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[Musical intro]

Male: Hello. And welcome to our Building Energy Code Seminar series. The series is based on our National Energy Codes Conference, which is hosted annually by the US Department of Energy. We're here to present you with the latest in building energy codes – from developments in the model codes, to updates on what's happening across states and local governments, to highlighting tools and resources that you can take advantage of in your day-to-day practice. We'll be hearing from a number of leading experts about the challenges they're facing, ways they're working to solve them, and how their efforts are building the energy efficiency, comfort, quality, and affordability of America's homes and businesses.

Join us virtually every week for important topics and interactive discussions and help us continue the conversation. To learn more, visit EnergyCodes.gov.

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Ian Blanding: Hello, everyone. My name is Ian Blanding and I'm with the Pacific Northwest National Laboratory and I'd like to welcome you to today's seminar, which is part of the National Energy Codes Conference seminar series. This seminar, we're gonna be talking about advanced technology and the role of building codes.

Before we turn things over to our speakers and kind of moderator – so, this is going to be a moderated discussion so, please, come with questions and really look for a lively discussion today. But looking ahead in the seminar series, we have two more seminars yet to come. So, next week, we're gonna be talking about policies for energy efficiency and resilience, and then, the following week, on the 17th, we're gonna be talking about field studies in the Northwest region. You can find out more at the link below, where you can also look for –

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recordings, a PDF to this. Today's presentation is available there. You can find a lot of good content up there. So, without further ado, I will turn things over to Chris Burgess with the Midwest Energy Efficiency Alliance to get us started.

Chris Burgess: Good afternoon – or good morning, everyone, depending on your time zone. Thanks for joining us. You may have seen earlier that Allison Lindberg was going to be facilitating; unfortunately, Allison's not gonna be able to join us today. But I will do my best to fill her wildly talented shoes. As Ian said, my name is Chris Burgess.

I am the building director at the Midwest Energy Efficiency Alliance and will be facilitating this discussion. We're gonna go – I'll give you some –

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order of *[Break in audio]* this is gonna go. Next slide, please.

As I saying – we're gonna launch a couple of polls for the audience, then, I'll introduce the speakers and we will move on to the discussion. Next slide. *[Break in audio]*

All right. Here's our first poll. Just want to get a sense of where people were from. Oh, very nice distribution in general. Great.

Not many participants from the Southeast, but otherwise, nice, even distribution. Thank you. Next slide, Nicole.

And then, we sort of – what you do for a living or what interests you might be. No builders. Okay. But otherwise, again, a nice balance –

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between others. Great. Thank you. Next slide, Nicole.

So, advanced technologies are entering buildings at a rate we've never seen before, really testing and expanding the roles and abilities to building codes to accommodate them. These increases are coming from the consumer market. Sometimes, they follow local policies to improve resilience or energy efficiency. We're looking forward to today's discussion session to explore the impacts and opportunities between advanced technologies and building codes. Our panelists will be setting the stage with brief presentations on solar and EV ready codes, grid interact to efficient building technologies and codes, and considerations in code for energy storage.

After those presentations, they'll be a few more polls and we will move to the interactive discussion about our topic. And we really do want to hear from you –

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so, type your questions in the chat box if you'd like to speak and we will either get to the question or call on you to speak yourself. Next slide, Nicole.

Our speakers here – that's a great group. I will read their introductions here and then, we'll start the presentation. Scott Prisco is the building official for the city and county of Denver. His career has spanned both public and private sides of development, design, and construction. He is a lead accredited registered architect, most recently serving as Director of Design and Construction for Arlington, Virginia public schools.

He headed up the district's ambitious capital improvement program. Prior to that, Scott owned an architecture firm in New Jersey and has designed myriad buildings, including the Microsoft School of the Future in Philadelphia, as well as several projects in the United Kingdom. As Denver's building official, Scott is responsible for applying and enforcing the Denver building code –

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to ensure the safety of all buildings in Denver. He oversees plan review permitting and inspection services, and will be working to improve customer service on all projects big and small. After Scott, we will hear from Chris Perry. Chris conducts research to support energy efficiency building codes and equipment standards, as well as smart grid and interactive buildings as a member of ACEEE. He joined ACEEE in 2015.

Prior to that, Chris worked at URS Corporation in Ohio as an energy management engineer and, most recently in Virginia as a sustainability consultant at JDM Associates. Chris is a registered professional engineer, a lead accredited professional – building design and construction – as well as a certified energy manager. He earned his master's in Engineering Management from Georgetown and a Bachelor of Science in Industrial Engineering from Penn State. And our last presenter will be Beth Tubbs.

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She is a senior staff engineer with the International Code Council. Beth is actively involved in a wide variety of activities, including code development support and representing ICC in various national and international committees. She is staff secretariat to the International Fire Code and the International Existing Building Code. She is the lead on ICC Fire Code Action Committee, which has been dealing with topics such as exterior wall finishes and claddings and energy storage systems. Beth is a fellow of the Society of Fire Protection Engineers and president-elect for 2021 for the society.

She holds a professional fire protection engineering license in both the Commonwealth of Massachusetts and in the state of California. And, with that, we will get to our presentations. Scott, you're up.

Scott Prisco: Thank you very much for that introduction, Chris. Really excited to be here –

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and part of this presentation. In terms of presentation, I'll give an overview of some big picture goals in Denver and then, touch on the EV and renewables that – codes and ordinances that we're dealing with. The slides are not advancing. Not sure what's happening.

Let me see. There we go. So, some of the big picture sort of community goals and priorities that we've established in Denver – response to climate change and equity are right up there at the top – and affordability. And we realize, when we're looking at those big picture goals –

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the sustainability and equitability piece of that is that it's really at the center of environment, social, and economic realms that any city or county deals with. It's really at the core.

We've been really ambitious in Denver and the mayor, in 2018, established an 80 by 50 action plan whereby 80 percent of the greenhouse emissions will be reduced from a baseline of 2005. A community-based initiative that we established this year is actually trying to move that forward to 2040. Very ambitious. It has not been approved yet by city council mayor, but that's where the recommendations are from this community-based group.

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All the initiatives that we do, we really have a robust interaction and dialogue with the community, from our 80 by 50 plan to our net 0 energy goals, which were at 2035 and are now starting to target 2030 implementation, as well as some very aggressive electric V charging initiatives. And all of those are happening through code amendments, ordinances, regulations, policies, guidelines. We've even adopted a Stretch Denver Green Code at this point.

When we look at our emissions – our greenhouse emissions – the buildings take up the lion's share of our emissions. There's 30 percent that happen through transportation, and the lion's share, obviously, through commercial facilities.

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I'll start with electric vehicle charging and we're looking at having electric vehicles by 2030 – 30 percent of vehicles to be electric – and by 2050, all light-duty vehicles. So, they're pretty ambitious goals. We had some challenges, obviously, with the chargers and what not, and that's why we're putting forward ordinances and codes to help ramp those initiatives up.

We were fortunate to win – the Mayor won an award – the Plug In America Drive Electric Award. Very proud of the advancements that we've made with electric vehicle charging.

Some of the mandatory components that we have in our codes now – which, in Denver, we're local rule so, we get to – we have our base codes – the IECC and IBC. And all the ICC codes are base codes, and then, we make –

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amendments to those in the ICC. We made an amendment for electric vehicle charging and there are three criteria that need to be met. You have to create EV ready, EV capable, and EV installed. Essentially, EV ready is everything's ready to go – conduit, conductors, everything except for the charger. Capable is conduit and room on the panel and installed is actually having chargers required.

So, when we look at how do we – when do we mandate these – for all new construction projects now, this is required. Any level three

alternation – meaning you're impacting 50 percent of the building – parking spaces added or modified – then this is required. For single family and duplex projects, there has to be one EV ready space provided for every new single family or duplex project.

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These are current codes now in our, again, our 2019 Denver Building Code Amendments. You can see that we have a percentage in every project – both multifamily and commercial. We actually push multifamily projects into our commercial IECC projects. So, if it's a multifamily, it's actually part of the commercial IECC.

One of the changes that we made – an Errata was required for our projects because we had originally started to look at what was required in zoning. Those are the spaces that we would look at in terms of mandating EV chargers, and it was an oversight on our part, because in the central business district, we don't require parking. So, that was an unintended consequence is that we had to sort of fix an Errata that's coming up this next month.

In terms of renewable energy, we're looking at –

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100 percent renewable by 2030. We have very ambitious goals in Denver and in Colorado and we're trying to push these initiatives forward.

Part of that is starting off with Denver – the 31 public sites that – publicly owned propertied – where we're gonna be having those sites put on solar panels by the city and county of Denver and then, they're shared to the community.

Another initiative that we have is that we are trying to really advance solar projects – both residential and commercially. So, they're expediting those with a two-day review, and we cap out any permit fee for any solar project to being $50.00.

Residentially, we're mandating that there's an area for –

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PVs on the roof and it has to be a clear area and a conduit provider with a – and when we do have PVs, we're following the 2018 so that we mandate all the fire access in the case of a fire event.

We also have a Green Building Ordinance that was recently first initiated by voter-initiated ballot, and then, it was modified 'cause it wasn't written quite for Denver. It was really taken from a Canadian ordinance, and council – we worked with community and revamped it, but you can see that there's – when you have a new building, you have to not only pass the I-codes and our Denver Building Code amendment, but you have to meet the Green Building Ordinance, which has solar requirements in it as well. Even for existing buildings, if you're gonna do a green roof project, you have to meet that ordinance, which, again, one of the options is solar panels.

We also have – as I'd mentioned, we have an optional –

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Denver Green Code – part of our new most recent adoption – and we're – there are a couple of paths to get there. You could be LEED Platinum. You could be Net Zero Energy. You could be Pass or House Plus – some of the other chapters. You take away the energy chapters in the IgCC or you just follow our green code.

So, we're really excited about that. Some of the future things that we have in our code coming up – we have a – we're doing our code amendment process again in 2021. We're looking at mandating renewables, and if you can't do them on site, then we'll have an off-site – a community solar fund that you can be contributed to.

Residentially, we're looking at requiring very aggressive ERI scores and then, we're also looking at required PVs. So, renewables are an important part of us moving forward for our community and mandating a certain percentage of projects –

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to have renewable energy.

And this slide – this will be my last slide. I have a lot of resources that I've included, but this will be my last slide. A lot of times, we like to look at the code as we're sort of pulling people up the mountain with our requirements. And ideally, it would be great if there was a paradigm shift where the market and the community

were driving that and we're following – or maybe we're on level field. It's always harder when we're sort of pulling folks in that direction, and ideally – and hopefully soon – there's a paradigm shift where folks wanting homes or purchasing homes are gonna want that Net Zero home or that LEED accredit commercial building – preferably at platinum level.

So, those are the directions that Denver's heading in. Very aggressive. And thank you very much for the opportunity to participate in this event.

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Chris Burgess: Great. Thank you. We had a couple of sort of clarifying questions come in. One asks, "How does Denver define multifamily or *[Inaudible]*?"

Scott Prisco: Sure. So, in the IRC, there are – multifamily could be IBC or IRC, based on if it's less than three stories or less or four stories or more, or depending on how the property line is. We consider all multifamily now part of our commercial and we made that amendment. So, that criteria puts you into the Commercial International Energy Code for Denver. So, only single family and duplex projects are considered under the residential side of the IECC.

Chris Burgess: Okay. Thanks.

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And I think we have another poll to launch, Nicole. Yeah. How many of you are driving –

[Crosstalk]

Go ahead, Scott. Sorry.

Scott Prisco: Yeah. So, I mean, these are just questions to get a feel of the audience of how relevant we're pushing and with the audience, if they were gonna be buying or considering purchasing an electric vehicle in the coming months. Very interesting. So, it's a little bit less than 50 percent would consider or thinking about it or have one. Very good.

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And I think there was one other poll, which is about solar panels. If your jurisdiction has any expedited plan review or has a fee reduction or a cap on their fee for solar panel projects. All right. So, not as many as I thought. So, this is something that I think is working really well in Denver. We're getting huge numbers of solar panels, and it's sort of exponential.

Every year – we're getting more and more every year, and I think that's a big part of it – that we are trying to help the solar industry through expedited plan review and fees.

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Chris Burgess: Great. Thank you. We had a couple of other questions come in but I'm gonna hold those until after the presentations. So, Chris, you're up.

Christopher Perry: All right. Great. Thanks. Can you all hear me okay?

Chris Burgess: Yes.

Christopher Perry: So, yeah. I appreciate the opportunity to come talk about a couple of things that are pretty near and dear to our hearts at ACEEE – grid-interactive efficient buildings and energy codes and what the synergies between them are and overlaps. I think Scott's last slide where he talked about a paradigm shift is a really good segue and kind of introduction into what we're gonna be talking about now, because I think with that – that could be a term used to describe GEBs, and we'll talk more about that. So, next slide.

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So, this is what we're gonna talk about. I'm gonna give a brief overview of GEBs, what they are, just in case anybody's confused about the terminology there. I will talk about a couple enabling policies to keep an eye on, then, we'll talk about GEBs and energy codes and talk about ASHRAE, IECC, California and LEED, and then, some key resources for you, and then, takeaways at the end. So, next slide.

All right. So, a little bit of background for everybody here. So, ACEEE – we are traditionally an energy efficiency research organization. So, we've been mostly interested in reducing the overall energy load and – next slide.

So, what we've – we're starting to become more interested in is the bigger picture. It's not just how much energy you're using, but also, when are you using that energy. And if –

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you know, it doesn't need to be reduced at certain times, can you shift that to a different time or can you mangulate in response to the needs of the grid. So, these are becoming larger issues. I will talk about why that is. Next slide.

So, we're seeing some major trends going on right now. You know, most notably, we're seeing a lot of adoption of electric technologies. We're seeing renewable energy like solar PV come online. A lot of people are starting to adopt things like electric vehicles and heat pumps and other technologies like those. And then, there are policies that also support these technologies – so, namely, electrification and decarbonization type policies. And the most classic example of these animals listed here is, on the level, the California "Duck" curve – and example of grid strain. So, you know, in non-Covid times, this is how it would work –

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but essentially, in the middle of the day, you'd have a lot of solar renewable energy and not a lot of need for electricity from the grid. But then, at the end of the day, when that – the sun is setting and people are coming home from work, all of a sudden, there's a spike in energy demand from the residential sector. It creates a lot of strain on the grid and it's really difficult for utilities to deal with. And it's dangerous – could cause blackouts. So, that's the classic example. There are other examples, depending on where you are.

Midwest – those curves are less pronounced because wind energy is a little bit more stable and throughout the day, but it still causes some uncertainty, and Hawaii's "Nessy" curve is kind of like California's "Duck" curve, just a little flatter at the beginning and maybe more pronounced ramp at the end. Next slide.

And so, what are we talking about when we talk about grid-interactive efficient buildings – or GEBs. So, the way that we define them –

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they are highly efficient buildings that can communicate with and act as a resource for the grid. So, what that means is two things. One – there's the more traditional energy efficiency aspect of these buildings so, they have, you know, high efficient windows and walls, HVAC systems, lighting systems, but then, on the other hand, there's this grid interactivity component where the buildings contain distributed energy resources – which we shorthand to DERs throughout this presentation – that can communicate with the grid, that can reduce or shift load on the grid. So, that could be connected HVAC systems, connected water heating system, solar and storage, or electric vehicle charging stations – resources like that. Next slide.

Okay. So, we'll talk quickly about a couple enabling policies for GEBs that I think is important for everybody to be aware of an keep an eye on. So, the first is California –

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Senate Bill 49. California has said that they want to see a demand – flexible demand appliance standards – so, talking about appliance and equipment in buildings. They really want to see that it can, you know, provide these demand flexible like, capabilities to the grid and act as a resource. And so, we're starting to see that shift since California passed this bill. Next slide.

And then, another one that came out fairly recently – so, FERC's Order 2222 – I think this was just in like, September of this year. FERC announced that they – what they're trying to do with this order is to open the wholesale markets to distributed energy resources. So, they basically – they want – you know, the resources we talked about – whether it's solar and storage or grid-connected water heaters or whatever it is – to be able to kind of compete in the market with –

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more traditional – like, if the utility is going to construct a new power plant or add new distribution lines, if you compare those two economics, then it really gives a lot more opportunities to these GEB resources and GEB technologies. And so, the way that this is going to work – RTOs – Regional Transmission Organizations and ISO – Independent System Operators – are taking the lead. They are convening utilities, aggregators, regulators, other stakeholders that are important for this. Their

filings are due in July of 2021. And this isn't directly related to code, but it's kind of like what Scott was talking about.

This could be part of a larger paradigm shift where this just kind of – this becomes the norm. We have buildings that are connected. They are resources for the grid. Next slide.

All right. So, now, let's get into the codes. So, we'll start with ASHRAE. ACEEE – we're members of the Standard – the 90.1 committee –

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mechanical subcommittee. So, we're directly involved in this. So, I think something that's really noteworthy is in February of this past year, the 90.l committee voted in favor of considering time of use rates in the cost effectiveness of new proposals. So, if you are considering when the energy is use – looking at those kilowatts – instead of just kilowatt hours, it can really help justify the cost of some of these technologies. So, we have an energy storage working group that we're also involved in that is currently looking at different measures to include in the 2022 version of the code, and we think this is a great chance to try out these time of use rates where Pacific Northwest National Laboratory – PNNL – is doing a lot of the analysis to figure out what the time of use rates look like.

One thing to note about a challenge here is figuring out what is a representative time of use rate for the whole country, because it really varies a lot depending on where you are. So, you know, if you have an average time of use rate that we're using –

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for this, it may not represent an area like New York City where time of use rates are much different and something like energy storage would be more justified in an area like that than in other parts of the country. So, I just have a question here – "How can our model codes help support the needs of different jurisdictions?" Don't have an answer for it, but I think it's an important thing to consider. It could maybe come as optional appendixes or doing more work at local and jurisdictional levels to figure out what works best for them. So, there's both this component – this national and this local component.

Then, I wanted to mention, too, the stretch code – Standard 189.1. It's not a code, it's a standard, but semantics. We're not directly

involved in that, but our friends at _____ Institute are, and we coordinate with them and talk to them about what they're doing. So, I wanted to mention some of the work they're doing in this area – the Automated Demand Response measure for the 2020 –

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version of the code and then, for 2023, they're exploring a whole host of GEB-type measures – so demand response requirements – including protocols for connectivity, time of use metrics, and I think something else about commissioning _____ GEB technologies. So, a lot going on there. Next slide.

So, that was ASHRAE, and now, let's talk about the ICC. So, ICC has not quite embraced GEB technologies in DER the way that ASHRAE has. I think a good example of that is for the 2021 IECC process. Three proposals that had pretty significant components were GEB related; all were overturned by the ICC board. So, there was a proposal on high efficiency and grid-connected water heating systems, electric vehicle ready requirements that are very similar –

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to what Scott was talking about in Denver – which would have been in residential and commercial buildings – and then, electrification ready requirements. So, all three of these were – the members voted on these in the final action votes for the IECC and they passed in like, overwhelming numbers, but then, during the appeals process, some groups like National Association of Home Builders, APGA and others, appealed and said, "These don't belong in the code", made arguments for them. ICC found those pretty much compelling and essentially, nullified these ones. So, we were disappointed. They – to me, they would represent a step forward for GEBs in the IECC and it seems like it's not there yet. So, next slide, please.

And then, a couple of other that we can draw on here are California Title 24 –

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and LEED. So, Title 24 – which I'm not – our organization – we're not super involved in, but it's really – it's good to keep on top of what California is doing with their code, which can be a model for others. So, in 2019, they included automatic demand shift control,

demand responsive controls, and demand responsive electronic messaging control center, and then, 2022, considering demand responsive lighting systems, heat pump water heaters, and thermal energy storage systems. So, a lot of relevant technologies there. And then LEED is piloting a Grid Harmonization Credit for up to three points, which is using New Buildings Institute GridOptimal metrics for evaluating grid flexibility.

You can earn up to three points that way. What they're placing value on, I think, is like, grid peak contribution, grid carbon alignment, short term and long-term demand flexibility. So, it's calculating all those –

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and then, you can earn more points if you improve those metrics. So, a pretty neat pilot to keep an eye on. Next slide.

All right. So, some high-level takeaways here for everybody. So, GEBs – you know, I made the case here – GEBs can really help mitigate the strain and provide energy emissions and utility bill savings. Building codes have traditionally valued energy efficiency and not demand flexibility, however, we're starting to see a shift – definitely more so in ASHRAE right now – and we're working to try and make that the case in the IECC as well. And we look to California's Title 24 and the stretch code and certification programs like LEED for helpful examples of GEB measures.

And then, I think one big takeaway here would be that – just recognizing the value of demand flexibility. It really takes us out of that old paradigm for energy codes where it's only energy efficiency and we can look also at –

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the impacts on the grid, when do you use energy, and that seems like it's a really key step here into recognizing these as an important part of the code. And with that, that's it for me.

Chris Burgess: Thank you, Chris. That was great. And I think we have a couple more polls, Nicole.

Nicole: I think I have just one for the next one. Oh. Maybe this is for this one.

Chris Burgess: What technologies are you most interested in? Choose your top three. This is gonna be interesting. A lot of interest in battery storage and solar PV and groupings around everything else – electric vehicles, thermal storage, –

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_____ controls, grid appliances. Interesting. Not much interest in electric water heaters. Okay. Yes. And now, we're gonna move on to our last presenter, Beth Tubbs.

Beth Tubbs: Thank you.

Chris Burgess: Take it away, Beth.

Beth Tubbs: Thank you. I wonder if we could just do my poll now because it will sort of lead into the discussion a little bit later. Thank you. I actually had a hard time coming up with a poll question. This was – you know, this – as you know, I'm a fire protection engineer so, energy, admittedly, is not quite my thing. I'm very interested in it.

I'm very interested in climate change and all of those issues. But my area is in fire safety. So, what I want to do – if you could go to the next slide –

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what I want to do – I'm just gonna talk about sort of two different things. My perspective, of course, is gonna be a little different. I hope I don't sound like the, you know, the negative aspect of this. I just – really thinking about this more holistically and just different events and things that have happened – and also try to give a sense for outside of the energy code and ASHRAE and how are we addressing some of these technologies. Ironically, the energy code doesn't talk about energy storage systems, but the fire code does. So, I know that probably hopefully will change in the future, but I want to put it from the perspective of regulating it to make sure that it works correctly and will be used for the purpose that it's needed for.

So, the perspective I'm looking for is more about safety of its operation versus the need from an energy standpoint – although, like I said, I'm very interested in that topic. And also, by the time – the other presentations –

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this is going to become more and more popular. We're going to see, for instance, energy storage installations far more frequently than we do now to become more sustainable in what we do. So, I'll be talking about some – a couple of examples, and then, talking about the provisions a little bit briefly. Oh, can you go to the next slide? Thanks.

So, I think the biggest thing is is to look at this as a delicate balance – that fire safety is something – this is part of the reason why we created building codes. The fire in Chicago, fire in Boston, London – all these places – this is where we came up with a lot of the provisions that ended up in today's building codes, which keep getting thicker and thicker. But it's important – though, you know, it doesn't always necessarily go along with some of the other objectives, there's various things we do. It's not just about fire safety or structural safety. It's about accessibility – which is a civil rights issue; energy – which is an environmental issue. So –

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but it gets kind of complicated balancing all these things, and I think my big theme is that we need to balance this. And what's interesting – just the other day, the National Fire Protection and Research Foundation – through NFPA – released a report by Brian Meacham and Margaret Mackame from London University. Brian's from US and he's a fire protection engineer as well, and it's talk about sort of the fire safety and the green attributes or green aspects of buildings. It goes through all sorts of topics. But they were kind of looking at it as we need to have an attitude of sustainable and fire resilience, because you don't want a fire taking something that we absolutely need for society and making people nervous, not wanting to implement the technology or putting firefighters at risk – occupants at risk – as we're putting these systems in homes.

We don't want that to derail the direction that this industry would like to go in – plus the fact that if you want resilient power –

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grids and everything, we don't want to lose those resilient pieces in a fire explosion. So, just kind of thinking about this. Next slide, please.

This first example is actually not energy storage or generation issue. I don't know how many of you are familiar with this fire. It became part of my life for a while, because they told me I would be answering a lot of media calls. So, it was an interesting process to kind of go through and learn a lot. But this happened in the UK.

It was an existing building that they had put cladding on – energy efficient cladding – and you have to understand – high rises in the US, since the '80s, have been sprinklered. The UK has not had that same – quite the same culture of that, and they've also had much more of "stay in place" and passive fire protection. So, it was a total catastrophe, and it also revealed a lot about the regulator system in the UK. At the time, it had been so de-regulated.

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That was part of the issue. So, there was a whole host of reasons this went badly, but I think it's a perfect example of not balancing the fire and sort of energy sustainability issues. Because of this, I mean, they've undone their entire regulatory system. They've banned combustible cladding – which sounds great from a fire safety perspective, but I understand those realities. Energy's expensive and it's part of having the bigger picture of it.

We can't just ban these materials that we need to be able to achieve our other goals. So, they kind of lost out. In the US, we haven't kind of gone that far because we've kind of looked at it a little bit more performance-base, but an example of how this could work against us. Next slide, please.

So, this one – you probably may have heard about this one. It was, you know, out there quite a bit, and maybe it's because the circles I'm in, I hear about it a lot.

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And just recently, UL actually did a nice study through their Fire Service Research Institute – did a study – a timeline of this event. This is one slide; they have a much longer presentation. But the issue here was this installation – it was built before our codes really addressed some of these issues in terms of what was adopted in that jurisdiction, and four firefighters were basically – there was an explosion because of hydrogen gas build up and they flew about 50 – I don't remember how far, but pretty far away from the unit and were injured and seriously – and they were hospitalized for a little while. And then, some were – I don't think they actually

ended up being exposed to it, but they made sure to check that they were exposed to hydrogen cyanide. So, this is, of course, is not the best image to have coming from a unit like this.

Granted, this doesn't happen every day, but I think it's an example of where we need to think about this to make sure –

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that we're all on the same page in getting everything achieved so we don't see these kinds of things. Part of the problem with this is that they did a lot – there was a lot of systems in there that were good. There was – it's not that they skipped out on a lot of things, but there was no gas detection and there was no – that fire suppression agent they used – it actually activated. The problem is lithium-ion batteries have thermal runaway issues that traditional sort of fires, once you put the suppression on it, it doesn't kind of reactivate in a sense, spontaneously, it might seem. I forget.

I think it was – I have to look up the system. Somebody was asking, "What was this? A halogen?" No. Novec something or other.

I can look it up. But it's in the report that's in the link at the end of the presentation as well. So, just quickly – as again, as an example. Oh. Can you go to the next slide? I keep forgetting.

Okay. So, briefly, what I want to do –

[0:43:00]

is talk about the 2021 codes a little bit and where you kind of can find these provisions. And, like I said, ironically, we're not focused in on the trigger to have these things; it's really just a matter of if you have these things, how they should be installed. And the IRC is coming a lot more into play these days because we're gonna see a lot more of these in homes, in residential settings – especially after California through wildfires, when people found out that their PV actually was not for them, it was offsite – it was they were sort of sharing in the generation of power. I think there's gonna be a lot of market drivers that people are gonna want all these systems. So, we're reacting more to making sure that we know what all the safety features are. So, if you could go to the next slide.

Thank you. So, I'm focusing on 2021 codes since we just finished those, but in the IFC, the fire code you will find in section 1207 –

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was 1206 in 2018 – these provisions actually first really came into the code in 2018. Before that, we only had provisions on lead acid batteries that were really focused on, essentially, a HAZMAT exception for telecommunication facilities. That's all it dealt with. So, this was expanded, put into its own chapter of all things sort of energy, and these provisions have been expanded even further to be consistent with what NFPA 855 now requires, which is their batter storage – energy storage system standard. We didn't actually reference it in 2021 because it wasn't put in the process standpoint.

It wasn't quite ready that we could adopt it into the code. But it's very consistent with NFPA 855. We still limit an array size to 50 kilowatt hours, or you can test through UL 9540a, which is like a performance fire test. So – but there's more focus –

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on commissioning, decommissioning, operation and maintenance. Those are all the things that would have helped, for instance, besides for the other – there's a lot of other requirements for gas detection, for ventilation, for spill control, depending on the energy technology, but all these pieces are found in 1207. IRC 328 is reflective – is actually residential in both pieces. Somebody had asked about Denver – what's commercial, what's not. Sort of the same thing.

You can still have a one and two family home, actually, in the traditional building code, but it falls outside the scoping, for instance, of the residential code, which is certain height and things like that. But we consistently put the provision so it's addressed in both places. Not as difficult to comply with as for commercial, but nonetheless, it's good to have those provisions for residential as well. Next slide, please.

Stationary fuel cells. These aren't the topic of the day as much – at least in my realm.

[0:46:00]

It's mostly energy storage systems. But there's a section – 1206 – that deals with this and also, in the residential code – R330 – that references basically the NFPA 70 and NFPA 853 for compliance. And, of course, anything electrical – anything – NFPA 70

compliance is always gonna be part of that package. We always reference out to NFPA 70 for all the electrical. What we're looking at here is features to kind of trigger these requirements to occur and compliance with any specific UL standards and things like that. Next slide, please.

PV. This was in the first presentation, actually. The reason we regulate this – it's both in the fire code and the residential code. We also deal with the structural piece of it, too. But, from a fire standpoint, we're focused on making sure the firefighters have access – safe access. That they understand what's energized, what's not.

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Obviously, compliance with NFPA 70 – that's where the detail comes from for the electrical piece. BIPV – we've been dealing with that when we're integrating those technologies. There's an exception for those kinds of systems where you could actually cut into them and not be at risk from electrical issues. And, to a certain extent, we deal with ground mounted, too – mostly keeping vegetation clear and things like that. Again, everything electrical will go back to 70, though. Go to the next slide, please.

Thank you. So, this last one – again, this goes back to the exterior wall like the Grenfell fire. It's more connected fire safety and energy efficiency kind of issue more than energy generation, but I think what's important about this is – so, in the UK, they've essentially banned combustibles. I'm sure that, as time goes on, they find better solutions and feel more comfortable regulatory wise –

[0:48:00]

what's getting on these buildings, who's approving and things like that, but in the US, there hasn't been any drastic change. We've been regulating this and requiring – we triggered this test in our exterior wall chapter – chapter 14 of the IBC and chapter 26 for plastics – because we understand we need to have these materials, but we have to do it safety. NFPA 285 is based – you see a picture of the test. It is the complete wall system being tested. It is an expensive test and there's gonna be probably some more discussion as time goes on about engineering judgment and making sure – maybe you could take the worst-case scenario and walk it back.

And maybe even eventually a guide of approved assemblies. But the key is that we don't say you can't have this material. What we're saying is you need to pass this test. And the system in the UK – not only was in a non-sprinkler high rise, but it didn't meet any of these things. It wouldn't have passed any of the exterior wall fire tests that are out in the world right now.

[0:49:00]

It was done incorrectly. And in the Middle East, you've seen these fires as well. They turned out a little bit better 'cause they were fully sprinklered high rises. You never want to see a fire like that in a building, of course, but the outcome was a lot different based on the fact that those buildings were newer and had a lot more features in them. But it's important to look at it as a performance and then, we need to keep the balance of meeting our energy goals, but also meeting the fire safety goals.

And we've had some incidents in the US, and I'm – I've been chatting with jurisdictions here and there and wondering how the inspection process and installation process goes, the approval process, things like that, but I think it's good to look at this more holistically. Next slide, please.

So, these are just the links. I don't really need to chat about them, but the Surprise Arizona – the UL report – is really good information and also, the National Fire Protection Research Foundation literally just came out I think last week. And I am – on to the next slide –

[0:50:00]

I'm looking forward to the discussion and my theme is I want all of these things to happen and just to make sure that we're – we can facilitate the process of making it happen smoothly and not derail the use of all these new technologies. Thank you.

Chris Burgess: Thank you, Beth, and other speakers. This was really informative and great.

We're going to do a couple of polls and then, we'll get to the discussion. As I said, we really would like to hear from the attendees, so, please type your questions/comments into the chat box and we'll call on people and you can unmute yourself and ask your question, start the discussion.

That's the next poll. Tough one. *Star Trek* or *Star Wars.* The force is strong.

[0:51:00]

Interesting. That's fun. All right.

And what's our next poll, Nicole? Do you think codes are a good place to include new technologies? A couple more seconds. Yes. All right.

Okay. We have one more. I forgot. Do you currently live or work in a jurisdiction with energy code requirements related to EV or solar?

[0:52:00]

Interesting. The majority think, "Yes" but some – a substantial number have concerns. So, that could be a good point for discussion. All right.

I think, with that, we're on to discussion questions. Again, put them into the chat and we will take care of that. With that, I'm gonna take a moderator privilege and ask the panelists a couple of questions here while more get put into the chat. It's gonna be for all panelists, but particularly, I think, for Beth or Scott. You know, training and education are critical to understanding/enforcing these new technology in buildings. What do you think –

[0:53:00]

DOE or other organizations could do to help with that understanding of how to do that? I'll start with Beth.

Beth Tubbs: You know, I was just thinking – it's been a little while, but I know there was an initiative with the DOE. A lot of things come in my way these days, but I know that they were working on checklists and things like that to help jurisdictions' code officials manage some of these new technologies – though I do have a concern we're gonna start seeing such a flood of these new technologies in many jurisdictions that have so much to enforce as it is. I mean, I think of the local building official here, you know? A couple of years back, he was doing the IBC and then, they added the energy code and the existing building code, and I suspect there'll have to be some kind of regional approach to it. But I think DOE was working on some

of that stuff. I just haven't really, myself, been able to keep up with some of those things.

Chris Burgess: Thanks.

[0:54:00]

Scott or Chris – you have thoughts?

Scott Prisco: Yeah. I think a big part of jurisdictions across the United States right now – this year and going into next year – our budgets are constrained significantly due to reduced revenue from sales tax and other components 'cause of Covid. And it would be ideal if there were opportunities that could be provided to jurisdictions for both training their staff, plan review, and inspection teams, as well as the professional community and construction community. I think that budgets have really impacted us and the development communities across the United States. So, if there was an opportunity to assist in bolstering that training, we would take advantage of it. I know Denver would big time take advantage of training if you had –

[0:55:00]

opportunities for us.

Chris Burgess: Yeah.

Christopher Perry: The only thing I'll add for that is that, you know, any time there's a big jump in the code, I think it is worth acknowledging that, you know, we want to see progress in the code. We want to see these new technologies. And it can be challenging for home builders if they don't feel like they have the resources to understand the changes from the previous version that they had been using. So, you know, to the extent that DOE can provide that training – you know, get some buy in and show, "Hey, here's why we're doing this. Here are the benefits of this technology. Here's how you can explain it and why you can sell this as a win for the homeowner and the building owner." I think that's really valuable.

Chris Burgess: I would agree. Okay. I'm gonna ask a deeply philosophical question on this next one. So, what do you think the implication –

[0:56:00]

is from the overwhelming dominance of the force in the *Star Trek* versus *Star Trek* question? Scott.

Scott Prisco: I'd have to say that early on, I was, I think, drawn this because the graphics were much better early on and then, I stuck with it. So, I think the visual effects were better on the early ones than – so, that's what got me.

Chris Burgess: *[Laughs]* Thanks. Chris?

Christopher Perry: I was wondering if it was a generational thing, you know? Like, I grew up watching the *Star Wars* movies. I didn't – I wasn't as exposed to the *Star Trek.* I know my parents watched all of it. So, I was wondering if it was generational. I'd be curious to find out more.

[0:57:00]

Chris Burgess: So, everyone wants to send in their age. No. Just kidding. Beth, what are your thoughts?

Beth Tubbs: Well, it's funny. It brings back when *Star Wars* first came out. For some reason, my parents decided that I was old enough to see it and my brother wasn't and I thought it was the *[Break in audio]* thing ever. He's always – I always remind him of that. He had to go see some little kid movie. But he's more into *Star Wars* than I am.

But *Star Wars* – I don't know. There's something about it. *Star Trek* I've watched off and on, but *Star Wars* – and lately, *The Mandalorian* has gotten my family through the pandemic a little bit so...

Chris Burgess: The pandemic?

Beth Tubbs: Yeah.

Chris Burgess: Whatever gets you through the pandemic is pretty solid. Great. My next question is sort of, you know, what you see, but what technologies do you think have the best chance of success and big impact if included in building energy codes over the next cycle or two?

[0:58:00]

I'll start this one with Chris.

Christopher Perry: Yeah. I can start with this one. I think – well, I'm a big fan or a big proponent of like, leveraging what others have done. So, you know, if we're looking – and Scott's showing us a great example of electrical vehicle proposals that have worked well for them in Denver, and I think if you could take that and adapt it to a model code or in other jurisdictions, I think that's a really smart move. And I would say, too, that anything that has both energy efficiency and the grid flexibility components – has both of those aspects – I think will have a bit better shot. So, the classic example of that would be like, a thermostat – like, a smart thermostat – that has both demand response capabilities and energy efficiency.

I think new examples of that would be like heat pump water heaters –

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which are super energy efficient. They also are grid connected. And then, maybe something like connected lighting where we have pretty good lighting requirements in building codes right now, but then, if there's an additional requirement to make them connected to the grid, I think that could have a great chance of success, too.

Chris Burgess: Okay. Beth?

Beth Tubbs: Can you remind me of the – sort of the beginning? Make sure I get the right kind of response.

Chris Burgess: I was just asking, you know, what technologies do you think have the best chance of success and big impact if they're incorporated into building codes over the next few cycles?

Christopher Perry: Beth, you're on mute right now.

Beth Tubbs: I pushed it twice. Sorry.

[1:00:00]

ESS – you know, we have it in the fire code, of course. It's not required – it's not triggered by the other codes, but I think that – I don't know – I mean, I grapple with what is market driven or what is – needs to be regulatory. I mean, I think, ultimately, you need to push people to do some of these things. I mean, I live in Massachusetts, which is very much – I sort of call us the mini-

California sometimes. I wouldn't expect to see so many PV things in the Northeast, but we have them everywhere.

We don't have them at my house yet, but there's a lot of incentives. I think incentives, probably, is sort of that next level – tax incentives. We also use the stretch code in Massachusetts and communities get incentives and monies back for that. But I don't know. I mean, I don't know. In terms of what is triggered, maybe it's more about the energy generation piece and then, the storage would have to follow –

[1:01:00]

maybe triggering that, I guess, to get to net zero. I'm not sure.

Chris Burgess: Right. Scott?

Scott Prisco: Yeah. I think there are a lot of opportunities for success with new technologies. I think solar has a great opportunity. The EVs – we have gotten some initial push back 'cause of upfront costs and what not. That one has a little bit more cost impact and maybe not an ROI on that one. So, that one hurts a little bit more than solar, where at least solar, you're getting return.

I think there's opportunities, too, for – like, Denver, we're trying to be more progressive than what the base codes are and so, ramping up percentages of – so, if your based code is here for the IECC, then just ramping up percentages of energy savings in each code cycle. Because we're local grown, we're able to have our amendments to those –

[1:02:00]

base codes. I think that's success that we have, and I think, like Chris had mentioned, we're looking in our next code cycle coming up. Grid – communicating grid equipment so it can be – whether it be hot water heater or thermostat or something that has – it definitely has overrides on it though, 'cause I had – do have concerns over some of that with certain facilities – both medical or senior citizens – you know, that they can maintain control when they need to. If someone has pneumonia, we certainly don't want to turn the temperature down, right? So, there has to be opportunities for override on that. But I think there are great opportunities – especially – Denver's gonna probably be experiencing, in years to come, what California is with peak demand and hopefully, we don't get to that duck curve – that it's more consistent.

And with different storage and other things, we can –

[1:03:00]

ride through that a little bit more gracefully than California is right now. But I think there are great opportunities in almost every realm of energy savings.

Chris Burgess: Great. We've got a couple of things coming in the chat here. I'm gonna give people a chance to talk. Mike Collignon – you've been pretty busy in the chat and you did have one thing about stretch codes so, if you have a question, unmute yourself and ask it. Otherwise, I'll just ask the panel to comment on stretch codes opportunities. Okay.

So, we'll go to the panel on stretch code opportunities. Why don't we start with Scott on that?

Scott Prisco: Yeah. I think –

[1:04:00]

we were really lucky. I was able to get a grant to start our first stretch code, 'cause we needed consultant help and what not, and with this new stretch code that we have – our green code – we're really excited about. So, the idea was to create this stretch code that ultimately would be an option and then, as our code cycles happened, we pulled pieces of it from each chapter that become base and then, further the stretch. In this first year of launching our stretch code, we've actually created a pilot program with five projects. The first _____ – we have one that's signed up now – will get an expedited review, basically cutting in half all of our cycles, and they get up to a $50,000.00 fee reduction in their permit fee.

And by doing that, it's sort of promoting our stretch code to the professionals and contractors and developers in Denver so they get more familiar with it when – as it progress to partial base, partial stretch code. And also, this sort of pilot's –

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gonna help us understand what are the staffing requirements in each of the different agencies? Because now, we're sort of crossing boundaries of what our code normally used to do. Normally, we were just sort of in a world of building and fire, transportation –

our basic reviews that we'd have. And now, this is sort of more like a lead project where it has water conservation and has other aspects – renewables and all these other components that someone has to review. So, then, we look at what staffing's required now through a pilot and then, we can go to counsel the mayor next year and say, "Hey, this is the staff we need. If we want to truly make this a priority in Denver –" and we're doing the same thing with a pilot for affordable housing – so, if we want to say, "Hey, affordable housing is a priority and sustainable design is a priority in Denver. Here's the staff we need, and we can expedite those projects."

So, I think there's some great opportunities for cities and counties, jurisdictions across the United States, to use stretch codes –

[1:06:00]

to test the waters of what their priorities are instead of just throwing out a mandate. And you can get the feedback from the development community – if you push too hard – if it's too hard to get there or if it's too uncertain. So, I think there are great opportunity to help you get to your goals maybe a little bit quicker and help the development community get used to a stretch code before it's *[Break in audio]*.

Chris Burgess: Right. Agree. Chris, any thoughts?

Christopher Perry: Yeah. I – so, I wanted to acknowledge Harold Jepson's comment in the chat because I think it ties in with what Mike said about the stretch code. So, I think stretch codes play a role, along with a lot of other potential outlets like certification programs like LEED. We talked about optional compliance paths – Harold mentions that – or flexible like, credits or points in the code. Like, all of –

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these can serve as kind of like a testing ground for some of these new technologies where you can try them out. It's not required by everybody, but if somebody chooses to use it and chooses to adopt it, then it's a way to try and see if it works. And then, you know, you can bring it to the National Model Code, such as like the IACC in that process, or maybe in the ASHRAE 90.1 standard and say, "You know, we have this provision. It's worked in these settings. Here's the feedback we've received. Let's try and incorporate this into the code."

So, I think there are a lot of different avenues – like stretch codes or other voluntary provisions or pathways that can serve that function for these new technologies.

[1:08:00]

Ian Blanding: So, I – this is Ian, from PNNL – so, I have a question for Scott, specifically, and then, maybe Chris, if you could jump in a little bit on this as well. What advice would you give – I know we have a number of jurisdictions on this call; what advice would you give to a jurisdiction seeking to add EV or solar-ready language into their building codes? I know you said there was some push back – certainly from the development community – on some of those provisions. So, any advice that you would extend?

Scott Prisco: Yeah. Great question. We did have some learning curves. We had a very robust community process. And when we did our Denver code amendment process, we followed the – sort of the national model.

So, we had code committees for each of the different books and one specifically for the IECC. And I –

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think the development community was not aware that the EV was something that we were discussing, even though we kept pushing out, "We have a meeting today. Here's the agenda on the meeting" and it was done through web, through newsletters. I even presented to Ludi beforehand about highlighting those items that would impact cost tremendously or have a significant impact with costs with the project. So, it was really out there before council voted on this amendment, and then, it gets amended, and suddenly, we realized that the errata – like, it wasn't impacting as many people because of our zoning code issue where – the way we were applying it was – it was required by zoning code. Well, most of the central business district, where you're providing parking spaces, doesn't have a mandate. So, we were missing out on a good part –

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of what we really – it was an unintended consequence. So, our errata's coming out to fix that. I think we probably would have gotten more push back earlier when we first got released if they were aware of that. So, my advice would be to reach out specifically to ULI, to the development communities, to BOMA,

NIAP, real estate groups, and have them more involved in that process before the code amendment process to help work through appropriate criteria, appropriate percentages so that the impact isn't overwhelming. And work out some of the details.

Like, we recently worked out some of the – you can picture, if you've got an outdoor sort of strip mall scenario – you don't want to put all of the EV chargers in front of one store. They should be evenly distributed from an accessibility point of view. You certainly don't want someone that needs a handicapped accessible –

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space, but they want the – half a mile away, they want that retail store a half a mile away. So, there are components that are important from a code perspective that you really need in there, but you have to work out how to get them to be affordable for the development community in the scenarios that they're used to developing. That would be my one recommendation – to have them – those specific folks – involved in the dialogue.

Ian Blanding: That's great. So, Chris, my – and thank you for that, Scott. I think that's excellent feedback and good advice. Chris, my kind of follow-up question on that for you – you mentioned that – you know, there are three proposals in the 2021 IECC that were more focused on electrification kind of ready type of components, and there's been some discussion about that in the chat. So, I'm curious. How can jurisdictions that are interested –

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in that get that information easily? Are there resources out there? Is ACEEE working with certain jurisdictions that are interested in incorporating those provisions in their code? Is there anything you can say about that?

Christopher Perry: Sure. That's a really great – yeah, so, what I was hoping to talk about here anyway. And I think a good thing to mention, too – Scott comes from Denver. Denver has a lot of great resources. Some of the jurisdictions who might be listening to this or considering these options maybe don't have the resources to really create their own or do the research necessary.

So, yeah, I would say that this is all – this has all happened fairly recently and we don't have anything available right now as far as

resources for those jurisdictions, but we certainly plan to. I'm not exactly sure what it'll look like yet, but I would say, in the meantime, for anybody that's interested in this –

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you can reach out to us, but there are a lot of organizations like ours that are – we are invested in this. We want to promote energy efficiency, grid flexibility in the code. So, I was trying to write down from memory a list. Whoever you talk to, it's probably somebody you already work with or know, just reach out to them and they can point you in the right direction. But some of those organizations are like, Nazzio, IMT, us – ACEEE – NBI – New Buildings Institute, Alliance to Save Energy, or your local regional energy efficiency organization.

So, if you're in the Midwest – me, as a great example. Just reach out and say, "Hey, we're interested in doing this. Can you help us talk about it or can you point us to somebody who can?" Our types of organizations are here to help with that, so, yes, we plan to provide resources. I don't have anything to point to at this specific moment, but, in the meantime, we would love to have those conversations.

[1:14:00]

Ian Blanding: Excellent. Thanks. And it looks like there's a question in the chat that I think we missed. This is specifically for Scott, it looks like. What third party certifications are required in Denver?

Or if not required, what do you approve in terms of third-party certifications for energy code? And then, it looks like there's also kind of another component to this question on energy disclosure but, I guess, answer the first question first and then, we can go to the second.

Scott Prisco: Yeah. So, we adopted the IECC and we pull forward a lot of the 2021. So, we adopted the 2018 and pull forward and then added or modified some things to be specific to Denver. So, now, we're having building commissioning as part of our –

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criteria for commercial buildings now and blower door tests. So, there's both a – normally, we would just be doing residential, single family duplex, multifamily, blower door. We did – four air

changes required for multifamily; three air changes required for single family, and then, we allow four for ADUs as well, an exception. We've ramped that up now in our most recent code amendment so that commercial projects required blower door as well. There aren't penalties, but there are – it's more of a – what we did is a steppingstone in this code so that we make the blower door required and if you don't pass, then you have to have mitigation planned and then, you have your contractors go around do whatever *X, Y,* and *Z* was in terms of mitigation, and then, you submit that report to us.

We're not – there's no penalty if you don't make it, but you have to show that you tried to mitigate where you failed. And that could be demonstrated through –

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smoke tests and other things that they can see where the leakage is happening. We're also requiring a building envelope to be commissioned, not just the systems to be commissioned, because the systems in certain sized buildings already have that. But now, we've got full commissioning for the full building and those third-party have to be included when the commissioning report is submitted prior to TCORCO. And that could be a preliminary report, 'cause obviously, the commission report won't be done until probably a year after the project is occupied. So, those are two of the third-party components that are really important to use in our most recent code amendment process.

Ian Blanding: Great. Thank you. And then, there's a question on Colorado passed an energy disclosure requirement on potential real estate sales, and do you believe there's been any positive effect on energy efficiency attributed to that –

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or do you think it's simply raised awareness? I think you're muted, Scott.

Scott Prisco: I'm on the AIA Government Affairs committee where we look all of those, and it helps me – it actually helps me from a – my perspective from building apartment and how the city/county weighs in on certain statutes going through. And on that one, I don't remember that one being raised specifically to us so, I'm not as familiar with it. It must've been a lower impact in regards to us as a building department and AIA. I do know that there's a – so, I

think that one is more of an awareness piece that happened. I do know that we're actively looking at – both from a – we already have implemented this in Denver from a city and county perspective, where we have the benchmarking. You've probably –

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seen different jurisdictions require benchmarking. We have a 90 percent adoption rate in Denver for benchmarking. The state has not required that yet so, we're working on a statute. We're trying to get a representative to work with us on this, but to have that benchmarking. And I think that will be a bigger leap for Colorado if we can pass that.

I know we've had great success now in Denver at 90 percent, again, adoption rate, and so that everyone that has a building – commercial building – they're giving us their benchmarking energy use and then, moving forward, we're actually in that next phase now looking at, "Okay. What improvements – " and we're seeing improvements being made year over year without any requirements, and then, there'll be a – the next step will be, "Okay. If you have a building by this year, *X* amount of energy improvement must happen or maybe there'll be penalties or some other thing." I'm not sure how we're gonna get there. But it's really an important tool –

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to at least show a baseline of where buildings are and which ones really need improvement. I think that would be probably the best help – more than the bill that you're mentioning, I think, which was a lower impact bill.

Ian Blanding: Certainly. Thanks for that. So, I'll kind of open it up to anybody else in the audience that wants to ask a question.

So, seeing no other questions in the chat bar, I think we'll go ahead and wrap it up but again, thanks to our great speakers today and thanks for your questions today. It's an emerging topic and certainly one that we're very interested in at PNNL and Department of Energy and so, we've definitely noted opportunities for training and resources to be made available. So, I think all that is really –

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excellent information.

And just looking ahead, again, for our National Energy Codes Conference Seminar Series – we have two additional presentations. So, next week, at 1:00 PM Eastern, we have a discussion on policies for energy efficiency and resilience. And so, that'll be hosted by the Northeast Energy Efficiency partnerships and then, we'll also have a discussion on field studies in the Northwest region the week after. So, we hope that you can join us and certainly, continue to access that link below for recordings of the webinars and then, also, PDFs of the presentations. So, with that, I'd like to thank everyone again and hope you'll join us next time to continue the conversation.

[Music outro]

[1:21:00]

Male: This has been the National Energy Codes Conference Seminar Series, hosted by the US Department of Energy. Join us each week for a number of other important topics in building energy codes just like today's. We're here every Thursday afternoon at 1:00 PM Eastern. Participate live in our upcoming events or listen to past events on demand through our energycodes.gov training portal. There you'll find other helpful tools and resources from education and training materials to compliance tools like our RESCheck and COMCheck software, get the latest on state code updates, get analysis of energy code impacts from energy savings to cost effectiveness and more.

Check out energycodes.gov for those and a number of other technical assistance resources from DOE, Pacific Northwest National Lab, and others. From the DOE Building Energy Codes Program, we hope you learned something new about energy codes and enjoyed –

[1:22:00]

today's session. Thanks for being part of the conversation and we'll see you next time.

[Music continues to play through end]

[End of Video at 1:22:43]