

[0:00:00]

*Male:* Hello and welcome to our building energy code seminar series. The series is based on our national energy codes conferences 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](http://energycodes.gov).

[0:01:00]

*Richard Fowler:* Welcome everyone. I'm Richard Fowler with the Pacific Northwest National Laboratory. I'd like to welcome you to the final event of the US DOE NECC seminar series. Today's seminar will cover what has been learned from a series of energy code field studies that have been completed in the Pacific Northwest. Before we get to the presentation I'd like to cover a few logistical items. As with other events, this webinar is being recorded and a video of the webinar will be available online in about a week. A PDF of the presentation will soon be available at the [energycodes.gov](http://energycodes.gov) link provided here on the screen. Recordings and copies of presentation slides from previous webinars are also available.

[0:02:00]

You are encouraged to ask a question at any time during the webinar today by using the chat box on your computer. We will monitor the question pane and relay your questions to the speakers to answer following their presentations. CEUs are available from AIA and ICC for today's live webinar and a link will be provided at the end of the presentation. Before we get to the presentation I'd like to ask a couple of quick polls so our speakers can get a better understanding of our audience today. I'll go ahead and load the first poll here which asks which most closely aligns with your profession? Please select from among the selections here. I'll give you a few moments. Ok. I'll go ahead and close that and we'll see what we have here.

[0:03:00]

Looks like several nonprofits, federal and states. We've got some architects and engineers. Excellent. Thank you very much. We'll go ahead and launch the second one here. In what region are you located? Ok. I'll go ahead and close that and display what we have. We've got a lot of folks from the Southwest, West, Southwest, excuse me. Southeast. Northeast. Perfect. That's helpful. Thank you very much. Now without further ado I will turn things over to our moderator Neil \_\_\_\_ from the Northwest Energy Efficiency Alliance to introduce our speakers. Neil take it away.

Neil:

Thank you for the introduction Richard and thank you all of you for joining us today for our session. My name is Neil Grigsby and I'm a market transformation manager at the Northwest Energy Efficiency Alliance working alongside \_\_\_\_ in our codes, standards and new construction department.

[0:04:00]

It's an honor to introduce this session and panelists to you this morning but I'm going to keep my part short so we can get on to the good stuff. Today's session titled 63 and Me will go deep into the genetics of Northwest homes to uncover highlights and key findings from field studies conducted in the Northwest states of Idaho, Montana, Oregon and Washington. For the past two years NEEA has collaborated with DOE and PNNL to conduct field studies in the Northwest to gain insights on how state energy codes have impacted new home construction and energy performance. And we have the pleasure today of hearing from three members of our project team who will share their first hand experiences, observations and key findings from their site visits and interactions with local building departments and builders. Now let me introduce our panelists.

[0:05:00]

First up we'll hear from David Freelove of Cornerstone Integrated Industries. David is the energy coder circuit writer responsible for supporting IECC code adoption and implementation and enforcement for the state of Idaho. The energy code circuit writer program which is funded by NEEA includes providing technical assistance for the building, design and enforcement industries on energy code related items in the state as well as providing training both in the classroom and in the field. Dave has worked in the code enforcement field for over ten years serving as the building official

for the city of Middleton, Idaho and as a residential inspector, plan reviewer and mechanical inspector for Canyon County, Idaho. In addition to his work in the enforcement industry, Dave has also been involved in 22 different residential and commercial energy code compliance studies in various states across the United States. Next up we'll hear from Greg Lasher from TRC.

[0:06:00]

As the residential energy efficiency field specialist for TRC, Greg provides energy design assistance, program management and technical building science guidance to builders and verifiers. Greg has over nine years of experience working directly for contractors performing energy audits and rating, weatherization repairs, HVAC design and consulting and analysis for his client. And last we'll hear from Bruce Manclark of Clear Result. Bruce is a nationally recognized leader in residential energy efficiency technical training, implementation of conservation programs, quality control testing and consulting on energy efficiency. Bruce joined Clear Result in 2012 after partnering on many programs. Bruce previously owned an energy services company Delta T specializing in the implementation of residential energy conservation programs and energy audits, inspections and the delivery of technical training to energy auditors, inspectors, HVAC contractors and community college students.

[0:07:00]

Now before we get started I'd also like to mention a great resource where you can find more information on the DOE field studies is at their [energycodes.gov](http://energycodes.gov) website. There you'll find recently published state field study reports, details on the DOE sampling and field data collection methodology, pilot studies, technical assistance, fact sheets, past presentations. And all these resources can be really helpful if you're planning a field study in your own local market. And one more reminder before I turn it over to Greg to get us started. As Richard mentioned if you would like to submit a question please use the question function in the Go To Meeting function box. And if you can, specify who, which speaker the question is for. We've reserved time at the end of this presentation for Q&A and discussion so we look forward to hearing from you. And with that, I'm going to turn it over to Greg. Greg feel free to take it away.

[0:08:00]

*David Freelove:* All right. So actually we were going to – I was going to be starting it off here. Let me make sure I can get my screen shared here.

*Neil:* You're right Dave.

*David Freelove:* Now I'm having problems with screen share.

*Female:* We can see your screen, Dave.

*David Freelove:* Ok. All right. Let me minimize my picture here so I can see that. Ok. I'm Dave Freelove. I'm the energy code circuit writer for the state of Idaho as well as the executive director for Cornerstone Integrated Industries. We're a company that just started here a couple of years ago based out of Peoria, Illinois as well as here in Napa, Idaho. So I've been involved in – we'll be talking about the field data collection and recruitment strategies. I've been involved in – not all of them have been DOE funded studies. But I've been involved in 22 different residential or commercial studies in various states and locations across the United States.

[0:09:00]

And I'm just going to start talking briefly about some of the strategies I use, some of the things that I've recognized over the last five years or so that I've been doing this, six years. These are just a quick overview of the states that I've been involved either doing the build management or the field data collection management within the states or it could have simply been I was just doing training to train field staff within these various states. Several states I've done the first phase studies as well as the follow up studies. You can kind of see a list of where I've been around the country. Looking at some of our sample plans, this is where we're always starting off with and we're looking at it. And we've noticed that there's been some – usually there's a lot of consistency in the number of locations we would visit or jurisdictions that we would visit within different states across the United States.

[0:10:00]

And one of the big exceptions that we noticed was Montana. Idaho, here's a partial list of our sample sets for Idaho. We actually had 28 different locations that we visited within Idaho. Montana was real different than a lot of states that we had visited before. We had a total of 12 jurisdictions is all we visited within Montana. So we see very unique situations when we're dealing with different states. We'll find ourselves in very rural counties as well as major

metropolitan areas. So but when we're talking about the recruitment phase of course we're going to follow DOE protocols. One of the things that we'll talk about is just it seems like common sense but we've seen where people have struggled with things as simple as efficient travel plans, making that initial contact. What type of image which an image is a huge thing when we're walking onto job sites and we're talking to builders or starting that conversation.

*[0:11:00]*

How do we start, do our conversations with builders. And then as well we talk about follow up with the builders. But real simple. We're going to route efficiently. We don't want to bounce from one side of the state for one house, drive to the other side of the state to get another house. We want to schedule builders within the same area. We want to – you always want to leave openings for random homes or leads because at times when we're speaking with these contractors in the field once we have that connection with them where we've made that conversation with them and we've got through the process of doing the data collection on the house, I would always ask the builders if they have any other leads. Do they have any buddies that may be interested in showing us some houses. So we would always try to leave some openings for those and we would budget ourselves on a daily basis.

*[0:12:00]*

Whether we were working alone or working in teams we always knew what a minimum amount of homes that was our goal for each day. So another big expense and another big logistical issue was simply our test equipment. When we're traveling with several sets of blow door testing equipment, duct blaster testing, flow hoods, flow cameras, whatever we had, it's very expensive to travel with that equipment as well as to even ship it. So a lot of times we would – if we had the opportunity or we knew well enough in advance where we were going to be staying we would ship the stuff to that location instead of carrying it with us on the planes. One thing is you walk into an airport. I have one of the older energy conservatory kits and you walk in there with a gun case and you immediately getting, start getting asked if you're going to declare that and you're being looked at with a very cautious eye when you're walking in there with your blow door frame in a gun case.

*[0:13:00]*

So I always would try to avoid carrying that stuff with me into the airports so we would just ship that. And then as well we're not – as we move from area to area usually we would do 10 to 14 days at a time in a location. So then we would come back home for 10 to 14 days. So we would just simply rent some storage units from U-Haul or whatever and that's where we would store our equipment while we were gone. But through this years of doing this I've really started to think out of the box. It's expensive to be staying in hotel rooms for 14 days at a time. So we started looking at ideas of using BRBO or Home Away vacation rentals. We were actually renting houses at times. We would have four of us in a location at one time so we could save substantial amount of money by renting an apartment or a home. And as well it was much more comfortable for us.

[0:14:00]

We could go down to the grocery store. We could grab our own food, cook our own dinners and it saved us money on that as well. But thinking further out of the box for example when I did Montana. Now it is with – Montana is for the most part within driving distance of my home in Idaho and I did most of my driving there. But I actually purchased a travel trailer and I pulled a travel trailer with me all over Montana when I did Montana. So I would go spend a week in Bozeman, spend a week in Billings and I would leapfrog my trailer from place to place. And then as I would come home for a week or two I would find a storage facility and I'd park that trailer there. And it saved me a huge amount of money. It made my travel very efficient. And it actually it, if I do another study like that again close to home it would probably be my preferred method. But again we were always looking at a minimum of 10 to 14 days on the road. This is what we were always looking for.

[0:15:00]

So making the initial contact, this is tough. It is really hard to train people to do this because you really have to have some charisma about you and be able to have some intuition on people and what they're, how they are and what they want to talk about. But I would always make the initial contact was just small talk. How are you doing today? Oh the weather is hot. Whatever. Just make that small talk but through that small talk is where I would try to find that connection with an individual that I was speaking with. We could be talking about weather. If I was in Kentucky they would

usually immediately ask me where I'm from because I don't have a - I talk funny. So we would talk about Idaho. That might spawn a conversation about fishing or hunting or just what Idaho was like and we would spend that time just having that conversation. And at the time I'm always looking for that power of persuasion. If I can give something to somebody it will obligate them to give me something back.

[0:16:00]

So we would have small game plans. If somebody was with me in the course of this conversation I may look at them and say, hey, can you run back to the car and grab me a bottle of water. Well, he would always grab two. We would offer one to the builder and that would give him that sense of obligation to give us something. The other thing is though is I really would ease into the visit. We don't just walk up there with a bunch of paperwork and be saying things about we're here to look at your house and make it sound serious. We would really ease into that conversation. We don't overwhelm them with that technical talk unless they get very technical. Then I would stand there and I would talk to them all day about air change per hour and air velocities and natural air change per hour. We would just go on and on about it. But then as well when we do get into that testing we're always going to minimize what we're doing. It's just a very simple test. It's just going to take us a few minutes. We'll be in and out of here.

[0:17:00]

But we stressed one of the biggest things I noticed with builders too is that we're stressing no contact with those building departments. We're going to ensure that anonymity. We're not going to be sharing any of this information with their building inspectors because a lot of builders are afraid that oh, they're going to find something wrong and they're going to call my building inspector and let them know. So we really would stress that type of stuff. But dealing with image this is something that a lot of people really overlook. So we do not overdress. We want to look like a construction worker. We want to make those contractors feel comfortable with who is walking on that job. For example the picture here of the guy in the I guess that would be casual dress suit. I worked in the construction industries for years and years. And whenever we saw a suit or somebody dressed like that walk onto the job site we looked at each other and said hide. Where are we going to go? Let's get out of here because obviously this guy's

from the bank. He's just, he's somebody that looks official that we don't really want to deal with.

*[0:18:00]*

So we really stress that we don't overdress. I wear sweatshirts, blue jeans, some work boots. And then another thing is what are you driving. It's amazing the amount of comments that I would get from builders in the early days of me doing this where I would be maybe driving - we had rented a minivan so that we could haul our equipment and have plenty of room. And then the license plates as well. In Kentucky and I have no idea what the issue is there but if you're driving around with an Illinois license plate they kind of look at you with a suspicious eye. So I would always be looking at I would pull up. The pickup here, that's my pickup. That's what I drive up to the job sites on. That's what most contractors, subcontractors, everybody else are driving pickups. Make sure that I have, if I was renting vehicles I would get there into Alabama for example and I would get the pickup picked up.

*[0:19:00]*

And one of the requests that I is that it had Alabama license plates on it. It takes that suspicion away from you when some random guy is driving up to your building or this guy that's called you. And then he shows up in a mini van or a little pink smart car with California license plates on it. They start getting suspicious. So we want to take those things away. Another thing to always be thinking about is just having your PPE. You're on a construction job site. And there's been many a construction sites where the builder has looked at us and says I'd let you on but you don't have steel toed boots. They are very aware of liability and letting people on to their job site. So always ensure that we have good pants. We're wearing some blue jeans, hard pants, steel toed boots, hard hats, make sure we have our eye protection, a high visibility vest even on these job sites, residential construction.

*[0:20:00]*

A lot of times they want these high vis vests on there. And then some contractors require all of it. And some contractors will be standing there in flip flops and shorts talking to you on the job site. So again you're really it's a hit and miss but always be prepared. And then as far as follow up, builders really, they do want to know what's going on with their building. They always want to know how am I doing. A word of advice. Even if it's terrible tell them



they're doing really good. I don't ever tell a builder that oh it's horrible and try again. We don't want to portray that to the builders. But we're going to offer that feedback to the builders. We want them to - if they want to know about this air change per hour and blow door tests a lot of times this has been the first time they've ever experienced the blow door test.

[0:21:00]

And we'll spend a lot of time when we're there doing the testing with the builders using it as an education opportunity as well because we'll be stepping them through the tests, showing them what this test does, taking them around the house with the floor camera, showing them where these leaks are at. I mean it really just spawns that interest when we're doing this. So we're always willing to offer that feedback. In Alabama they did had - they had jurisdictions that did require blow door testing in certain regions so we were able to provide them with that information and the jurisdictions would actually accept that as a test. They were, they did recognize DET certification in that state so we were actually, some of these builders we were certifying some of that blow door testing for them. So but we're always providing them those test results. We're duct pressure testing, blow door. A lot of them want to know how did it all turn out in the state. So we're going to provide them with that information. We're going to provide them of course with our contact information.

[0:22:00]

Even the regional energy organization, department of energy. Any of that information they want we would have that information readily available for them usually in the form of handouts that we would have. But typically we would only be leaving that information for them when they're asking for it. And then of course if they did want that information I would always - and it would sometimes be a year to year and a half after the study. But I would provide them with that information. I would keep their email addresses and I would make sure that we got that information provided to them so that they could see what the studies and how it turned out within their state. So I'm running a little fast here. But my contact information. Again I'm with Dave Freelove with Cornerstone Integrated Industries. Here's my contact information as well as through the Idaho Code Collaborative where I'm the Idaho energy code circuit writer and here's my contact information as well.

[0:23:00]

And please feel free to contact me at any time. I'm always willing to provide support but I'll turn this back over to Neil or I believe it will go to Greg next. Thank you very much guys.

*Neil:* Great. Thank you so much Dave. Some great tips and techniques there that have definitely led to your success in this project so thank you for sharing. Next up we're going to introduce Greg Lasher from TRC. Greg you should be queued up and ready to go.

*Greg Lasher:* Great. Thank you. Let me get set up here. All right. Can you see my screen?

*Neil:* Yes, we can,

*Greg Lasher:* Great. Ok. Thanks. Thank you. Again my name is Greg Lasher. I work at TRC. I'm an energy efficiency field specialist.

[0:24:00]

And I just want to say about David Freelove. He is the master of gaining access to homes which anybody that's run one of these code studies knows that's the most difficult thing to achieve so I appreciate his consultation on the Oregon project that they can provide. So I led the Oregon field code study starting in November of 2019. A group of intrepid field auditors got out there and we got our 63, at least 63 observations of our seven key items. So I'm going to show you some of the things that we saw in our Oregon code study. I'm first going to start with a quick top level description of the Oregon code which is not completely unique but it's certainly a big part of what happens in Oregon.

[0:25:00]

Then of course I'll take you through some building trends and some observations. So in Oregon we have what we call a prescriptive plus additional measures to code. What they require in the 2017 Oregon residential specialty code is they provide prescriptive minimums for the assemblies that you see in your screen here. And it addresses every major assembly in the load that contributes to energy efficiency. Also love to show this because we do have *[Break in Audio]* pathway. So beyond the prescriptive minimums then a builder of a single family home in Oregon needs to also choose one item from the top of this chart called envelope enhancements. And they need to choose one item from the bottom

of the chart. Top of the chart is mostly envelope although it does have some duct sealing options that are pretty commonly chosen.

[0:26:00]

And the bottom are all mechanical options that affect the energy usage in a home. So in order to get a sense of what builders chose and then try to connect that with what they did in the home – of course it would be wonderful if there was a uniform database for all this. That doesn't exist. So we wanted to gather this information out in the field. So what we did was we interviewed the builder and asked questions. Not surprisingly many builders had no idea what the choices were for the home. Not necessarily the builder but sometimes it's a site supervisor who is giving us access. Oftentimes they did know and that was one of the ways we recorded it. The other way was simply to take photos of the plans that we find in the home which is relatively easy to do.

[0:27:00]

A lot of homes at the finish have the plan set still in the home. And David will tell you it's usually in the kitchen in a drawer in the island. So in this case we have a photo record of this builder chose options 5A and that's what that looked like. So I'm going to just take you through a number of our photo records to show you the diversity of how to record the plans. On the left you see a literal copy and paste of the charts that I showed you earlier with the ones chosen highlighted. And then we have on the right choices 2A from sort of the self manufactured list. On this screen we show that someone actually wrote it on the plan set.

[0:28:00]

And then on the right we have an old fashioned copy and paste right onto the plan set. For this one the architect threw in some visual imagery to show options 2 and A. And the last example is maybe a somewhat hasty scribbling of the choices 3 and A on the bottom of the plan set. So we considered all of these to be legitimate choices and we tracked that. Ok. So now I want to shift this presentation a little bit and talk more about what we did beyond the seven key items. Of course in the DOE methodology we're focused on statistically significant observations of in our case seven key items and that number of observations is 63. We knew when we received the data collection tool that there were many other things that told a fuller story of the energy usage of homes in Oregon.

[0:29:00]

So we took a number of them very seriously and prepped our field auditors and then recorded some information. So that data collection tool by the way. I believe my count was 194 fields that were possible to fill out on each home. And so we picked a few that we thought were important and did some recording of those items. What we then did is we took that data, ran analysis, created a master spreadsheet of the building trends and observations is what we called it and have created some slides, some of which you'll see today. One of the lines on the data collection tool that we liked quite a bit was is this home participating in an above the code program.

[0:30:00]

There are a number of ways for us to see that but the most common probably being that a label is often put in the electrical/[*Break in Audio*] home. But also we would ask the site supervisors or builders on site. And they tended to know that answer fairly well. And we were happy to find that our results from our code study matched what we knew was the level of participation in these above code programs. In Oregon we had three choices for this, EPS for new construction, Earth Advantage has a suite of certifications and then of course LEED. And of particular note the EPS for new construction is very popular program in Oregon. About one third of the homes in Oregon go through this offering. And it is a cash incentive paid to builders to exceed code. So we felt that was something we wanted to know more about.

[0:31:00]

So we will see that reflected in some of the charts that we're going to show you. So now I want to kind of take you through some of the areas in the home that use energy and show you some seven key item information but also some stuff beyond. Water heating is not a seven key item for us in Oregon but it's a big part of the sort of diverse story that's told about the energy usage in Oregon. And so I'm just going to show you some visual images of what we see in Oregon, the tankless gas hot water heater is the most efficient way to heat water with gas for domestic hot water use. And this is an installation in a garage. This is also a garage installation of the traditional gas storage water heater, far less efficient than the tankless like I showed you.

[0:32:00]

Then when you switch fuels to electric this is also a traditional hot water heating method. Lesser efficient than the one I'm about to show you but it's a standard electric storage tank. And then a heat pump water heaters which are growing in market share and have been heavily incentivized for market transformation. We can see that in the next chart. So we had 65 observations regarding the type of hot water heating in homes at the end of this project. And this chart shows that builders who participated in an above code program chose the two most efficient options in far higher numbers than builders who did not participate in above code programs. Heat pump water heaters and gas tankless options are about four times more common in above code home according to this data.

[0:33:00]

So this clearly shows this is one of the ways that builders are exceeding code in Oregon. Another way to slice the data is across time. There was an Oregon code study in 2014 that we referenced and so just five years prior to this report 2014 Oregon field study found no heat pump hot water heaters. Just like their known availability in the market. So this 2019 that had a total of 90 observations found heat pump water heaters comprised 25 percent of all the hot water heating systems. Gas tankless devices saw a threefold increase, comprising 36 percent of the market. And you can see that the gas storage, it used to be the dominant method of hot water heating and it's been diminished down to 21 percent in our code study.

[0:34:00]

Moving on to the envelope we'll mostly here show you some fails in these and this is one of mine coming from a contracting world and insulating crawl spaces. There's a lot of work that goes into insulating a crawl space. And if you fail to insulate the hatch or insulate it well, it seriously degrades the R value, effective R value. And we saw what are probably relatively common results in building industry that only 53 percent of the hatches that we observed complied with the surrounding R value. And this is what we're talking about. So this crawl space is probably R 30, could be R 38. Yet you're seeing the hatch use a completely different fiberglass bat and not big enough and not well enough installed on the hatch.

[0:35:00]

We also saw a number of hatches that had no insulation at all. And unfortunately this is not a common occurrence but it is something that we see out in the field at the completion of a home the hatch is just missed. And then of course the quality of installation of insulation has a critical impact in how much energy that that insulation can save. And perhaps this installer was a little bit confused about what conservation means in this case and they didn't want to throw away the odds and ends so they jammed them in this space. But it's not going to conserve as much energy as a bat that is installed to grade one resident quality.

[0:36:00]

So we labeled this as grade three. Moving on to the duct work that we observed in the Oregon homes. This is just a visual of a typical duct leakage test that we do. You can see on the left the duct blasters attached to the main turn. And on the right the attachment monitor showing us the pressure level of 25 pascals and 103 cubic feet per minute which at that pressure - and then some examples of good duct sealing. So on the left you see the gray mastic on the seams of the duct work and that's going to seal that, those ducts and prevent leakage. Of course the orange foam we'll get to in a minute. But that's not duct sealing of course. That's envelope sealing when the envelope is completed.

[0:37:00]

And then the picture on the right is a duct boot so just lifting off the grill from the floor vent. And you can see the duct mastic has been applied inside. And I've tested enough ducts in existing homes to know this is a major leakage area so it's good to see it done at construction. So looking at the data on duct leakage we had 67 observations in the end. And we tested this of course regardless of ducts were located inside or outside the envelope. And the study observed a large deviation from the average home looking at above code participants. So participants in an above code program lowered the leakage rate to an average of 4.9 CFM per 100 square feet. Conversely homes built to code have an average leakage rate of 6.8 CFM per 100 square feet.

[0:38:00]

On to envelope infiltration. And this is a blower door in the front door in this in monometer attached to it is showing the negatively pressurize this house at 50 pascals and got a leak of 1,000 square

*[Break in Audio]* cubic feet in minutes. So reducing air leakage from a home's envelope is different than other energy efficiency measures that a builder might need to know because it requires a concerted effort on the part of the builder. It's not simply a product that they can buy and install and get that result. So it takes some focus and it's not necessarily the most expensive efficiency investment but it's certainly one of the more important choices. So this is an interesting way to look at energy usage in homes. The average across our study was 4.1 HCA50 for Oregon.

*[0:39:00]*

But then again when we break it down into above code participation you see a large deviation. 3.4 ACH50 which is indicating of course less leakage and more efficiency. And then for code homes it was 4.6. Then some visual examples of envelope, a good air sealing. On the top picture you have a less common example of caulk being used, applied to a top plate before the drywall goes up. The caulk there will help seal that wall assembly from air leakage into an attic space. And then in the bottom picture you have a much more common way to do that which is installation of a vinyl gasket stapled along in the same spot along the top plate there.

*[0:40:00]*

Pretty inexpensive solution to air leakage for a home. Some more examples of good standard air sealing techniques. You have a plumbing penetration on the left presumably going through a bottom plate and into a crawl space. You see the orange foam applied sealing up the hole there made around the plumbing penetration. And on the right you see what we call a rigid air barrier installed behind a tub shower insert. And this is not rocket science but it does require a little bit of planning on the part of the builder because they typically need to insulate behind where that ridge air barriers goes out of sequence from the rest of the wall installation. So you wouldn't - you have to have your insulating sub show up at a different time, insulate there, install the rigid air barrier.

*[0:41:00]*

Then typically the tub insert is installed and then the rest of the installation happens. so it is a known massive air leakage point in a home if the rigid air barrier is behind tub inserts. And lastly a couple of pictures of missed opportunities for air sealing. On the

left we have the fresh air intake and the exhaust from a sealed combustion unit penetrating probably a ceiling or wall of again a garage. And this was at final so we marked this down as a missed opportunity. It is possible for anybody to go back and seal that up. But at this viewing it was a missed opportunity. And on the right you have a brand new window installed probably pretty well installed. And the window manufacturer has done a fair amount of work to make sure the unit they produced is air tight.

[0:42:00]

But if you don't seal in the assembly you can see some places here where caulk or foam could have made that window assembly a little tighter. Then that's a big missed opportunity. So that's the stuff that I wanted to go over for Oregon.

*Neil:* Great. Thank you Greg for showing some of the Oregon findings and also providing a good example of how the DOE methodology can be customized for different state code structures. Next up and for our final presentation on this panel we have Bruce Manclark from Clear Result. Bruce, I'll go ahead and turn it over to you.

*Bruce Manclark:* Thank you. Are you all looking at the right screen?

*Neil:* No. You're going to want to switch that. There you go.

*Bruce Manclark:* How's that?

*Neil:* Yes. You're good. Great.

*Bruce Manclark:* Ok. Thank you all, especially the two preceding presenters.

[0:43:00]

You made my job very easy. So I'm going to just kind of rift here on the 63 and Me theme here. So yeah Oregon is kind of a little more complicated than the average state code. But in Washington we needed to take things just a step further and make things even more complicated. And the top sort of flow bar kind of shows you that you've got some state codes in the IECC and then in state modifications. And then that determines what the key items are for your study. Well, Washington state you have lots of ways to earn points. So you start out with a code and you have a fairly strict base code that everybody has to meet. And then you have to earn various points based on the size of the house. And so basically the



points are arranged by envelope, air sealing, HVAC, water and renewables.

[0:43:00]

So going in you don't know what you have to look at. So this sort of mandated that we did a two phase process. So the first process that we did we had to go out and find out how people were actually building. And so phase one we got into a sample of jurisdictions and they put us in some small room some place with a whole bunch of plans and we determined how people actually went about meeting code. We quickly found out that it wasn't easy even at the code office to find out what the path we had to look at all sorts of documents. So once we found out what we were going to look at, phase two began and that was actually going out into the field. So phase one, what it found is that the good news for us is that 92 percent of the homes were built with six combinations of options. Otherwise it would have made it quite difficult.

[0:45:00]

HVAC and water options were selected. If you think about it if you're a builder you're going to go for the cheapest, less disruptive to your building habits points that you can get. And just changing out HVAC and water heating became the cheapest, easiest points if you will. And then they kind of focus on different envelop upgrades or air sealing options. So we looked at 342 plans in 13 jurisdictions that were arrange by small, medium and large. And phase two we went to 184 homes to get 63 observations. And all of this kind of came up with an familiar output to some of you and that's the annual statewide potential. Because Washington we pride ourselves in doing things that are complicated. We had to add that extra phase in there. So how we found the homes and convinced builders to let us in.

[0:46:00]

So ideally you would always start with the local jurisdiction. And you think that in the past we found a little more receptive on how the different homes and could we actually follow you along on your inspections. In this study not so much. If we were fortunate we got a list of open projects, maybe a list of builders. Often we got no response. We don't have time and I get that. They're very busy people and they just said whatever. And oftentimes we sort of got a reaction. It's an unfunded mandate. I don't have any particular interest in helping. So how do we find the homes? Well,

almost every national builders these days has a big flag. So we're just going to follow the flags around and see what subdivision was active. Track the truck. We found wall installation before it got covered, the hardest measure to inspect.

[0:47:00]

So oftentimes we'd park our cars outside of big installation companies and follow them to the job sites early in the morning. And this is how we actually got some wall observations. Of course scan for the can. Any large subdivision is going to have numerous port a potties out there and that helped us locate new construction sometimes. Online tools, Zillow Redfin. Zero in with Zillow. Where are homes being built? And often Zillow would help us track these down. And then we'd utilize our contacts with the utilities. If we got if we knew somebody there that put us in contact with the staking engineer and they said oh well, I can tell you. All the new subdivisions up around x, y or z. Why don't you go poke around up there? And turns out other people work Sundays and they're often real estate agents and open houses.

[0:48:00]

And especially if they looked lonely we'd go talk to them and say hey, how are you today? And sometimes we got to test the model house. Other times they said well, I'm kind of busy here but I have keys to a couple houses down the road. Why don't you go take a look at that? We found them really friendly. And then of course search for the job shack. So because of the code in Washington state being sort of complex, it was absolutely mandatory to find those plans. Greg indicated this too. And it wasn't always easy. Sometimes they were at the house and it was an easter egg hunt to find the darn things. Back to the building department I will say that if we went back to the building department to find the plans the building department was always friendly and they would go get the plans for us. And then the site shack often would be where all the plans are actually kept.

[0:49:00]

This is ideal. You walk in and there's a nice tub, everything is in there. One thing we found, the cleaner the floor, the more likely you could find the plans. Oftentimes when they clean up they just throw away the plans and we did quite a bit of dumpster diving to get plans sometimes. Then revisit the local jurisdiction that I mentioned before. What's interesting is this was sort of primarily

obviously an energy related study. But having – I'm the old guy in the study. I've been looking at homes for over 40 years now. And from a personal perspective so many things have gotten so much better. And other things kind of took me by surprise. So this is sort of personal revelations about looking at new homes in Washington state.

[0:50:00]

So we had a lot of builders that were doing ducts on the inside and as much pushback as we get ducts on the inside what it forces the HVAC and the builder to do is actually talk to each other on how to accompany this. And because it's more complex we found a lot more forward thinking went into it. And if the ducts were on the inside it tended to be a better duct system in terms of air flow and also a cheaper duct system because so fewer feet of duct was actually used 'cause you just – you have to think about it. So the ducts on the inside I found a really good trait. I was happy to see it being done well. If they didn't put them inside the bad news the ducts at least in the north of Washington have migrated from the crawl into the attic. From a thermal point of view ductwork in the attic it generally does look like this flying spaghetti monster. And from a thermal point of view it's the worst place. Kennewick, Washington, 110 degrees during summertime.

[0:51:00]

You put \_\_\_\_\_ ductwork up there and it really affects things. Code does not really address where you put your ducts but it obviously has an energy impact whether it's in the crawlspace or an attic. Web trusses used as garage ceilings. Boy it was just really hard not to have gaps in those situations. I'd like to see a good detail done on that. Homes no longer have 8 foot ceilings. They tend to have 10 and 12 foot ceilings. Obviously this increases the heat loss on a per square basis and also mandates that I have to go out and buy a ten foot blower door frame. Controllers, ok. Now we get to the stuff that sometimes is it done becomes a checkbox. Right? And this is a ventilation controller, very common one. This is supply side ventilation. And you can program this device to meet various ASHRAE standards.

[0:52:00]

But in many times they were not set up at all. Here on this Honeywell controller you can go in and set the number of bedrooms, the square footage of the house and the vent airflow.

And oftentimes they're not set up. In some cases the wires were not even plugged in but the controller was there. Same with ventilation timers on exhaust fans. Oftentimes it was not set up either but it was there so you could check the box. HRVs we're starting to see quite a few more of those. In some cases they were really well done. There's a third party company that would actually do the design and the commissioning of them. But the ones we tested, they definitely didn't go through the balancing process. Or if they were, if the ag was filled out it was at least my feeling that the results were wrong and I think just sort of automatically entered.

[0:53:00]

In Washington state if you're going to use your air handler as part of your ventilation system it's mandated that the air handler have an ECM. We found quite a few cases that the air handler did not have an ECM where it was required. HVAC sizing project, the good news is we kind of just focused on e-pumps here to see what the balance point would be. And let's face it. If you build an efficient house and you sort of use rules of thumb that you used to use you're going to end up with low balance points. And the good news, they're always in the mid-20s which is really pretty good for the northwest. Code does say you're supposed to be an HVAC sizing calculation and they were seldom located. Gas furnaces were almost always oversized. This should not come as a surprise to anybody. Our homes are coming in at less than ten BGUs per square foot at design conditions.

[0:54:00]

So 2,000 square foot house would have a heat loss of roughly 20,000 and the smallest gas furnace that is easily, commercially available is 40,000. Heat pump controllers not set up. Code also mandates where the auxiliary heat is fed in. Here's a really good confusion on it. If you see the compressor will turn off at 35 degrees and the ox heat will be allowed to come on when it's 70 degrees on site. So this person would be sort of doomed to have a heat pump that wasn't very efficient for them. So we found kind of a big gap on how heat pumps were set up. The other really interesting thing to me is if anybody ever wanted to actually do a building analysis of new homes, nonutility fuel sources.

[0:55:00]

Here we're looking through this window and there's this big propane tank. What's that big propane tank? That is the gas fireplace and the gas cook top in this entire subdivision. Kind of found that a little surprising. Obviously this subdivision was built beyond the gas lines. Also irregularities in what different code officials required which probably shouldn't come as a surprise to anybody but one that has sort of a real impact on how things get done is do you need a stand for a heat pump water heater in the garage? If you do, it makes the job harder. All of a sudden the technician has to do a deadlift of 18 inches of a pretty darn heavy object. And again this was some jurisdictions required the stand. Other ones didn't. So yeah. Looking ahead to the next code and I think - and again this is my opinion.

[0:56:00]

I think there's going to be a lot of additional training and assistance that's needed. I think that getting ducts on the inside - I think that the way that we presented in the past sort of overcomplicated it. And we're starting to see some really good examples especially if we can prove to them that getting ducts in the inside actually decreases their HVAC cost. As we get homes tighter and tighter ventilation becomes more and more important. There has to be somebody that does ventilation commissioning. HRV design installation and commissioning, all of these are areas of needed improvement. Heat pump commissioning, somebody has to be in charge of making sure that controls are set up so that \_\_\_\_\_ isn't running all the time. And again Washington code you get more additional points the tighter and tighter you make it. I think we can all sort of easily get to - not easily, it requires worth with 3ACH at 50.

[0:57:00]

But some point totals encouraged beyond that and I think there could be some training on how to make homes tighter than that. And that is the end of my presentation.

*Neil:* Great. Great findings and insights Bruce. Thank you so much for sharing. Also unique challenges for unique code.

*Bruce Manclark:* Yes.

*Neil:* So good job just getting out there and getting your data. Well, that wraps up our three presentations. I just want to remind folks we have received a few questions in the question box but if there are

anything else you would like to ask, please type that in. We're going to move on to a series of poll questions that we'd like to hear back from the audience on. So here's – let's see here. So the first one here is how do field studies benefit your region and/or local markets.

[0:58:00]

All right. And the results are coming in. Looks like option number one providing information on code compliance is the leading vote getter so far. And there it is. 46 percent chose option number one as the most useful benefit of the field studies, providing information on code compliance. Thanks for filling that one out. Next poll question, what field study information collected is the most valuable.

[0:59:00]

Three options there for you to choose from. And I think these results speak to some of the interesting findings that we heard from Bruce and Greg. Installation and equipment trends and best practice. So getting a chance to see what kind of technologies are being installed, what types of building strategies and techniques are being used seems to be valuable for the audience as well. So that's great.

[1:00:00]

Thanks for your feedback on that. And I believe we have one more poll question. In your opinion how often would field studies be most useful for you, things here to choose from. Great. And this one, strong response for three years. That does seem like the right amount of time to measure any changes in market trends. And it seems like a good frequency. So thank you for providing your feedback on each of those poll questions.

[1:01:00]

Now I'm going to invite all presenters back as we field some questions that came in during the presentation. So hopefully you're seeing our question screen here on the presentation. We have Bruce and Greg joining us again and Dave I'm sure is online as well. I'm going to start with a question for Dave as you started Dave. How did you manage federal reimbursement when using Airbnb or BRBO as lodging options?

*David Freelove:* Well, under the contracts we used through the different regional energy organizations or the prime that we were subbed under we didn't have any problems with the federal reimbursement because we were being reimbursed by that particular entity.

[1:02:00]

So we weren't bound to the \$129.00 a night. But actually even if we were on the BRBO on those requirements when we were doing long term rentals we could easily have met that anyway. On average we could get a two or three bedroom apartment for around \$100.00 a night you could find good units to be staying in.

*Neil:* Great. Thanks Dave. Next question for all panelists. When you approach building departments how did you manage the goal of preserving an anonymity for the homes used in the study? Was that a consideration when asking the building departments for information?

*David Freelove:* Yeah. I can start off with that one.

[1:03:00]

I mean the anonymity is always the issue and we stress that even when we were talking with building departments because building departments would have that thought that they may be being audited too. How well are they enforcing the code. So it was always an issue with the building departments to stress that anonymity so that they didn't feel like they were going to be I guess thrown under the bus or look bad compared to other jurisdictions within the state. So it was an upfront thing I would always tell those departments is that we do maintain that anonymity. Basically I would tell them same thing I would tell a contractor. This house, by the time the study is said and done, the only thing that anybody is going to know is that house was located in Oregon or in Idaho, whatever state we were doing the study in.

*Greg Lasher:* Yeah. I think it's also important that the builder know that the results are anonymous.

[1:04:00]

And I think David showed a lot about how the builder involved and give us access to test the homes and then sharing that. But we also along the way need to reassure the builder that we were not

the code officials and we were not going to be reporting. So that was another crucial piece to gaining access to the homes.

*Neil:* Bruce any thoughts on this one from your perspective?

*Bruce Manclark:* I think they both covered it really well.

*Neil:* Ok. Great. Thanks for weighing in on that one. Another question for all panelists, it would be great to hear your perspective on this. From your firsthand experience of the key items that were collected which item is the last one collected to meet the magic number of 63 datapoints. And which is the hardest? And which is the easiest?

*Bruce Manclark:* I'll lead that one.

[1:05:00]

The hardest for us was wall installation just because maybe you have that night where the walls are uncovered before the sheet rock goes up and that's sort of where tracking the trucks became important. Windows by far were the easiest. Most of them have the stickers there until the window cleaner comes at final, right, with the special stuff to get the sticker off and not leave the glue residue behind. The most difficult to do is probably the most time consuming and that's duct leakage test just 'cause it takes time. Although having done most of my duct leakage on retrofit homes doing it new construction without furniture and stuff around sure made the job a lot easier.

*David Freelove:* Go ahead Greg.

*Greg Lasher:* Yeah. Sorry. In my experience in Oregon the last one of our key items to hit the minimum of 63 was duct leakage. And I think that was the result of two things.

[1:06:00]

One gaining access to mostly finished homes was proved to be a little more difficult for us [*Break in Audio*]. Be a bit more casual at the [*Break in Audio*] and like David said have a conversation with the builder. You're out of their way. You can do your observations. Complete you often had to have the home unlocked for you. So those were harder. That's the first part and then the second part was if you got access you walked in and perhaps the home was either ductless heated so you couldn't get the duct leakage test



completed. Or possibly multiple *[Break in Audio]* like wall heaters. So that forced us to gain access to another completed home in order to get the duct leakage.

*David Freelove:* And in my experience of doing multiple states around the country, the top three are going to be duct leakage testing, wall installation.

*[1:07:00]*

But also I found difficulty in obtaining your floor installation or slab edge installation. In certain regions I have done this data collection in the primary method of construction was slab on grate construction. So really the only way we could verify permitter installation is in the particular state, their regional practice was to do an interior wall perimeter installation. So we were trying – we were literally needing to find these stem walls that were sticking out of the ground but before the floor was poured so we could verify that perimeter installation. So it's like Washington and Oregon, yeah, we would run into issues where we would get to a home that was finalized and as Greg stated ductless or *[Break in Audio]* in there. But overall it is always a struggle to get that wall installation.

*[1:08:00]*

You've got such a small window from the time the home is insulated until they're in there putting sheet rock on. So those would be the top three. And I concur with Bruce on the easiest by far being the obtaining the U factors and solar heating coefficients on the windows. Those by far were the easiest to obtain and complete.

*Neil:* Great. Thank you for sharing. And there's a comment that came in from the audience that I think is worth sharing just given our current situation that COVID has made getting access to final homes much more difficult as well because of builders concern about potential contamination from having people in the house. So that is something to consider in current times and hopefully not much longer. Moving on to another question. So we've heard from some builders that it's more challenging to get ducts inside for single floor homes.

*[1:09:00]*

What are your thoughts on that and what have you seen?

*Bruce Manclark:* This brings out the most creativity. And again I think the better builders that have focused on energy efficiency for a while, they get duct on the inside at least in Washington doesn't always mean ducts where you can see them or something. Right? Your own design. What we saw a lot of was drop soffits with ductwork in it. And when you're making drop soffits better be aware that means again your HVAC guy and your builder actually have to talk to each other. It also encourages shorter duct runs. Also they could build a box in the attic like the picture I showed earlier. And so they don't – they're not below the level of the ceiling but there is an air tight box above them that is heavily insulated. And in Washington state that counts for ducts on the inside.

*Greg Lasher:* Yeah. And I would say I'm working with a lot of buildings right now on this.

[1:10:00]

So Washington, the new Washington code scheduled to take effect in February doesn't require ducts inside but it's going to be difficult to build a new home that's gas heated without doing that in order to get all the credits that you need to be compliant with code. And then the draft of next Oregon energy code says ducts need to be inside or deeply buried. So a number of builders are having this specific question posed to our team and the program that we work on. I have experience that Bruce does which is there's a number of ways to do it. Builders are reluctant to spend the money to redesign homes. It's difficult. And one of the things that we did a poll question on a call with builders. They do fear walking in and seeing soffits and bulk heads, not a grand foyer. That's a concern.

[1:11:00]

I think some of the larger production companies also fear the marketing department and their influence on design for the same reason fearing that they build these homes with ducts inside them and they don't sell. They sit on the market. But a lot of it is simply doing things differently. Bruce has the key there that if you do the design work you can lower expenses in some of the other areas like your HVAC cost of insulating materials. But we tend to point to some successful examples of builders who have been doing it for a while particularly in Washington. And their homes are selling as soon as they start them right now. So that's a pretty compelling example of maybe ducts inside isn't to be so feared.

[1:12:00]

*David Freelove:* So a strategy that I see used not commonly in Idaho but a strategy that I see used as far as how are they bringing ducts into the thermal envelope is using crawl spaces. So they're doing a perimeter installation around the crawl space. There's a couple different ventilation methods that they use to condition those crawl spaces. Some work better than others. Another thing that I have noticed is yeah, we do consider that a conditioned space and within the thermal envelope but most typically they're still using the R6 insulated duct in those unvented crawls even though they're within the conditioned space. So that is one strategy that I see quite commonly used on single level homes here in the state of Idaho.

*Neil:* Sounds like a good training and education opportunity. Bruce I want to go back to you for a follow up question on anonymity with these projects and building departments.

[1:13:00]

So when you went back to the building department for information on a compliance path, was there any anonymity concerns or questions or sensitivities to navigate while doing that?

*Bruce Manclark:* Sometimes we are requested to fill out a document release form of some kind that said that we would keep the information confidential, x, y, z and we would sign. And we never took the plans outside of their office. And just give it a space, give us some space and we could look at the plans. And sometimes it would be contained somewhere else within the documents. By that point they knew that the anonymity wasn't going to be an issue. We weren't there to burn any builder or burn any code jurisdiction.

[1:14:00]

And quite honestly some of the jurisdictions they're remarkably honest saying we actually don't have the number of inspectors we need. I think some of them thought we might make the case to help hire another inspector to tell you the truth because they just couldn't keep up with doing thorough jobs. But they're always friendly when we went back with a specific address. Then could you do this for us please.

*Neil:* That's interesting. Good. Thanks Bruce. Let's see. Another question has come in from the audience and I think it would be great to hear each presenters perspective on this one. Did you

encounter many homes that utilized radiant heat tubes in the floor? It would seem that combined with either ductless mini splits or in places that don't need AC, ERVs could help.

*David Freelove:* I'll start off. Overall in the multiple states I've been in is it's not a very common practice.

[1:15:00]

When we would see them it would be on your more expensive custom homes that we would see the hydronic floors or any kind of radiant floor systems or even ceiling systems. I think the initial hold back on that and why it's not real prevalent in the building industry especially on an entry level housing is just how it's cost prohibitive. I mean it's a fairly expensive system upfront cost to put those systems in a home. And I think that's what scares a lot of builders away from doing that because the reality is that the cost of the house is what people look at. And I think most consumers they don't really take into consideration what the operating cost for these homes costs. They're just looking at how big of a house can I get for what price.

[1:16:00]

I know we're seeing the consumers moving different directions especially in certain regions of the country they're really moving the direction of energy efficiencies on homes. But I think that's really what's the hold back on seeing that being prevalent in the industry. So that's at least my take on it.

*Bruce Manclark:* I can go next. I'm sorry Greg. Did you want to go next? I just kind of jumped in there. Thank you. Yeah. To my knowledge we didn't have a single one in the study. But if I can sort of interpret maybe the second part of the question, we did see some efforts made with ductless heat pump homes to have the RV to distribute conditioned air throughout the house. I don't know how well their work can be pretty tricky to get that done and make the occupants comfortable.

*Greg Lasher:* In Oregon we didn't see any radiant slab heating in our study.

[1:17:00]

In my own ramblings around the state I can speak to one home, vacation home that we rented that had it. And it was kind of surprising. And agreed, the reason is it's cost prohibitive. It's also a nontraditional sequencing of subs. There's the certain amount of

planning that has to go into that. Certainly not production scale a builder is going to take that on. It makes them more money down the road. There's a certain attractiveness I think to home owners of not having the conditioned air swirling around you. But once they get their first bill in most cases it's probably a luxury that most homeowners wish they didn't have, they're paying for each month.

*Neil:* Great. Thanks.

[1:18:00]

Let's see. Next question. We just got another one in from the audience here. Did you encounter many insulated concrete form homes?

*David Freelove:* I'll start that off. A few. We occasionally see those. Very, very rare. I maybe have seen a handful of them across the country where I would primarily see ICF used if it was used would be more basements. In the Midwest through even the southern part of the country, construction is primarily done with basement. And on occasion we would see ICFUs and they were using that as sort of for their basement wall construction. But there was a few, there were a few homes that we did see with ICF on them. And actually we were quite eager to grab those homes to get those involved in the study and to see those options.

[1:19:00]

*Bruce Manclark:* Yeah. We saw zero to the best of my knowledge in the Washington study.

*Greg Lasher:* In Oregon visited 163 homes and we saw one.

*Neil:* Ok. Great. Good to hear your feedback on that. Thank you. So just want to check with the audience. We have a few minutes left. And other questions that you have for the panelists as we wrap up here? Panelists any other closing thoughts you'd like to share?

*Bruce Manclark:* Oh I'll lead off here. Yeah.

[1:20:00]

Again as sort of the old guy here on the panel and having worked with builders for gosh, something like close to 40 years now it's easy to get cynical. It's like gosh it's hard to push that rock uphill. But boy. My sort of personal takeaway from the study is that

things have gotten so much better. The builders are getting the message even if code doesn't necessarily require it. Homes have gotten tighter. The windows have gotten so much better. Insulation quality has gone up. Duct tightness has increased dramatically. So on a day to day basis it's sort of hard to see our progress. But boy, when you look at these code studies and especially you have longer than 40 years like me I think our work is making a big difference.

*David Freelove:* I guess my comment or closing comment is we're using these as compliance studies. And one of the things that I've realized over the years of doing these

[1:21:00]

I believe my very first study was the 2014 Oregon study is that enforcement equals compliance absolutely. I believe that wholeheartedly. We can write the best codes in the world but it's very evident when you go into jurisdictions and for an example they're required to be doing R20 minimum walls and we're looking at houses that have two by four construction with R13 bat in it. And the only way that happens is that the jurisdictions allow it. And so I believe that we are – I agree wholeheartedly with Bruce. We are seeing a slow steady movement in better and better construction on our homes. But I'm still a firm believer that the level of enforcement is going to always be equal to the level of compliance within any jurisdiction.

*Neil:* Well said.

[1:22:00]

*Greg Lasher:* I think that's a good point David. And I'll just sort of go on the tail end of that and say that inspectors literally have literally thousands of things to look at when they walk in a home. And I've actually sat in meetings where groups of inspectors have said, they've raised their hand and said that they've never inspected to energy efficiency code. And I think that was a while ago but it's going to take some time to move things and educate inspectors in all jurisdictions about what to actually look for. Frequently builders like to complain about inspectors that they have nearly an impossible job and of course they're going to focus first on safety. So I think there's a lot to learn there.

[1:23:00]

And the last thing I would say is boy am I glad that my study ended in the first week of February before COVID hit and not only the study out in Washington state but the staggered traits that continue to this day a little bit less so of course than in the summer. But I would have been asking for some extensions on the deadline for sure.

*David Freelove:* And just one follow up comment I'll have is I've been a building inspector in large jurisdiction with predominantly custom homes dealing with 25 inspections a day plus driving 200 miles to get that gone in 8 hours. And I am fully aware of the overwhelming sense that a building inspector has on a day to day basis to complete his inspections and do the thorough job that they all intend to do.

[1:24:00]

So by no means was I trying to blame an inspector for anything because I do know that that overwhelming sense of just trying to get it done and you're trying to get it done in the most efficient and fast manner you can. And we're humans. Things get overlooked. And I know that the other big player in that too when we're dealing with jurisdictions and level of enforcement is what is the political atmosphere within those jurisdictions as well. I'm fully aware of how that plays a role in the level of enforcement as well too. So overall I think we're doing a great job overall nationwide. But of course as with anything we do in our lives we can always do better. And we slowly move that direction and we take our baby steps and eventually get there.

*Neil:* Well said Dave. I'm going to squeeze one more question in just because I have an interest in this one also. But how often are you seeing the ERI compliance being used?

[1:25:00]

*David Freelove:* Here in Idaho we're seeing it used more and more. Across the country we're seeing I believe we're nearing or just over three million homes that have been done now in the United States. At least that's the latest I saw on the resident page. And I think that predominantly it's not being used as a compliance option in Idaho. But it's being primarily used as a marketing tool. But we're seeing more and more builders using it at least in the Boise area and the eastern Idaho area. And I think it's going to be more and more over time that we're going to see that.

*Neil:* Great. Thanks Dave. And I know that's not an option in Washington. So Bruce you probably didn't see it. Greg any thoughts from your perspective?

*Greg Lasher:* I'm unaware of any builders or jurisdictions that are utilizing that.

[1:26:00]

*Neil:* Great. Well, thanks Dave for your national perspective on that and also from Idaho. Well, thanks again panelists. Great job presenting really interesting findings that you share with the field study. You all did great work on this. We really appreciate your efforts in presenting for us today. I also want to thank the DOE and PNNL for their design, for designing this study and their support in conducting this field study. It's been a great help. With that, that is the close of the DOE webinar series here. There's been some great presentations so thank you to all the presenters and to the audience for tuning in and for giving us your feedback and answering poll questions and submitting your questions. We really appreciate your participation and attendance today. So with that I'll go ahead and just sign us off.

[1:27:00]

Thanks again you all. Happy holidays.

*Bruce Manclark:* Yeah. Thank you Neil.

*Neil:* We look forward to seeing you again soon.

*David Freelove:* Have a wonderful day guys.

*Greg Lasher:* Thanks everyone.

*Male:* This has been the national energy code 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. To participate live in our upcoming events or listen to past events on demand through our [energycodes.gov](http://energycodes.gov) training portal.

[1:28:00]

There you'll find other helpful tools and resources from education and training materials to compliance tools like our rescheck and comcheck software to the latest on state code updates to analysis of



energy code impacts from energy savings to cost effectiveness and more. Check out [energycodes.gov](http://energycodes.gov) for those and a number of other technical assistance resources from the DOE, the Pacific Northwest National Lab and others. From the DOE building energy codes program, we hope you learned something new about energy codes and enjoyed today's session. Thanks for being part of the conversation and we'll see you next time.

*[End of Audio]*