Vermont Building Energy Code Collaborative
Multifamily Meeting

6/10/21

Participants

Team

Liz Bourguet- Energy Futures Group
Sean Denniston- New Buildings Institute
Richard Faesy- Energy Futures Group
Eveline Killian- Cx Associates
Kelly Launder- Department of Public Service
Keith Levenson- Department of Public Service
Mark Lyles- New Buildings Institute
Barry Murphy- Department of Public Service
Gabrielle Stebbins- Energy Futures Group

Stakeholders

Kathy Beyer- Evernorth
Bob Bolin- Burlington Electric Department
Enrique Bueno- VT Passive House
Randy Drury- 3E Thermal
Samantha Dunn- Evernorth
Will Fontaine- Snyder Homes, Shelburne VT
Steve O'Malley- VEIC Energy Consultant
Kai Palmer-Dunning- NEEP, Massachusetts
Craig Peltier- Vermont Housing & Conservation Board
Mary Jane Poynter- Efficiency Vermont
Jesse Robbins- Freeman French Freeman
Michael Russom- Burlington Electric Department
Charlie Willner- Evernorth

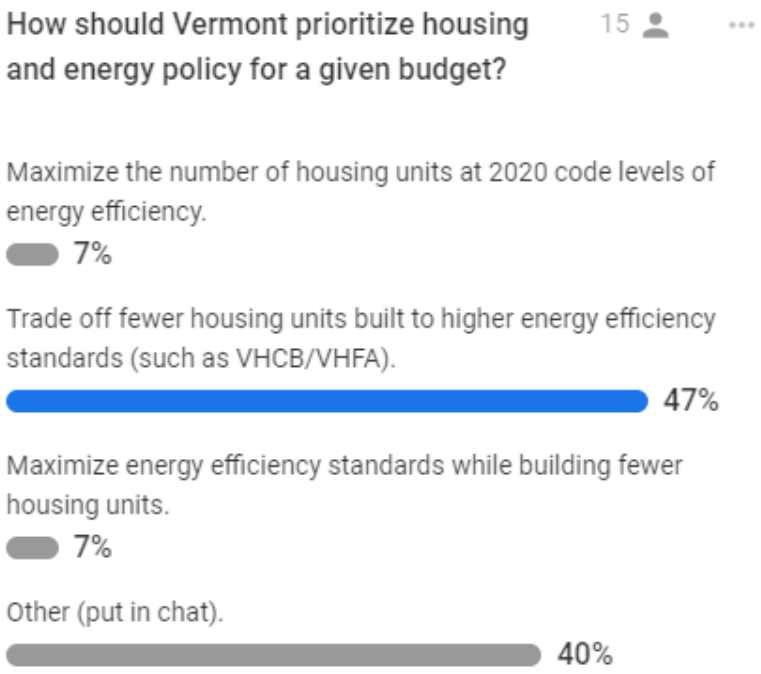
Discussion

Balancing Policy Priorities

- Craig Peltier introduces his work and sets the stage
    - 4 key things that drive the overall policy goals: 1. To build efficient quality housing, 2. In a cost-effective manner, 3. They're concerned about increasing costs, and 4. And growing costs impact our highest priorities, including addressing homelessness and downtown development
    - These priorities have left room to go above code and accomplish these things. They are deciding, what are measure that make sense to do?

    - VHCB/VHFA–have standards that are deeper than code. Now, as codes evolve, we want to link our standards with Code. So, they adopted “high performance homes”
    - Building Design Standards- includes language for embodied carbon as a soft requirement
- Enrique Bueno (in the chat)- What variables are considering to calculate "Cost Effective" housing?
- Kelly- can you speak about how you define cost effectiveness?
- Craig – cost effectiveness has been done in different ways. They were concerned about how long the payback should be for the wall. Settled on R-31. And windows, which is .28, not triple glazed. There are also sourcing concerns. They are concerned with long-term payback.
- Kathy- appreciates the conversation and the need to balance policies including how to build more housing. As non-profit affordable housing developers, what are the best choices we can we make with energy efficiency and also build more housing? They do MF rental housing. By its nature, MF housing is more energy efficient than single family. She likes the point system, standards based on sq footage.
    - We do a payback analysis- energy audit. For example, they analyzed energy cost and incremental construction costs for a building they did a few years ago. Could share this analysis. When we do analysis, we might get to payback territory 30 years and beyond- is this what we want? What new technologies will be available in 30 years? We will get to near net zero, but today, we won’t get there.
- Samantha- happy to share information where they’ve done a deep dive in cost implications for mechanical systems and envelopes with a payback analysis. Generally looking for payback that is under 20 years, sometimes stretch to 30. When it gets to 50 or 70 years, we feel like it’s not the best use of public dollars.
    - Samantha can send us the materials
- Enrique Bueno (in the chat)- @Kathy, have you checked the total cost of ownership results that Avesta Housing has produced comparing 19 of their buildings, which shows the cost effectiveness of High Performance and Passive House design?
- Richard- balance between energy/ climate goals and need for more housing. Should public funds be spent on fewer but more energy efficient units or more units that may be less energy efficient? Relates to next poll.

Poll:



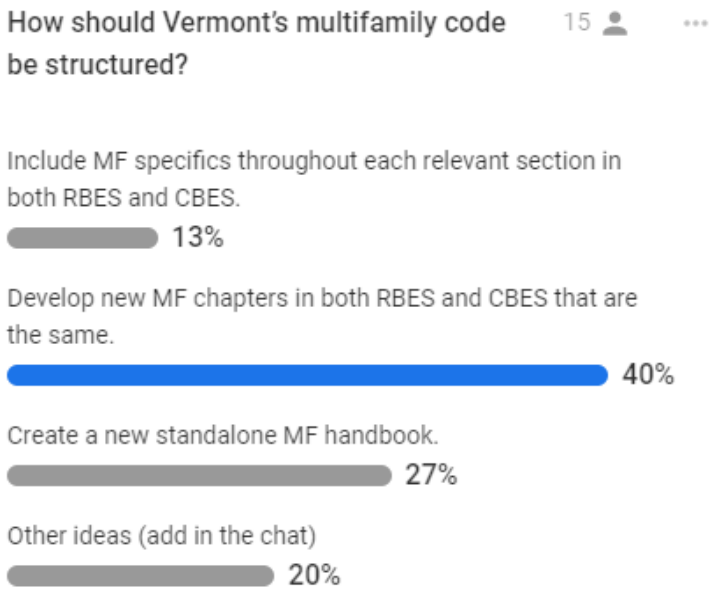
- Richard- explanation of poll- Progressively more stringent energy standards going from a to c.
- Mary Jane Poynter (in the chat)- Other: spend money on envelope and air tightness and not get crazy about super expensive and complicated mechanicals. Other: there are new mech system options coming out every day!
- Enrique (in the chat)- agree with Mary Jane
- Steve- thinking about what's coming in for air and water technologies. If we are building buildings with high temperature distribution, we're not setting ourselves up for the future. If low temperature distribution, we could be focusing on electrification and decarbonization. There is amazing complexity with owners and operators trying to keep buildings running. Commissioning to get buildings to operate is way above what people are willing to take on.
- Richard- so, should we focus on envelope over mechanicals?
- Mary Jane- And if you're going to an air-based system, maybe the complexity of mechanicals could go down. Tiny package unit rather than big projects – maybe even straight electric heat or hot water.
    - Eveline- what would we do about cooling then?
- Craig- the prices of fossil fuels have been stable since fracking in 2010 and this shows up in payback analysis. So, when discussing climate change, you need to keep this in mind. The industry has advanced despite fossil fuel prices, not because of them. We find things we can do with marginally more money.
- Kai Palmer-Dunning (in the chat)- prioritize electrification readiness
- Bob Bolin (in the chat)- more/better not an option?
- Enrique Bueno (in the chat)- Triple pane windows u value 0.14 are cost competitive and US made already

- Jamie (in the chat)- Other: prioritize low carbon (over low energy). E.g. prioritize low first cost electrified mechanical systems that may not be the most efficient but are using a clean fuel source (electricity) rather than gas/propane/fuel oil.
- Jamie (in the chat)- Great points Mary Jane!
- Enrique Bueno VTPH (in the chat)- @ Evelyn, there are already ventilation systems that heat, cool and dehumidify through ventilation air

Background on Multifamily Code from Mark Lyles from NBI

Multifamily Energy Code Structure

Poll



- Craig- what have other jurisdictions have done?
- Mark- the general trend is to require units in MF to comply with residential code, then common spaces (regardless of height) to comply with commercial requirements of code.
    - We are seeing some advanced jurisdictions have R2 MF buildings to commercial path, which would be more stringent code requirement, especially for hot water systems, than Residential.
    - Also, ventilation continues to be a problem. There is no real elegant solution that addresses that challenge.
- Charlie Willner- has anyone done a study of the impacts (environmental, energy) of MF vs single family? The payback and impact on how much housing will be built? How the different aspects of the two codes would have different impacts?
    - If one goal is to drive down energy use, what if you look at the impact of one typology vs the other? Do we have an understanding of what would be most impactful? Might help to guide long term decisions
- Craig Peltier- we should be looking at whole building stock to get to root of impact
- Richard- this also raises the question of focus existing buildings

- Kathy– it would be good to reach out to architect community and ask this question (of how to structure MF code). Some architects haven't been able to make these calls. We could come up with some names to run these questions by.
    - Richard- we want to make the code work for those who have to apply it. What would make it more workable from your perspective? We would like their input.
    - Kelly- we could send out a follow up poll and people could forward it to contacts.
- Enrique- in VT, there are 70,000 low-income MF units, which will require weatherization in the process. Also, in terms of separating codes- internal gains, ventilation requirements, equipment is different than Commercial – so there are many different aspects (than MF). Base code allows for extract only ventilation- that's not going to help with energy efficiency, no approach to sanitary ventilation.
    - The governor's goal is to build 5,000 MF units in the next 3 years. How many of these units are going to be built according to base code? Also, even stretch code is coming up short on ventilation and air tightness.
    - Kathy- when we build with VHFA funds, Evernorth are following new MF energy standards, usually reaching passive house standards for air sealing.
    - Enrique- yes, they're doing a great job but you're probably not going to be building all 5,000 units. I'm worried if these units will require weatherization in the very near future
    - What is code that will apply to these new units?
- Richard- do we know what compliance rates have been for MF? Affordable vs market rate?
- Kelly- Is MF covered in the Commercial assessment? Not sure if there is a separate delineation
- Barry- will look into it
- Kathy- my guess is higher compliance because you have architects and engineers involved
- Jesse Robbins- questions whether net zero is really the right goal. With some building materials, embodied carbon use increases. The payback for energy insulation can be very long to offset the carbon footprint of manufacturers. Our goal is to offset climate change. And it's hard to use something combustible like cellulose in MF buildings. Electric space heating may be something we need to look at.

Technical Discussion Questions #1

- Jesse- electric resistance heat. Working on a mixed-use project under CBES. This comes up in a lot of projects, so the discussion has to address both Residential and Commercial.
- Kelly- is there a prohibition on electric resistance heat in Commercial? I thought the language was the same as Residential.
- Barry- no- there is the exemption for 6 mmbtu and exception related to heat pumps
- Jesse- there is an exemption but even a greater push towards electrification and away from fossil fuels will work in some areas. Load reduction is important but there are cases we would be exceeding this.
- Steve- there are times when electric resistance should be on the table. Shouldn't just eliminate this exception.
- Kathy- we have used this exception frequently.
- Richard- how do you address the cooling side? If this is replacing HPs, are people replacing cooling?

- Kathy- we have used electric resistance heat as a supplement to heat pumps. We have not done straight electric resistance heat.
- Craig- are you saying that 6mmbtu should be higher?
- Jesse- I think there are only extreme cases (back up) when electric resistance is acceptable. Places where it would be appropriate. Trying to use hybrid water heaters, in much larger buildings, would a more localized option would be a better solution?
- Richard- are you typically putting in individual water heating or central systems?
- Jesse- I think it's a mix and a lot depends on how the bills are being paid. With a push towards tenants paying for utilities, which is a way to encourage conservation, this means a unit-by-unit approach.
- Craig- the questions around ventilation, cooling, there are a lot of moving parts right now
- Richard- is cooling something you think about going into new buildings?
- Craig- often, but not always. Sometimes we try not to do it, but we discuss it every time. Less and less people are putting A/C units in windows. Challenge is how much energy ventilation units are using.
- Steve- central DHW losses- when we have large recirc loops in MF, 50% or more energy used to heat water is lost into the building shell. Also, now that we're building better shells, building load is domestic hot water AND we're losing 50% of it circulating it the buildings and then we have to cool the buildings. Which means that electric resistance tanks aren't that crazy.
- Steve- ventilation- concerning ACT 250– there is no stretch code in CBES but RBES does have stretch. So what to do if you have Act 250 project? Differences between code for 4-story MF building that is Act 250, can be doing exhaust-only ventilation. Should be addressed
    - Kelly- the Department develops stretch CBES guidelines, this years' stretch CBES was not adopted by the Natural Resource Board. So, there are guidelines for CBES, but it was not adopted. Residential stretch code are in statute, but Commercial is adopted by the Board but they chose not to.
    - Richard- RBES is in legislation, but CBES isn't?
    - Kelly- Yes, per statute, Act 250 will follow RBES stretch for residential. For CBES, you should use best available technology. Previously that was defined by the CBES stretch guidelines we developed. Now Natural Resource Board uses CBES base
    - Richard- is that something legislators should know about? Is this a loophole?
    - Kelly- we need to know going forward that there's a possibility that the CBES base will be it for Act 250 projects.
    - Steve- CBES just says follow RBES ventilation. Also a follow up about Act 250 – priority projects and downtown designations don't have to follow Act 250. Should the intent for priority projects be that they meet stretch code? Are there other projects that should get exemptions? Should those be steered towards RBES stretch?
    - Richard- where does that standard live?
    - Kelly- I don't believe designated downtowns are exempt from energy standards component of Act 250 or stretch, but I'm not sure about priority projects.
    - Kathy- in Act 250 statute, there is a requirement that if you are priority project that is exempt from 250, but you still have to meet energy code requirements.
- Air leakage testing requirements- new envelope people come on board to meet the demand. Isolation of units is something we're trying to achieve.

- Charlie- we have not had any issue finding folks to do testing in our buildings.
    - Code is very prescriptive- but we're trying to drive down actual energy use. Long term, are we going to move to a system that we prescribe an energy use level that meet to a standard? Are we trying to prescribe equipment or systems?
- Enrique- cooling in MF is a high priority because it's the leading factor due to internal gains, even in our climate zone. There are some units that can provide cooling through ventilation. Combined with electric heating is going to be best solution. Have to take into account as our climate is getting warmer
    - Ventilation- balanced ventilation should be mandatory for MF buildings. Extract only ventilation is no ventilation. Even in base code.
    - With increasing electrification, we're going to be requiring a 7-to-10-fold output in electric grid. Important to lower loads, so we need highly energy efficient buildings
- Jesse- Balanced ventilation and energy recovery is very important. Air tightness is important but caution against diminishing returns and has a concern about embodied carbon in insulation.
- Richard- Jacob Racusin and Brian Just- have a proposal for point system for embodied carbon. Will talk about it at upcoming Res meeting.
- Steve- LPD lighting- with 4 story building, parking garage is dictated by LPD requirements, but 3 stories, there's nothing in RBES to address what lighting should look like in those spaces.
    - People should be directed to CBES for requirements for lighting.
    - Enrique- going towards electrification, heat pumps in a low performance building do not provide adequate comfort. If people aren't comfortable, they will be messing with it, it will be increasing the electricity usage of the heat pumps.
- Mary Jane Poynter (in the chat)-study on refrigerant leakage based on fitting types.
- Bob Bolin (in the chat)- require pressure independent flow control for all domestic water fixtures. Are lower infiltration and exhaust only ventilation mutually exclusive?
- Keith Downes (in the chat)- We will be discussion embodied carbon at the 3rd C&I meeting on the 15th.
- Mary Jane Poynter (in the chat)- yes the LPD is an issue
- Mary Jane Poynter (in the chat)- or the lack of requirement in RES
- Sean Denniston (in the chat)- They are. With code-compliant infiltration rates, an exhaust-only ventilation system would have to depressurize the space to over half the pressure that is used for envelope testing in HR-MF in order to achieve the ventilation air required by standards like ASHRAE 62.2.
- Sean Denniston (in the chat)- ASHRAE's new MF Design Guide specifically discourages unbalanced ventilation in MF.
- Mary Jane- is there anything in code for refrigerant leakage?
    - Nothing in Res or Com
    - Mary Jane- has a refrigerant leakage study. Their experience is that there is leakage and there are issues when HVAC contractors are installing split equipment. They're supposed to test if there is leakage. We'd be willing to pay more for a better pipe connection. Could put testing requirement in code. I don't know how much testing is actually done. If they use the least foolproof method of making the connection, then at least they have to test for leaks and they have to report. Amount of leakage is significant

enough that we should be worried about if we're going to be putting that many split systems on the roof.
    - Richard- Are there other standards in other jurisdictions?
    - Mary Jane- part of national mechanical code
    - Mark – ASHRAE 228 –accounting methodology for net zero does include projects that account for refrigerant leakage.
    - Keith Downes- would fit in the C407 maintenance information as addition to that section. Should add to list of things to discuss further.
- Craig- in the point system, there was modeling to support what EUI these are getting you to. Ultimately what are the EUIs we're trying to get to? Maybe this could be more explicitly laid out in the code? So people don't think it's just prescriptive. EUI goal with each code cycle?
    - Richard- we want to make sure these is a MF EUI.
- Steve- for windows, for 4 story buildings, you have to follow CBES, which is 0.37. But for 3 story building, follow RBES 0.28 window requirement. They should be the same. 4 story should be using 0.28 windows. People are using them 24/7.
- Richard- need to be aligning standards between the two for MF
- Enrique- anything above 0.17 is not adequate for VT for energy efficiency, comfort, condensation- there are already US built triple glazed windows.
- Richard- next round of code should be looking at triple glazed windows.
- Barry- compliance rates for MF- not specific numbers. All minimums exceed the requirements. Only looked a relatively small number of MF buildings in the state.
- Richard- should consider for next market assessment study to include specific MF compliance rates.