

Residential Working Group - Energy Modeling, Prescriptive Path, and Renewables Meeting #3

June 30, 2022

3 p.m. – 4 p.m.

Introductions:

1. CPD: Eric Browning, Antonio Navarra, Allen Yanong, Robert Pruet
2. CASR: Katrina Managan, Courtney Anderson
3. Attendees: Sean Denniston (NBI), Robby Schwarz (BuildTank/Noresco), Bill Rectanus (Thrive), Jonathan Fertig (Davis Partnership Architect), Christine Brinker (SWEEP), John Dutch (KoelbelHomes) Srinidhi Sampath (RMI), Jonny Kocher (RMI), Rob Buchanan (Xcel)

Review Updated Proposals:

1. #31 ERI Path & #19 Compliance Path Options – combined into one proposal
2. #67 IECC R404.4 - Minimum Renewable Energy System
 - a. Updates Made: There has not been a lot of impact here.
 - b. Summary of Proposal: If you look at exception here, all electric properties have an exception. Path through R408, R406, and excluded homes under 1000sf.
3. #47 R408 Additional Efficiency Options
 - a. Updates Made: Addition of demand responsive thermostats - control that is approved for participation in a demand response program. Xcel is only one right now, but this allows third party programs to be capable in the future. Removed high performance thermal envelope based on our discussion last time. 18 credits are higher for mixed use building than all-electric building

Summary of Topics Discussed:

- a. ERI Path and Compliance Path Options
- b. R408
- c. Renewables
- d. Overall Stringency

Detailed Notes:

#31 ERI Path & #19 Compliance Path Options

1. Basis of proposal is ERI score of 50.
2. Christine - It seems like there's no direct push towards electrification other than you can avoid putting in minimum renewables. Does it allow a mixed fuel building to put ERI on top?
 - Robby – you have to reach a 50 before install PV.
 - Christine – you can do that if you do gas or electric

- Sean – In prescriptive path, you have different credits.
 - All electric is 55 and all other is 50? Incentivization in ERI path is different. ERI is already more stringent. We'll acknowledge what is doing better than prescriptive.
 - Christine – Prefers that approach and that it would match other pathways better. Other jurisdictions do this.
- Jonny - Can we split it between electric and mixed fuel, while still keeping the overall R406.4 average to 50
 - Not widely used. Robby part of amendments is to make it more straightforward.
 - Conclusion: Sean – updating proposal to require ERI of 55 of all electric and ERI 50 to mixed fuel

#47 R408 Additional Efficiency Options

1. Eric – From code perspective “approved” typically usually refers to AHJ, but this is for utility company.
 - i. Conclusion: Changed and updated it
1. Rob Buchanan – Can we review 408.3.4 Can see where a high performance thermal envelope that a builder increases thermal envelope but goes cheap on space heating. If I building a high performance house, do I need a high performance heat pump?
1. Sean – Ror high performance envelope, 408.8.2 doesn't say you have to have a heat pump. If you have a high performance envelope, the 408.8. high performance space heating gives you credit for PHIUS standard electric resistance system.
1. Rob B - Why is 408.8.2 allowed but not 408.8.3?
 - i. Sean – we can add that in.
1. Jonny – Looking at this table, see that going mandatory all electric route, it's a credit route. Can you share how much additional incentive for all electric building vs gas?
 - i. Katrina – let's go through minimum renewable proposal. In this proposal you only need 3. In minimum renewable, it gets you out of the credit.

#67 IECC R404.4 - Minimum Renewable Energy System

1. Jonny - How was 20% chosen?
 - a. 20% chosen from starting point. Goes back to early goal of this code cycle. NZE Implementation plan started goals. Plans set a starting place and want to make sure the plan is the right requirement for this code cycle.

2. Rob - #3 exception requires an ERI of 33?
 - a. Sean – that's quite low. Advantage of that is that ERI would give you opportunity to do hybrid renewable energy and efficiency approach. If we look at prescriptive credit, you would have to get there with efficiency alone.
3. Rob – is 3 and 4 meant to be equivalent to each other?
 - a. Sean – that is the intent.
4. Rob – definition between all electric property is different.
 - a. Sean – needs to be updated
5. Christine – does that end up covering like all of the roof space of an average new house, or a tiny fraction of the roof space of an average new house, or somewhere in between?
 - a. If you're talking about mixed fuel, pushing towards NZE performance. so I think that for townhouses we might see that it starts to be challenging, but for traditional construction I know because of the efficiency levels that we're talking about, we're going to be talking about smaller arrays to get to 20% than I think people often would have been, you know, thinking about how they can get to 20% with their existing homes.

Other Topics Discussed

1. Stringency -

- a. Bill – If you get 35 points, you basically have to do an electric home. You appear to end up all electric
 - i. Bill – You're either going to be all electric or “all electric” with cooking. Massive preference for gas cooking. Big hurdle for electrification. Significant negative effect of hp water heating in conditioned space. Struggling with this where temperature different will be significant. We're using it and going to use it in the future.
- b. Katrina - You can get there with partial electrification of space or water heat.
 - i. Heat pump for space heat and water heat gets you 14-18 points out of 35, you would still need another 17-21 points.
 - ii. Bill - How do you get 14-18 points from one piece of equipment?
 1. Katrina - High performance electric water heater is 4 points. If it's an unconditioned space, six points if it's conditioned space. Then there's premium up to 8. So that gets a range. Assuming that your water heater is in conditioned space. 18 for space and water heat. That leaves 17-21 other points if you want to keep gas cooking and fireplaces.
 2. Bill - That's the stringency I'm concerned about. You're either going to be all electric or all electric. Keeping cooking out of the picture, I mean, cooking is not a massive source of greenhouse carbon in the atmosphere. It's a massive preference in the home building industry and buying public, they want gas cooking. It's the sexy fancy thing, so buildings are going to want to keep putting that in. I think that's a big hurdle towards all electrification and in my view is 1 cooking and two I think there's negative effect of heat pump water heating. Temperature difference in the area where that water heater is located will be significant and I know the manufacturers say it's not, but it outputs about 200 CFM of air into the space, it's about 10 to 15 degrees cooler than the air that it takes in, so there's going to be an effect there. You know we're using it, we're going to use it in the future. The table says you're either all electric or you're going to put your gas cooktop in and be all electric. I guess that's the end goal

where the city wants everybody to be all electric and that's exactly what this is doing. If that's the stringency that's out there, then that's the stringency that's been achieved.

- iii. Katrina - I think we did add it up in a previous working group to know that like you could get there without electric space heat or electric water heat, but you have to do sort of everything else does that right?
 - 1. Sean - Yeah, it's if you don't want to electrify space or water heating, you do. You don't need to do everything else, but you do need to do the lion share of the other options. So if you think about the ways to get there, and I think if you don't do renewables, then it would be very, I think it might be actually impossible to get there without electrifying one or the other. You can get there with efficiency alone and no electrification. Most builders would likely choose partial electrification over other options.
- iv. Bill – Where solar doesn't work, does the builder or buyer have much choice in how they construct their home? And this is in a particular worry of mine now, just because the supply chain has completely crumbled. And having flexibility in the specifications that I choose for my home and maybe this will all go away. You know, as the market turns and I don't have to worry about it. But right now it's a massive concern because. You have to make another choice for cost and supply concerns. Doing all doesn't give you a lot of choice to work through an issue.
- v. Courtney – Quickly adds to 30 if you don't do space or water heat. adding up everything that's available. If you're not doing electric space, heat cooling or water heating. And those are the points that I was able to get to. So in this scenario, would need to partially electrify, and I do want to maybe clarify too. This isn't the commercial proposal. We don't have the Renewable credit in here. So Sean, I think maybe we need to clarify that.

c. R405

- i. Bill - Points being used cannot satisfy 405? The points here being used cannot be used to satisfy 405? Robby said 405 is an envelope calculation?
 - 1. Sean - 405 is modeling, as opposed to ERI, not prescriptive.
- ii. Bill - Can I meet 405 without putting any of these in my home?
 - 1. Sean – you will find you need to do similar types of measures. That the prescriptive path is inherently conservative, with the way that it describes points and the modeling paths, since it's more sophisticated, doesn't have to be as conservative. And so you might find that you don't have to do quite as many things.
- iii. Bill – Concern is if these are additive – to meet 408, I can't use anything I've used in 405? It means that starting point of 0 points are some of these off the table?
 - 1. Sean – if you go through 405, then there's 2 ways to do it. You're building without including anything that you did in 408, or you can include the things that you would have done in 408, but you have a different modeling target. So it's kind of a confusing element of the underlying code. The ICC didn't implement 408 in a very clear way, but we've in in Denver. We've written the proposals to try to leave the IECC an intact as much as possible, recognizing the practitioners would be moving from one jurisdiction to another, and we didn't want them to get shocked when they come to Denver as like, I'm used to this being here and now it's not there and it's worded differently.
 - 2. Bill – Worry that if I can't do solar and I need 35. Can I get 35 points without including things I did in 35?

- a. Sean – It says you can't use anything you used to meet 408. It says the renewables for meeting minimum renewable requirement can't be used to meet requirements in 405 or 406. Can't double count just renewables. If you're not doing renewables, and going through path through one of its exceptions, you're not using renewables to meet this requirement. You're going through the exception. So you could use a partially renewable 10% of your annual load from renewables under 405 or 406.
 - 3. Bill – I don't see renewables.
 - a. There is the line in the proposed 404.4 which is the minimum renewable energy system capacity that says on site renewable energy systems used to comply with this section shall not be included in the calculations for section R-405 or section R 406. So that is very specifically about renewables used to meet this requirement.
 - 4. Katrina - I think Bill trying to ask what this point 2 here, what's it referring to this 401. 2.2,
- iv. Sean – 401.2.2 is how you comply with going through R405.
 - 1. Rob – 402.2.2 is a clarifying section that opens the 405 door to compliance. That's it. Robby – R405 uses EM. Solar doesn't impact EM.
 - 2. Sean - It gives you two options. If you go through 405, you can either comply with 408 separately outside of your calculations or you can ignore 408 entirely, in which case you have a different performance target for our 405.
 - a. Robby – R405 uses energy model and model and solar doesn't impact em.
 - b. Bill – But heating and cooling equipment do?
 - c. Robby – Yes
 - d. Bill - So if I use a heat pump water heater in there to get to my target, I can't count that in 408?
 - e. Robby – It's cost compliance. Doesn't directly impact your model, because model is based off thermal envelope, house tightness, duct leakage. Whatever you use in your equipment would go into reference home in model. Efficiency impacts it slightly. It's not same as ERI.
 - 3. Bill – if we need to get everything on the sheet? Does 405 eliminate my options? I'm exaggerating a little bit. Everything on the sheet to achieve the 35 points without solar. I want to make sure that 405 doesn't eliminate any of those options.
 - 4. Rob – Let's talk on a different call.
 - 5. Sean – we didn't fix this confusing underlying language for the language I gave. Should we fix the underlying language to make it clearer? It would look different from neighbors. Would clarity be worth it?
 - a. Eric - yes. We don't want to provide poor language if it's consistent. Maybe partners can adopt and approve language. Make it clear for user.
- d. What does seem doable?
 - i. John Dutch – most of what I was going to say was leaning towards what is iterated. Concerned about mandatory renewable energy. Townhomes are a struggle. Studies with solar shading? Majority of townhomes being built today have outdoor living space, which requires stair tower to roof area. By nature, stair tower will provide shading.
 - 1. Katrina – What does seem doable?_

- a. Jonny – all electric. If you went all electric in that townhome, you wouldn't need to do solar. Proposals are interesting and get incentive to try to do this. From simplicity of code standpoint, and enforceability, just an all electric mandate would make more sense. The natural gas system will continue to expand which will be a stranded asset in the future.
- b. Katrina – there wasn't an appetite for all electric mandate from the code committee.
2. John – I understand if I was going all electric route, we need to sell. We were using HPWH for years, but stopped using them because homeowners hated them. You need 700 cf for water heater for it to work correctly. Methods to reduce that space.
3. Christine – have heat pump water heater. Water heater picks up load, but hopefully technology has improved from John's previous homeowners experience?_
- e. Katrina – do you have recommendation on what's doable?
 - i. Bill - Don't know. Structure points so you can choose either electric space heating or water heating to comply. Flexibility._
 - ii. Most appliances aren't included from homeowners -
 1. Sean – those appliances would need to be installed. Savings is based on having those installed. It's an option since it can't be available for all builders._
 2. Bill – it takes more points off the table_
 - iii. Sean – if adding 17 in efficiency is pushing too far, what is manageable under the market? Is it 10 extra credits?
 - iv. Katrina – I think people don't have an answer. Would you like us to reduce it some before going to committee?
 1. Rob – It doesn't feel like we have consensus.
 2. Katrina – we don't have stringency consensus. Is there a way we can get Bill and John more data so they can figure out where it should sit?
 - a. Bill – having a call Rob and Robby how modeling works in association with this. How I would achieve 408 and if I needed to add minimum renewable option, how would I do that.
 - b. Working session with Rob, Bill, and Robby to work through some of it?_
 - c. Yes
 - d. John – needs more time to run numbers.

Next steps/upcoming meeting topics:

- Wrap-up Proposals

Meeting adjourned