part of the large building permit close-out.

A similar, simple online application for single family homes should be developed. This would be the only application that homebuilders need to submit to the state. It would not be enforced except in

³² https://publicservice.vermont.gov/sites/dps/files/documents/2022VermontComprehensiveEnergyPlan_0.pdf p.

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municipalities that choose to do so. Homebuilders would close out their application by certifying that they built their projects according to the application (or attach amendments).

**** B.3. Require homebuilder-owner agreements (overseen by OPR) to include a clause referring to the RBES application.** This will ensure that homeowners are aware and jointly accountable for the compliance of their home with RBES.

*** B.4. Eliminate filing certificates in town records and the notarization requirement.**

A centralized publicly accessible database eliminates 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. The current requirement for notarizing RBES certificates will become unnecessary and should be eliminated.

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.³³ *What is this based on?*

C. Improve workforce training and support.

It is critical to bring Vermont's construction workforce up to par with other states and with the energy codes, under one authority.

**** C.1. Give DFS authority over all building trades certification and energy code training, with an advisory council representing all trades.**

- a. Training Certification - Develop a voluntary, generic certification for each trade (homebuilder, insulator, weatherizer, energy consultant, etc) to demonstrate energy code proficiency and coordinate with OPR's Contractor Registry to list the certification.
- b. Training Materials - Develop accessible and readily available energy code and building science training for builders – to be taught also to designers, subcontractors, developers, building distributors and suppliers, planners, **housers** (*EFG term?*), municipalities, real estate agents, lenders, appraisers and other audiences with an interest in housing, construction, and finance – in various formats and levels of detail.
- c. Trainings - Make training available regularly in various formats and venues to all of the audiences listed above, in all areas of the state. Make it clear that RBES and CBES are required energy codes and how to comply with the codes, including project registration and certification. Coordinate energy code training through tech centers, efficiency utilities,

³³ 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.

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professional organizations, trade groups, state agencies, regional organizations, municipalities, and the proposed Weatherization Training Center.

**** C.2. Develop on-site services statewide under DFS.** Offer energy code and building science support, including help with problem solving. These may initially be EVT consultants or contracted consultants.

*** C.3. Increase training and support for Energy Consultants.** 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. For example, energy consultants could provide plan review and/or meeting prior to construction; assist builders with filing the permit or application and completing the owner/contractor agreement; perform site inspections with blower-door tests 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.

*** C.4. Increase and coordinate training for Weatherizers.**

- a. The PSD has budgeted a portion of a \$875,000 U.S. DOE grant “Workforce Developing Training Funding” to provide workforce development in order to grow the weatherization workforce in Vermont. This could include include Building Performance Institute(BPI) Training and could be expanded to include more general building science and include new construction.
- b. Efficiency Vermont has received a \$1M Workforce Development Training Grant from the American Rescue Plan Act. It provides funding for entities and programs that increase the number of people working in or supporting the weatherization field in Vermont. Programs must directly serve an eligible population, defined as: Low income (defined as less than 80% AMI); or individuals who, as a result of the COVID-19 pandemic, are unemployed or are employed part-time but want and are available for full-time work; or moderate income (defined as income between 80%-120% AMI); or workers whose entry to the weatherization workforce represents greater opportunity for economic advancement.
- c. Efficiency Vermont anticipates adding a Workforce Development position. A full time position will be hired in 2024 to assist with Talent Pipeline Management in the energy efficiency trade workforce. This position will work collaboratively with Vermont partner organizations on helping to build and implement long term strategies to recruit and retain more skilled workers in the weatherization and heating electrification fields.
- d. Work with the Division for Historic Preservation to develop appropriate methods and materials for retrofitting and weatherizing historic structures.

**** C.5. Support the Weatherization Training Center (WxTC) Initiative.** Vermont’s Office of Economic Opportunity is partnering with Efficiency Vermont to use \$1.7m DOE funds to create a special training center. The WxTC will serve as a hub to coordinate existing training programs and develop new training programs for Vermont. A specific goal of the WxTC is to diversify the workforce and bring underrepresented individuals into the weatherization field. If a viable business model is identified for

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the WxTC, a request for proposals will be issued in 2024 to solicit an entity to establish and run the WxTC.

* **C.6. Move the Building Code Assistance Center (call center) to DFS.** Move the existing Efficiency Vermont Energy Code Assistance Center (ECAC) under DFS and expand its scope to offer all building code interpretation, project support, training, and specific energy code advice. The current funding for this center is \$105,500 annually **from the DRP-DSS budget.**

Funding: Several major funding streams are becoming available through the federal Department of Energy to help states meet their energy consumption reduction goals. Vermont has already received one grant.

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's 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. One example is DOE's "State-Based Home Energy Efficiency Contractor Training Grant Program with applications due January 31, 2024.

D. Increase awareness of building energy codes and requirements.

Regardless of improvements to 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. As noted above, municipalities and DFS through Act 89 and the Agency of Natural Resources already inform owners and builders of energy codes. The Committee recommends these additional efforts to increase awareness:

** **D.1. 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.

** **D.2. Loan Closing Checklists** – Ensure that the inclusion of energy code certificates is included on lenders' and real estate attorneys' mortgage loan closing checklists.

** **D.3. Contractor Training Certification on Agency Websites** – Include certifications on the Office of Professional Regulation's (OPR) Contractor Registry³⁴ and DFS's Trades Licensing and Certification³⁵

³⁴ <https://sos.vermont.gov/residential-contractors/>

³⁵ <https://firesafety.vermont.gov/licensing>

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webpages. Require Contractors (OPR) and Trades (DFS) to disclose at registration and renewal whether they have obtained certification appropriate to their trade.

**** D.4. 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.

*** D.5. Radio Show** - Create an educational question-and-answer show based upon the wildly successful “Car Talk” of years past. Each episode would feature a different issue, a commonly encountered problem, or a submitted question. The radio show option would encourage call-ins, and perhaps could become a regular feature of Vermont Public. The shows could be archived for the public and also for future improvement of the codes. Committee member Jim Bradley and energy consultant Chris West once had a similar show on WDEV.

Funding. 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.

*** E. Increase support of and funding for above-base code projects (stretch codes).**

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 EEs to support the building community to reverse this trend. While the EEs 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 EEs 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 that go beyond the base code levels. Currently, the EEs offer incentives and claim savings for projects that are built better than code. This approach should continue, but in order to incentivize the EEs to support projects all the way up to the “net zero” level of performance, savings should be rewarded to the EEs from baseline code conditions and not from the code in place today which is the current approach.

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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. Encourage DFS to use the U.S. Department of Energy's (DOE) grant to Energy Futures Group for the "Vermont Energy Code Administration Project" to support these strategies.**

Energy Futures Group (EFG) has been awarded a three-year grant to support the development of energy code administration in Vermont. This can be considered as support for "phase 2" to the Act 47 BECS and a follow-up 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, and training energy consultants.

Timeline of Recommendations: Public Buildings (Commercial, Multi-Family, and Rental Housing)

Timeline of Recommendations: Owner-Occupied Single Family Home

Response to Charge 3: Evaluate the 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 non-energy 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's

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- e. The calculations should begin to include some accounting of the economic benefits and risks of health impacts from energy code compliance, and non-compliance (including potential building failure).
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.
 - a. 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 EEUs play in the new construction market to provide the technical assistance and/or incentives in exchange for claiming the energy and carbon savings.
 - b. 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 likelihood of Vermont not meeting its legal obligations of the Global Warming Solution Act is very real without immediate, significant statutory change. We believe that the recommendations outlined above will change Vermont's trajectory significantly as well as prepare our construction workforce and our buildings for the future. This future must include safe, healthy environments to live and work in.

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)

DRAFT

Appendix of building failures **NOTE: JIM WILL WORK ON THIS NOV. 2-3.**

Our committee focused on problems associated with the lack of awareness and compliance with energy codes. Lack of knowledge of how to comply with energy code – coupled with the 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.

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.

What follows are just a few examples of failures, large and small.

Single Family Home, Craftsbury VT

Constructed: 2006

I can't get this to be 2 unequal columns.

Problem: inadequate application of foam insulation and vapor barrier.

In the house's first winter, ice jams of 6-7 inches built up on the roof. The foam insulation had shrunk away from the rafters causing large gaps. A consultant found 2 problems: (1) the insulation was sprayed in one 6" application, rather than spray in 2" applications. (2) the mixture ratio utilized was 'off ration' and 'lacking isocyanate.' The case was litigated and eventually a second installer was hired to repair the work.

In 2021, we noticed heat loss again in our roof. It was determined that we needed to tear off the roof and replace the insulation in full. The rafters were now rotten due to high moisture, so in 2022 and 2023 the entire roof had to be replaced.

Financial Damages:

- \$15,000 legal fees 2008 - 2009
- \$14,000 insulation repairs 2009
- \$40,000 insulation and roof replacement 2022, 2023

Message from the owners: Thank you for this important work you are doing! As consumers of construction, we are currently vulnerable with little protection. We need to ensure contractors are trained, certified and held accountable for standard of care and workmanship.

Single Family Home, Warren VT

Built: ?????

Problem: failed roof sheathing due to improper insulation installation.

Cost to repair? \$xxx

Single Family Home, Highgate VT

Built: 2015

Again: this should be 2 columns to save space.

Problems: Underinsulated low-slope roof; air infiltration at outlets and window/door openings; air gaps between trusses; propane leak.

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Estimated cost to repair: xxxxxxxx

Jim: what was the problem and what was the estimated cost to repair?

Single Family Home, Bridport VT

Built: 2017

Any photos?

Problem: ice damming, moisture trapped in wall; sheetrock damage; can lights not sealed; gaps in cellulose insulation with low density; failed structural sheathing.

Estimated cost to repair:

Single Family Home, Swanton VT (Jim, this is Bruzze)

Built?

Problem: Incorrect insulation install?

Estimated cost to repair?

Single Family Home, Essex VT

Built: ????

Problem: Incorrectly installed exterior insulation??? Sheathing failure. Windows need to be replace?

Estimated cost to repair: xxxx

Single Family Home, Williston VT

Built:

Problem:

Estimated cost to repair:

Single Family Home, Westford VT

Built:

Problem?

Cost to repair?

DRAFT