

*Erin Nobler:*

Good afternoon. My name is Erin Nobler from the National Renewable Energy Lab, and I'd like to welcome you to today's webinar, entitled "The Energy Audit Process & State Applications." We're excited to have you with us today. We'll give folks a few more minutes to call in and log on, so while we wait, I'll go over some logistics, and then we'll get going with today's webinar. I want to mention that this webinar will be recorded, and everyone today is on listen-only mode.

You have two options for how you can hear today's webinar. In the upper right corner of your screen, there's a box that says Audio Mode. This will allow you to choose whether or not you want to listen to the webinar through your computer speakers or a telephone. As a rule, if you can listen to music on your computer you should be able to hear the webinar. Select either Use Telephone, or Use Mic and Speakers. If you select Use Telephone, the box will display the telephone number and specific audio PIN you should use to dial in.

If you select Use Mic and Speakers, you might want to click on Audio Setup to test your audio. We will have a question and answer session at the end of the presentation. You can participate by submitting your questions electronically during the webinar. Please do this by going to the Questions pane in the box showing on your screen. There, you can type in any question that you have during the course of the webinar. Our speakers will address as many questions as time allows after the presentation.

Before we get started with today's presentation, I'll like to introduce Molly Lunn. Molly is a program analyst with the U.S. Department of Energy Weatherization and Intergovernmental Program. She will give you a brief description about the WIP Technical Assistance Program and other upcoming webinars in this series. Molly?

*Molly Lunn:*

Hi, everyone. Thanks for that great introduction, Erin, and thanks to all of you for joining us today. We're really pleased you could make it. As Erin said, I'm Molly Lunn with DoE State and Local Technical Assistance Program. I help coordinate that program here in WIP, and before we dive in I wanted to give you a bit of an overview, for those of you who might not be familiar with the resources we provide folks. Next slide – so TAP has been around for quite a while – about a decade – and I'm sure a number of you are familiar with it.

We're focused on providing technical assistance resources to state and local, tribal and K through 12 officials, to help you all develop

high-impact and sustainable clean energy policies, programs, and projects. We think of ourselves as really supporting one of the Department's key missions, which is taking clean energy to scale, and the way that we've done this and worked with state and local leaders has evolved over time, but this graphic right here sort of lays out our latest thinking on technical assistance, and how to help you – how to get the biggest bang for our buck, as well as yours.

So you'll see up at the top that we're focused on five priority areas. We think of these as the key areas for really getting to scale in a community. So there's strategic energy planning, program and policy design and implementation, financing strategies, data management and DM&V, and what we're really talking about here today, efficiency and renewable energy technologies, although we sort of think of this as a broader bucket in terms of just technical topics, and that audits this would fall into that general area. For each of these areas, we are developing resources, hosting peer exchange and trainings, and providing one-on-one assistance; so again, for example, today we're providing a webinar, an online training. And within that, you'll hear from Conor from the state of Colorado, who'll be presenting his experience and case studies of working with audits at the state level. And then finally, we do provide one-on-one assistance for these kinds of topics, and you can access that assistance by submitting a request online. I'll talk a little bit more about that in a moment.

Next slide, please – so just a slightly deeper dive into our efficient and renewable technologies priority area. First I wanna highlight a couple of peer exchange and training opportunities for you all to take advantage of. We've hosted several audit-related webinars in the past. Many of those are hosted on our Solution Center, which is our online portal for resources. And also the Federal Energy Management Program, FEMP, host quite a number of webinars and trainings on these topics as well, so you can access those there.

I just wanna point out that those kinds of webinars range, so there's sort of everything from the 101 basic what is an audit, to the much more detailed applications of audits. Today, we sort of think of what we're doing as hopefully a balance of both, but really focused on that state perspective – how do audits play out for state-level programs, and what are the important things you all need to know as you're working with and sorta taking the next steps with an audit?

We also have, as Erin mentioned, a number of upcoming webinars focused on technical topics and our state-specific applications, so this is a series that we've developed in collaboration with the state

energy programs. And in particular, a number of the competitive states, who have been awarded competitive awards, so these'll be webinar sessions once a month, and the next one we'll be hosting in June will be focused on deep energy retrofits. So these webinars are advertised in our Technical Assistance Program Alerts, which I'll talk about in a second, and they're also advertised online.

Again, I'll point to where you can find those in just a moment, but again, next month we'll have one on deep energy retrofits, and then we'll also be having one that's focused along \_\_\_\_ sectors. So sector-specific programs – those'll kick off in June, and the first one will be focused on school programs. So again, how states can work to support energy efficiency in their schools. Finally, in terms of peer exchange and trainings, I hope that many of you will be joining us at next week's State and Local Communities Summit. This is our national opportunity for peer exchange here in D.C. It's on May 30th and 31st. If you're not already registered, you're still welcome to do that; we'd love to have you, and you can expect to hear largely from your peers on successful strategies they've taken to pursue clean energy in their communities. In terms of resources, Lars will talk a little bit about different resources you might wanna tap into, specifically on audits, but more broadly on efficiency and renewable technologies.

The Buildings Technology Office here at DoE, as well as, again, FEMP, have some great resource libraries on efficiency-specific topics, and you can move to those from our Solution Center. Again, our Solution Center is our online portal, and this summer we'll be launching an improved portal for technology resources. Right now it's fairly bare bones, broken out by types of technologies, and later this year we'll be launching a version that is a little more hands-on in terms of walking you through resources that are specifically relevant for state and local governments.

Finally, again, we will welcome you to apply for one-on-one assistance and peer matching. We do, are focused on high-impact efforts, and it is by application, so if you go to the next slide, you'll see in the middle there, that's the address where on the web you can find your application for assistance. You can also send us an e-mail at the address below, [TechnicalAssistanceProgram@ee.doe.gov](mailto:TechnicalAssistanceProgram@ee.doe.gov). That address is where you can also request to sign up for our TAP Alerts – that's the newsletter I mentioned before.

And then, finally, you'll see the address up at the top of the Solution Center, where you'll be able to find all the resources we mentioned, past webinars, and then today's webinar in about two

weeks will be posted on the Solution Center, including the transcript and the audio. So you can find that and many more resources online. So thank you again to everyone for taking the time from your busy schedules to join us today. We hope that you will help us continue to offer resources that are really of value to you by filling out the brief survey at the end.

And then, finally, I also just want to again thank Erin from our National Renewable Energy Lab, Lars, as well as Connor – great range of expertise here for you all to hear from and learn from. So with that, I'll turn things back over to Erin.

*Erin Nobler:*

Great – thank you, Molly. Now let's go ahead and get started with today's presentation. I would like to introduce you to our first speaker, Lars Lissell. Lars is a certified building energies assessment professional through ASHRAE. He works here at the National Renewable Energy Lab, and has been involved in the auditing of over 55 buildings and campuses that include energy modeling, energy efficiency recommendations, renewable energy recommendations, and project implementation and financing recommendations.

Along with the energy assessments, Lars has developed software tools to streamline the energy assessment calculation process, and acted as a trainer to the Deployment Teams Energy Assessment Training Course, which educated over 1,100 people on the energy auditing process since 2007, when it began. Lars?

*Lars Lissell:*

Yeah, thanks, Erin, and thanks, Molly, for that information up front. It's great to be on the webinar today. I'm gonna try to give you guys a little bit of insight into the energy auditing process from actual auditors' perspectives, and hopefully some of this information will help you in your pursuit of energy audits for your facilities. So I'll just jump right into the information here. The audit process, the main objective of doing an audit is to identify those opportunities for energy efficiency, and ultimately reduce costs within a facility.

So that being the main objective, there are other objectives for an energy audit that are equally important, so in addition to just identifying those opportunities, you also wanna be able to provide that information to the owner or operator to decide which of those recommendations they can implement. So it's great to identify the opportunities, but then the next step of that is trying to implement things and get projects in the ground so you can start realizing those energy savings. The way that an energy audit typically works is there's three steps.

There's the pre-audit, there's the actual step of doing the audit, and then there's the post-audit. So pre-audit, that's mainly a data collection step, looking at historical energy use data, studying the building, looking at operating trends – just stuff that you can do before you're on-site. The actual audit step, that's when the auditor comes to your building, collects information, consults with the staff, looks at how things are operating, what kind of equipment you have.

And then identifies modifications and identifies energy conservation measures on the site to kinda start building out that plan, and populating the energy audit report that'll be delivered post-audit. So after the auditor leaves the facility, that's when they'll start running the calculations, putting together prioritized lists of recommendations, and putting together the energy audit report that'll be delivered after the calculations and everything are complete. One thing to keep in mind is that an energy audit is an energy study, so the auditor's not actually gonna fix things for you.

That's one thing that we see sometimes when we're on site is people will say, "Oh, I've got a hot or cold spot in my building. I need lights replaced; the lighting in here's not right." The energy auditor's not actually gonna do the energy efficiency measures. They're just gonna identify the measures and help you find a way to implement those measures, but not necessarily implement them himself or herself. But there are things that can be done during the energy audit, so if there's facility staff going around, they might have a box of light bulbs.

They can be making changes kind of on the fly. You know, that's perfectly fine, but the ultimate goal of the energy audit is to identify those measures and get those into the energy audit report. So for energy audits, there's certain times when you need to do energy audits, whether it's a compliance audit, or whether it's taking inventory of buildings, or inventorying equipment. There's certain times when you need to do it just for compliance, but beyond that, you wanna make sure that the energy auditing process has value.

So you can go beyond the compliance piece and actually make an energy audit a very valuable activity within a facility. So to do that, you wanna make sure you bring the right team together, which means getting the facility managers, getting the energy managers. Maybe pulling a decision-maker that has access to funding projects into the energy auditing team, a project champion, building engineer. And sometimes even pulling in like a utility representative to be on the energy auditing team; all of these.

If you can build a strong team prior to when the energy audit happens, there's gonna be more benefits from the energy audit, rather than just being able to check the box that you have done an energy audit. And then in that same vein, the things that you wanna try to do was you build that team are participate in the energy audit, so have everybody come to the kickoff meeting. Have everybody come to the close-out meeting. Circulate the first draft of the report so that everybody can take a look at it and get their input.

And then also just have brainstorm sessions; find out how can you get things implemented? How can you make that energy audit activity the most valuable activity that it can be? And then also if you have a good, strong team, it also helps with consensus-building, so making sure that the measures get implemented post-audit. One of the first steps in the energy auditing process after you've identified that an energy audit needs to be done is picking a good energy auditor. There are a lot of ways you can do this. You can look to certifications.

You can look at old audit reports that auditors have done. But basically, you wanna do some due diligence up front to ensure that you're gonna get a good energy auditor, and then in that same vein, get a good energy audit out of the process. There's a few certifications that exist for energy auditors. A real popular one is the ASHRAE BEAP, which is Building Energy Assessment Professional certification. That's an exam that ASHRAE puts on where they test some conceptual ideas, make sure that you're a competent energy auditor before you can gain that certification.

That also requires experience and also some schooling, so that's a really good one. That's the one that I did last year, and it's a very rigorous process to get selected for that, so that's something to look for. The Association of Energy Engineers also does a really good one, Certified Energy Auditor; same thing, requires experience, taking some classes, and then passing an exam, so that's another one that's widely recognized. A couple other activities you can do is asking when you're shopping around for energy auditors, just ask for a sample audit report.

See if it's high-quality, see if it's got functions in it; just basically look and make sure you'll be getting a good-quality product at the end. Also, calling references, seeing how they've done in the past; just kinda some general things to get as much information as you can about the auditor and what kind of audits they've traditionally produced. Some utilities will have a list of approved contractors. That's something that's utility by utility, but like Excel has a list of

approved energy auditors, so you can go to their web site, look at that, and find a good one.

And then also you wanna make sure that the auditor that you select is leveraging the latest auditing technology, so a product that's kinda on the market soon is a product called Simuwatt, which is basically a software-guided workflow. It kinda takes some of the transcription steps out, so that eliminates some errors in data transcription, streamlines the process. And there's also other tools – kWhOURS is another company that's produced an auditing tool. Of the different types of audits that you can get, typically they fall into one of three categories.

It'll be either ASHRAE Level 1, ASHRAE Level 2, or an ASHRAE Level 3 audit. And I don't wanna spend a ton of time talking about the different ASHRAE audit levels today. They're spelled out in great detail in the "Procedures for Commercial Building Energy Audits" publication that ASHRAE has released. That walks through exactly what's included in all of the audits, but just so it's on your radar, there are different levels of energy audits, and with those different levels, there's different levels of detail. So we'll step through those real quick now.

But first, another thing to know about is that the different levels of audits are also gonna have different costs associated with them. As you can probably imagine, a Level 1 is the least detailed audit, Level 2 is somewhere in the middle, and then Level 3 is the most detailed level of audit, so you're gonna pay more money for the most detailed energy audit, because it's gonna be more time-consuming and there are more steps in the process. These costs here – I mean this isn't a hard cost that you can expect to get every time.

But this is kind of the range that we've seen, just in the audits that we've done, and also in the audits that have come through our office. It's kind of a rule of thumb that depending on what level you select, the cost could fall somewhere in here. But these costs also do vary, depending on building complexity, how far an auditor has to travel, who the audit is for, and all of that. So real quick, let's step through these different levels of audit. Level 1 is traditionally called a walk-through audit.

And that's kind of what you get in a walk-through audit, is an auditor comes to your building, you walk through the facility. He identifies some ECMs, and then performs some analysis on those, but there's not a ton of analysis that goes beyond that. You're not gonna get the super-detailed calculations, you're not gonna get

energy models, that sort of thing. It's just kind of an initial estimate of cost and savings, and those costs and savings are typically just hand calculations – something done in an Excel spreadsheet or something like that.

You wanna do this level of audit when you're not sure if the building has high potential for savings or not, so you can maybe do this with a wide portfolio of buildings, and then use that first walk-through audit to identify which of your buildings are most high-potential for energy efficiency. Or also use that to screen for the next level of audit, so if the Level 1 audit comes back with a lot of efficiency measures, then maybe it's time to move into a Level 2 or Level 3 audit for those target facilities. This table is just an example of what you might see in a Level 1 audit.

The ECMs will be listed, just a quick description, rough energy savings calculations, cost associated with implementing that measure, and then a simple payback period – no sophisticated economic analysis or sub-metering or anything like that. A Level 2 audit goes beyond a Level 1 in that you get a more detailed survey of the building, and then a breakdown of the energy use within those buildings. So some initial energy modeling, some of the ECMs, capture the interactions between them – so like if you replace light bulbs, you're gonna also save on HVAC energy.

Some of that stuff will be included in a Level 2 audit. There should be some discussion of operations and maintenance impacts, but basically just a little bit more in-depth than your Level 1 walk-through is gonna have. You're gonna do this audit – this is kind of a standard audit for a wide array of buildings, because it's not super-detailed. It's still pretty cost-efficient. You're not gonna pay for that very in-depth analysis, but you still get a sophisticated enough analysis that you can identify bankable projects.

And this graphic here is an example of what you might see for a Level 2 audit, so just telling you instead of you're using a certain amount of energy, you should get a breakdown of well, I'm using a certain amount of energy for lighting. I'm using a certain amount of energy for equipment. I'm using a certain amount of energy for pumps. And those should be broken out. Level 3, the most detailed level of audit – this is sometimes called an investment-grade audit, or a detailed analysis of capital-intensive measures.

This is kind of the gold standard of audits. This includes everything that a Level 1 and 2 audit has, and then beyond that, there's also typically sub-metering that's done, so hooking up sub-systems to data loggers, or sub-metering buildings, and getting that

next level of detail beyond the Level 2. And then other distinguishing factors that all measures should have life cycle cost analysis done on them, so instead of just doing the simple payback, these should include net present value, operations and maintenance impacts, 25-year cash flow, that sort of thing.

And one thing to note is that the Level 3 is the most detailed, but it's also the most expensive, so you have to find that balance between detailed and how much money that you're willing to spend on an audit. If you're gonna implement measures with some sort of alternative financing mechanism, you're probably not gonna wanna do a Level 3 audit, because typically in an alternative finance scenario, whoever's financing the project is gonna do their own analysis.

So that's one of the pitfalls that we see is people spend all this money on a Level 3 audit, then they use an ESCO or something to get things implemented, and the ESCO comes in and does their own audit; just one thing to keep in mind. And then this next slide is a description of an energy model that might be performed, and some sub-metering that might be performed in conjunction with a Level 3 audit. That's what you might expect if you do a Level 3. Keep in mind, though, these are not sharp boundaries between the Level 1, 2, and 3 audit.

So there's no hard-and-fast way to say that the audit that you got is a Level 1, not a Level 2. A lot of times, it's something that's kinda negotiated by the building owner and the auditor – kind of what features they need. Audits are very customizable, so if you need some aspects of Level 2, but you don't need a full Level 2 audit, that's something you can talk about with the energy auditor. Just because you say you want a Level 2 audit, that doesn't pigeonhole you into only getting a Level 2 analysis. Maybe there's pieces of the Level 3 you want; maybe you just want a Level 1 with a couple of pieces from the Level 2.

It's kind of a gray area between those. Like I said earlier, Level 2 is pretty common, at least in the public sector. Now that we've talked about audits, what the process looks like and the different levels of audits, we'll jump back into how you step through the auditing process on a building perspective. After you have the audit completed, the next step is to validate the results of that audit and make sure that everything within the audit report is showing what's actually happening in reality.

So you wanna do some basic validation on that audit report, and again, circulate the audit report through the team, have everybody

take a look at it. But basically going down this list, there are some really easy things to do to check and make sure that you have a high-quality audit report. Just some basic sanity checks, looking for obvious mistakes – maybe there’s an extra zero on an energy savings number, or maybe there’s something in the report that’s not applicable to your particular site – going through the audit report making sure that there aren’t those obvious mistakes.

Another one is comparing EUI and savings, so for instance, if your savings they’re predicting is higher than your energy consumption, you know that there’s a problem with that calculation. So that’s the type of thing you would address with the energy auditor in the comment period. Also, just doing a basic copy edit on the report – seeing if there’s spelling errors, duplicate numbers, a table that hasn’t been updated, that sort of thing. And then also looking for things like the cost, like do they have sources for the costs of implementation?

Has the material and the labor been split out separately so you can get an idea, and have they included a contingency in that so you’re not gonna try to implement the measure and realize the costs are way off? Those sort of things are really good to check for. And also a building description, so typically the people in the buildings know the building a lot better than the auditor does, so make sure they’ve got thorough descriptions in there, existing conditions, number of components. All that information should be included in your audit report.

And again, energy savings – just make sure the numbers are reasonable. Make sure the breakdowns seem reasonable by system. Make sure that the energy savings interactions are captured – those sorts of things. And this is all stuff that’s definitely good to ask the auditor about, so if they don’t have these specifically spelled out, call them up and say, “Have you captured all of these things?” Just doing the validation; it’s not gonna offend them if you call and ask them questions about their audit. That’s just part of the process.

And then also utility bill analysis – have they accurately catalogued how much energy your currently using? And make sure that they’ve got your actual rates in there. Blended rates are fine, but if you have the actual time-of-use rates, demand rates, those sorts of things should all be captured. Then also verifying the assumptions that the auditor used – there should be a list of assumptions after every measure; just make sure that those assumptions seem reasonable.

If they're assuming 100 percent savings, or even a 50 percent savings on something, kind of across the board, that's something you might want to bring up and ask them where that assumption came from, and that sort of thing. Then also if they did life cycle costing, check on the discount rates, escalation rates. That's typically something that varies organization by organization, but making sure those actually match the discount rates and the escalation rates for your particular location and organization. That's a good thing to check.

And also equipment life, so does the analysis that they ran, are those realistic lifetimes for those particular components? A couple of rules of thumb here – 25 years is a life cycle that you'd run for renewable energy, 15 years for HVAC, and 10 for lighting. Those are just kind of standard equipment lifetimes that should be included in the life cycle costs analysis. And then go through the list of ECMs one time. Compare them with the list of ECMs that you wrote down during the audit, or during the audit close-out meeting.

Make sure that everything that was identified during the site visit is included in the audit report. And one thing to keep in mind when you're validating these audit reports is you don't need to be an engineer to do these reviews. This is something that anybody can do. Some of the stuff is a little bit more involved, like the life cycle costing pieces, and maybe the energy savings pieces, but anybody can go through a report and do some basic QA on the measures. So don't be afraid to just roll up your sleeves, dig in, and make sure that you've got a good audit report, and that everything's been validated in there.

The next thing I wanna talk about is the post-audit, so what do you do after you actually have the audit report, and you've validated it, you've had people review it – what's next after that? So typically where you'll be is you'll have a list of projects, and you wanna find a way to get those projects implemented, because that's the main reason to do an audit is to get things done after you have successfully gotten a good audit report. So what you wanna do next is what I've laid out here on this slide. Prioritize that list of projects that you have.

Look for funding from within the organization, and check for incentives or utility programs that offer grants, rebates, or general money that you can bring into the project. If there's not money to do projects in-house, then identify alternative finance options. So we'll just step through these four steps in the next couple of slides here. The first step, prioritize projects – so when that audit report

comes back to you, you'll have a list of a bunch of projects in there, so at that point you'll have to take those projects and figure out how to prioritize them.

Typically, what you wanna do is you can see on this chart that you've got things like O&M improvements, energy awareness, load management – those things on the left-hand side of the diagram, that are low-cost/no-cost options. Then as you move to the right there'll be things that are more expensive – the capital measures, the retrofits, replacing equipment, that sort of thing. So taking that list, chopping it up into doing the no-cost/low-cost stuff first, and then moving into the more capital improvements is typically how you wanna prioritize those, and especially for the no-cost stuff.

If there's stuff that you can do that's not gonna cost you anything, attack that stuff first and start implementing right away. There might be other priorities within an organization, like maybe you wanna prioritize projects based on internal rate of return, or simple payback period, or something like that. Just find a way to prioritize those projects, and then give yourself a prioritized list so that you know what stuff to approach first. Then once you have your prioritized list, then it's time to look for ways to fund that project.

So there's a bunch of ways that you can fund projects, both internally and externally. But I've listed out a few ways here – allocated funding, looking for special energy funds. Maybe there's a pot of money that's been set aside within an organization; could be something that comes out of an Operations & Maintenance budget. Your O&M guys aren't gonna wanna hear that, but potentially there might be some money there. Also dedicated facilities improvement funds; maybe there's money that's been set aside to improve the facilities year after year.

There's a bunch of different ways. Grant programs, bond programs, you can work with your utility to do demand response – there's all sorts of things. And also leasing and lease purchase programs, that's another thing – leasing equipment and then paying it back, which is kind of an alternative financing mechanism. But yeah, basically you just wanna look at every possible source of funding, any way that you can get the project implemented. That's money in the bank. The next step is to look for incentives.

So a good place to start looking for incentives is a web site called DSIREUSA.org, and this is a really good database of incentives. It's got renewable energy incentives. It's also got energy

efficiency incentives. They list them all by state, and then when you get to the state level you can look utility by utility, so this is a great place to go and just look for additional money streams that you can pull into the projects. So you can use this to boost allocated funding, or maybe even use this as the primary source to get projects implemented.

Depending on where you're at, incentives vary widely, but some places – in particular the Pacific Northwest – there are incentives that can cover a good portion of efficiency and renewable energy projects. So it's always good to check out those incentives. And then the final step is to investigate alternative finance options, so there are a lot of different alternative finance options out there. ESPCs, UESCs, PPAs, Enhanced Use Leases – the list goes on and on. But the reason I have this fourth step is because it's kinda like anything – why finance a car if you can pay for it up front?

But if you need a car, you can use the alternative finance mechanisms to get it, to finance it. This is kind of that last step in trying to implement projects is go after those alternative finance options. A lot of times they can offer either cost-neutral or even cost-negative options for getting your projects implemented. So we've talked about a lot of stuff in these last few minutes. I wanted to put together this energy audit checklist so that after this webinar's done, there'll be a resource that you can look at and go back to as you move through the energy auditing process.

It's a complicated process, but if you follow the steps that we've talked about, it's very possible to have a successful audit and then to move past that and get projects implemented. The last bullet point on this checklist is tell everyone what you did, so after you're through the audit process, after you've implemented measures, that's when you really wanna showcase the effort and tell people what you did. Show your management how much money you're saving them, and how much energy you're saving them, and just gain a little bit of exposure for your program.

That can almost be the foundation for an energy awareness program. If you're telling people what you did, then they'll think about energy a little bit more, so that's where I'll leave you today. There's a couple of resources here that I put down on this resources slide that are just great for finding more information about this topic, as well as many other topics. So the FEMP web site is a great resource. There's other TAP webinars that are coming up, and also that have been done previously, on the TAP web site.

You can see there FEMP does First Thursday Seminars that are really good. Typically, they cover all different sorts of energy topics. NREL also does an Energy Assessment Training Tool, so if there's any sort of program or anyone on the phone that's trying to build a program, this is a course that we offer here where we teach people how to do energy audit trainings. And then I mentioned Simuwatt Audit in the slides as an auditing tool that's coming on the market soon for streamlining these auditing processes, so check that out.

So I guess we're holding questions till the end, but I will turn this back over to Erin.

*Erin Nobler:*

Great, thank you so much. Now I will go ahead and pass it on to our second speaker, Conor Merrigan. Conor is the principal of a small consulting firm specializing in community-scale sustainability, project management, and energy efficiency sector advancement. Prior to launching his consulting practice, Conor was Senior Manager of Commercial and Public Efficiency at the Governor's Energy Office in Colorado, where he managed a variety of energy efficiency and high-performance building programs. Conor?

*Conor Merrigan:*

All right, thank you very much, Erin; I appreciate the opportunity. And thank you all for being here today. Hopefully I can give you a slice into the life of how these energy audits can actually be used in your state programs. I put a title on here of "Lessons Learned, Successes, and Examples;" that is roughly what I'm going to cover. Please do continue to type in your questions, and I will answer as many of them as I can.

To give you a little bit of background, I came on board at the Governor's Energy Office in Colorado about the same time that the American Recovery and Reinvestment Act funding actually came through. I'm a venture many of you were aware of; we were sort of caught in that paradigm as the former director there, he did this much better than I could ever do it, but he could do a very great caricature of the sort of DoE process of, "Okay, the funding's here – now go. Now stop. Now go, go, go – stop," which doesn't do it justice in any way, shape, or form.

But those of you that have been through the hazing and the fire of the ARRA period, you know exactly what I'm talking about, so I am speaking from that experience. And I just wanna share some of the lessons that I've learned through that period. It was an incredibly exciting time; obviously, there was more funding available than at any other time in the office's history, and possibly

more still than will ever be again, so we were able to do some extraordinary things. And I'm gonna talk about a few of those, and specifically about how the role of energy audits came into play in that situation.

The basic tenet here, I think, of audits is summed up in this old adage. This is actually the oldest of the old adages that I could find, rather than the simple, "You cannot manage what you cannot measure," this is the original attribution that I can find of meager and unsatisfactory knowledge if you can't measure it, from a Lord Kelvin. The point here is that this auditing process is only as useful as you can make it at the end of the day. And what I'm showing at the cut-out is a page from the final Measurement and Verification Report from all of the ARRA energy savings.

Which was an effort that I oversaw and really, was very enlightening in terms of how the programs could've been designed better – how they were designed. How the audits themselves could be designed to create better efficiencies, so that at the end of the day, you as the program manager, or in the state Energy Office – whatever position that you hold of being on this webinar – can tell the story in the right way. And so I've really come up with a very strong, strategic focus on designing programs the right way up front.

And it was this experience that really led to that becoming the case. So, just a few big-picture items that I wanted to cover that are really critical to designing an audit program, or a program that's using audits, especially at the state level. That note which I already sounded, that design to verify from the first slide, really is quite critical. When you're looking at how are these audits gonna be implemented, and how is this program gonna be implemented, if you're not thinking about how that's going to be validated, how that's going to be verified at the end, how that's going to be able to be told as the story, you're gonna have problems.

And that's something that a few of the departments, the programs in our office learned a bit of the hard way, but at the end of the day, this is just something to keep in mind from the front end when designing these programs. You really are gonna have to think about how you're gonna verify that, and I'll get into that a little bit with a couple of the case studies. The strategic implementation is very similar. The only difference I see in implementing strategically is using audits when they're needed; so, not when they're not, and using them when they are, to what level.

Lars talked about 1, 2, 3; certainly there's some cases where you do need audits. There's other cases where you really don't. I'll illustrate that a little bit with one of the case studies. Requiring stakeholder resources – as a state agency, when I was working at the Governor's Energy Office there was sort of a tendency – and I think this holds true in utilities as well – to offer things for free. So here, without requiring as much skin in the game, so to speak, from stakeholders, we have found repeatedly that it does not get the kind of results that we would like to see – the kind of realization rates, et cetera.

So I am a strong proponent – so much so that I think it's important to put in that the basics of an audit is required there to be some sort of skin in the game, from whoever is using the resources of having the audits. And then finally, local partners serve a multitude of benefits, from creating local jobs to being able to open gateways and get to people that otherwise wouldn't be able to. The importance of partnering locally is reinforced dramatically in a number of the ARRA-funded programs that we had at the Governor's Energy Office.

And I would just say those three big steps, if those are all encapsulated in your program, it should lead to success. I did wanna sort of go from the design to actually using audits. There is what I think Lars struck on really well is validating the methodology, the data that's used, and whether that's doing it yourself, as I think is certainly a very valid means, someone else in your office, or even a paid consultant in certain circumstances, it's an important thing to do.

A lot of times I think that can be done a bit on the front end by making sure that the contractors are vetted and you have documentation of the work they do, but certainly it is an important step. As well, having an audit report without a “what to do next” is really, in my mind, not useless, but certainly not nearly as useful as it needs to be. So make sure that all the reports are set up from day one to say, “Here's exactly what you do next.” Preferably, it's in the electronic format with a hyperlink; without electronic format, exactly the phone number to call.

I think in order to get those realization rates up, what's been found in programs across the country is that you really need to have sort of the approach of providing as many options for people to implement as possible. The third bullet on here, summarize and simplify, this just gets to the fact that some of these items can be very technical in nature.

And I always make sure that there is a very short and succinct up-front summary on all of these audit reports that are being utilized in the programs that I was overseeing, just to make sure that that information is communicated effectively to the recipients. And then integrating, leveraging, and sharing – this is just a note that any time there's an energy audit, that's a huge opportunity.

Whether it's for building staff, whether it's for making partners with historical preservation folks and having them come along on the assessment, or doing their assessments at the same time – which is something we tried out a little bit in Colorado. Any time that's happening, make sure that you look at that as an opportunity, whether it's bringing staff from your departments along – it's an amazing thing to be part of, and a good way to get out in the field. I did wanna hit a few of the common audit issues before I jump into the case studies.

These are things that I've seen. I believe they're fairly widespread. The lack of coordination with building staff and users – many times folks can show up and not have everything coordinated. That's just a waste of time. We really wanna make sure that whoever is behind the audit, not only are they on the ball, but the people that they are supposed to be meeting. I don't think that the list that Lars presented with maybe seven people on it – I don't think I've ever been to an energy audit with all seven of them there.

But I've been to far too many of them, or heard of far too many of them, more accurately, where there's only two out of the seven. And you wanna get as many folks there as practical. Again, that goes to that leveraging point, but really, just the coordination piece is actually pretty critical. Lars mentioned that even in a Level 2, there is some accounting for synergistic effects, using the example of de-lamping or putting in a light bulb that has less heat, gives off less heat, and therefore requires less cooling energy from the HVAC system.

This is something you look for, because there are a lot of times where these measures, these ECMs, are accounted for individually, and their synergistic effects on each other are completely left out. So make sure that it's a good question to ask, and depending on who your auditor is, you will get a different answer. Sometimes the energy bill analysis is not completed – that pre-audit. I've seen a number of times the folks show up, and getting that information from the client, from the municipality, you all probably have some experience.

A lot of times, these are handled in your accounting department, and they might be paid automatically, and you might have to go through several steps of procurement to actually get the type of information that you need from these bills. And it's a good thing to start early because this just takes a lot of time, so on all your energy auditing programs, make sure that the energy bill analysis is an up-the-bucker on that, so that that information can get to the auditor, because it really does help with that walk-through.

And then finally, the lack of energy balance diagrams or explanations, and this is really just to say that of that pie that Lars presented, 100 percent of the energy should be accounted for, gas and electric. And typically, don't be surprised by seeing a pretty large chunk defined as other, which is just the information that they cannot find, they can't determine. It's hard to capture everything, especially in a Level 1 or even a Level 2 energy audit. But there should be something that'll give you a picture of how much is that other?

I mean if they have 50 percent listed as other, that audit probably wasn't as good as it should've been. Okay, so I'm gonna jump right into a couple of case studies. This first one is on the small commercial side. This is something that we instituted at the Colorado Governor's Energy Office with stimulus funds – the Main Street Efficiency Initiative. And this program really recognized an underserved market – one where the margins are a little too tight for the big players, some of the energy service companies, the ESCOs.

And not really as almost institutionalized as some of the residential-size auditing processes are, to not only make the audits, but then make the improvements. So the goal was to assist – I'm not gonna necessarily read these. But essentially it was creating jobs and saving energy, and that's what we did. Here are just some basic program parameters around this. There's the timeline. It was pretty quick, once we actually got going after the DoE said, "Go," we decided to make it happen, and there was a very short program development window at that point.

And then we launched and went ahead, and finished up within a year, so we were actually ahead of our reporting deadlines through ARRA. This is a very successful program on many, many levels, including being quick launch, boots on the ground, as they like to say, and having solid metrics that were able to be reported ahead of time. So this is something that I'm really proud of, although full disclosure, I'm not the one who initiated it; I'm just the one that

ran it once it got started. So we had four program types – this is more just to sorta share my experience.

It was very complex funding sources. Everything had different funding sources, and there were these four different programs, so it ended up being an incredible complexity to manage. So I would definitely recommend simplifying such a thing, were someone to do it again, but because of the different funding sources, we had to manage it this way and we simplified to the extent possible, but it was very difficult to manage. Program message – so this is – I talked at the very beginning about being able to tell the story with an audit, and being able to tell the story with energy efficiency.

This is just a very simple graphic which encapsulates what the message was in this particular instance with the Main Street program. So there was much more behind it, but I'm gonna get into just a little bit more depth of what's there. But at the end of the day, this is what we were communicating to all the communities in Colorado. It was really aimed at Main Street, Colorado – small communities that don't typically have access to resources – and at the end of the day, we have the term that we like to think we've coined of the new energy economy.

And this is really how we get there. So the MSEI in a Box is sort of the basic, underlying foundation for this program, and so it is the road map. The document also provides some resources to assist both businesses as well as the local community partners manage the program. And the point is, is that it is a comprehensive training for all aspects of energy management – actually, which reminds me that there's a question up here that notes that the CEM is a certification offered by the Association of Energy Engineers.

That is just side note is a fantastic, overview, comprehensive energy management certification, if you wanna go. It goes much deeper than their CEA, which is really focused in on auditing – well, not deeper – it goes sort of much wider, I should say, and covers all aspects of comprehensive energy management. It's a certification that I hold, and I would certainly recommend it for anyone interested in getting deep in this topic, and certainly knowing more than enough to be dangerous. So there's the box – these seven parameters were included in each one of those four types of program.

And the way that we essentially approached all the stakeholders that were interested is that you don't get any money unless you include all seven of these. So these seven pieces of the box, or

things that are inside the box, are really the basic components of an energy management program. I'm not gonna go through them all, necessarily; we're gonna focus more on that step number 4, the facility assessment, for this particular presentation. But this is really setting up these programs for success, and all of these are things that supplement the energy assessment.

You have to have that project financing. You have to have, ideally, that measurement and verification to make sure that they're actually working well – the things that you install as you got through the audits are actually working, and then you can re-tune them if they're not. So the audits, specifically, for the Main Street Efficiency Initiative, ranged from just a rebate application, which in some cases was a form that you would fill out on investment-grade audits. And that rebate application, it's just worth mentioning, it goes back to strategic implementation.

We determined that for these small businesses, we knew, based on our experience, based on the opinion of some of the consultants we had hired, et cetera, that if we were to offer rebates for programmable thermostats, re-commissioning of your HVAC system, those are the type of things that every business that's gonna enter this program needs, and you really don't need to go through a walk-through audit to determine that. All you need to do in that case is fill out a rebate application saying "I don't have a programmable thermostat" or "I just wanna have this HVAC commissioning," and we know that that's gonna save energy.

So in that case, the audit, so to speak, was just saying what you had. But then again, it also went all the way up to an actual investment-grade auditor, too, where companies that were really interested in going as deep as they possibly could wanted to get the payback figures. And there were some rebated offered for those, although not at the depth that would cover it if they weren't highly motivated. So the audits were also customized by program and need – I think that's probably a duplicate point at this point. They were selectively verified and audited.

We had a third party to the third party who would come in and check out whether the procedures were done correctly, and that the numbers were accurate, that kind of thing – all the things that Lars talked about in the verification side. And finally, there's a high realization rate, but this is one I'm gonna sorta hit on a little bit, because I'm not sure exactly what it was, which is really frustrating when you're trying to tell the story. So here are the results, and we have pretty solid results.

And if you look at it, the thing you'll notice is that these numbers can be manipulated to form other numbers that all tell really good stories. And at the end of the day, what we did with the local partners – there were 30 different communities. Most of these were municipalities, in forms of counties or locals, and there were also a number of energy efficiency organizations – probably a lot of the folks that are on this call – that type of background. We had good job numbers, contractors, all local, all across Colorado outside of the Denver metro area, which is where most of these resources tend to concentrate.

There were a fantastic amount – I mean an annual savings of \$800,000.00 makes a pretty big difference to Main Street America, especially where these folks were. 819 business that were engaged – by engaged, in this case I mean went all the way through the process. So we have about 5 million square feet affected, therms, which are 1,000 KBTUs, so 100,000 BTUs – we saved a number of those with natural gas improvements, and of course the electricity savings. Those are all substantial, for about a 15 percent average energy reduction per business owner.

So these are all big numbers to tell a really good story because of the way that the program was designed. It goes back to what is the auditor being asked to collect? What are the implementers being asked to correct? And with this strategic few, we were able to spin – that's funny – a number of good stories were able to come out of this that we were able to present to the community, and even to DoE, as far as a good use of funding. And of course, that 15 percent is one of the big numbers.

Also, as you could see, you could manipulate this with a little bit of math and come up with a KBTU per square foot reduction as well, for energy use intensity kind of thing. The one thing I don't have on here is how many businesses started, or this is 819 of how many actually implemented, and so that was a mistake on my part, to not be able to get sort of the full realization rate, which is a big deal when you're talking about energy audits, and something that is important for everybody to keep in mind.

On a national scale, that's really the standard of how many audits vs. how many people actually did something is how program successes are measured. So that realization rate unfortunately wasn't fully captured here, although I can sort of get to it. I didn't wanna put it in because it wasn't totally accurate. It's something to keep in mind as you do your programs that if you're only gonna track a few metrics, track people who did something, and that's with follow-up calls or surveys or whatnot.

Build that one in the program so you can figure out whether these are actually being successful or not. And track both how much the total energy [audio glitch] recommended vs. what they did, if possible, so you can sorta see a percentage of things recommended to what's actually happening. All of these will help tell the story so you can continue to receive funding year after year. So big lessons learned here – to question assumptions – in a couple of the programs we were working with – I mentioned there were four of them – we assumed that energy savings explicitly were being tracked.

But because this was rebate dollars, and we were partnering with a number of different entities, it turned out I found out a good deal into the program that the actual energy savings were not being tracked. So don't always assume that everybody thinks about these things in the same way you do. Make sure that your basic assumptions are spelled out to every vendor, every entity that you're working with. Money talks; matched money talks louder. I already mentioned that we had a – as you can see from the last slide, we had a great deal.

We had a total \$4 million or so invested, and about \$1.8 of that was our rebate dollars. So there was a good amount of money that came out from our partners there. The market for small commercial retrofits is still underserved, and I think that's an accurate statement nationwide, and I think that's just something to pay attention to. It's hard. The margins are low, and there's difficult entry, and getting people who have those skills out to the places that need them is often difficult. We've certainly been seeing a rise in the folks being trained as small commercial auditors.

Here in Colorado, at least, and I'm sure nationwide with all the green jobs work. But it's still a market that could use some help to mature. Simpler et cetera – I don't need to spend time on that one – and I did say that as the bottom, I think I've already said that the auditing expertise is becoming more common, so. On the large commercial side, this is another program I was managing for the state. It's the Energy Performance Contracting – we use EPC other than ESPC – it's the same thing.

The issue, the challenge here was making sure that the technical energy are these investment-grade, sort of Level 3 audits, and that they're being utilized in the most effective and fair means possible. I'll get into that a little bit as I go on here. But also, the role of the state in this case was really to provide that third-party solution with both the public entities on the one side and the energy service

companies on the other side. And so we were really in that case the only ones in a position to do this.

So, just a basic primer on energy performance contracting, before I get started – I'll let you read the words – I'll focus on the diagram here. The essential idea is that if you have a before-pie with the energy costs, through financing the energy savings you'll pay less money to your utility company and less money in maintenance, and that will, for the first typically around 15 years is about the average term on one of these things, will be paid directly to the financing organization – maybe the ESCO – will be paid back out of those utility costs, so theoretically, it's off-balance sheet.

There's a lot of nuance there we could get into another time about lease/purchase, and we have TABOR here in Colorado, and all sorts of things. But essentially, and then after that 15-year period of the loan, all those savings that are remaining at that point accrue to the entity that has got the improvements in the first place. Energy performance contracting – I could go on and on and on. I've been told I should not go on and on and on. I think it's an amazing thing.

And I am gonna make sure to hit one highlight towards the end of this, assuming I have time, that is sort of the drum that I consistently beat, but I'm gonna skip that for now. So here's what we do in Colorado. I should just note that currently the name of the office has been changed to the CEO, the Colorado Energy Office, but because when I was there it was the GEO, I'm gonna continue to use that term. We would prequalify the ESCOs. We had 14 when I was there; we have at least 18 now, and that ensured the highest level of quality.

And then every few years we'd have a totally open RFP, but we would review them on an annual basis and make sure that they're meeting our expectations, and then that would be that. So we also had a set of standardized processes and procedures, standardized contract documents to make this much easier and clearer for everyone. The ESCOs are under contract with GEO to use the GEO contracts, and then the ongoing guidance and support was provided in the form of technical assistance.

In our case, it was by a third party, unlike, say, the state of Washington, which has all that in-house. We contracted with a couple of vendors to provide that ongoing, continuing support and technical assistance, and it was incredibly valuable. Providing technical reviews of deliverables was sort of their primary function. So the EPCs and the TEAs – the problems with technical

energy audits before we addressed the issue is ultimately one of the complexity of the energy performance contracting and the technical energy auditing process.

Explaining this, even to a skilled energy manager, can sometimes be a very difficult chore. And when you're going out to a rural school district, where you may have a facilities manager who's also the principal, it's incredibly easy for – typically, I like to say through no fault of their own. But for an ESCO to miscommunicate something or something to be missed in the process of communicating about the energy audit, or the performance contract, that can lead to bad blood down the road.

And that's been the case in many, many states; has led to many, many states setting up some sort of similar program to Colorado, where we play that third-party role just to make sure everything is communicated effectively, and standardize things. With the TEAs, specifically, what the common – one of the common factors is that these are very detailed. And I think largely it's the number of 26 cents to 70 cents a square foot of energy audits were being offered for no cost, or for a really minimal cost, and offered as loss leaders so these companies could then come in and hopefully get the work.

And what was happening is that these municipalities and schools and whatnot, different public agencies, would essentially be jumping on these low-cost bandwagons. And because this is such a highly technical, and really the cost, compared to the amount of the EPC, which is millions and millions compared to maybe 100,000 for the TEA – it wasn't as much of a big deal. But they would jump on that first number, and there were a number of companies exploiting that who were not necessarily held to very high standards, holding them to very high standards.

And it's just a bad situation, especially since these are such long-term financing deals, and the buildings go on forever. So that was a lack of standards and uniformity as to a TEA. What is a TEA? Is it a Level 2-1/2? Is it a Level 3.5? There was no sort of standards around what a TEA was; each company was just peddling whatever they wanted to. And so ultimately it was just muddying the water. It made for a very confusing situation out there in the state, and it just was not effective.

So there was a decision made to get some performance contracting legislation passed that would enable the state to play a role; especially for state buildings, but also for other public facilities. So solution – what we did is we engaged the stakeholders. In this case, the stakeholders were actually going directly to the ESCOs as

well as to the municipalities that had been through this process, some of the subcontractors, et cetera. We have a very strong relationship with our ESCOs here in the state of Colorado, and quarterly meetings and such, typically.

So we were able to engage them effectively and find out what they would like to do about this TEA pricing question, as well as from the state side, and try to come up with a fair solution. We looked at the data, took a hard look at what the audits actually were costing, what they could look like. We defined the standards and said, "Well, this is what it's going to be." And at the end of the day, after getting all of that input, required accountability around that, meaning that if the ESCOs were not following this policy, then they could eventually face being asked to leave the GEO program, which is really not a good thing if you want business in Colorado.

And then we would also make sure to revisit that as needed. And so at the end of the day, what we did in Colorado is came up with a fixed cost for these technical energy audits. And that was actually the way that it was worked out was so that it wouldn't be as much as they wanted, but it was the full cost, perhaps, of these technical energy audits. But it would be enough so that the municipalities had to think twice before walking away from it, and I don't know actually if I included that or not.

But that's a really key point, is that the technical energy audit is paid for whether the EPC moves forward or not. So rather than wrapping everything in – well, if they move forward with it, then it's actually wrapped into the finance cost of the energy performance contract. But if they decide to get the TEA and then say, "Sayonara," which used to happen quite a lot as well – in that case the ESCO's getting burned, if you will – then they still have to pay for it. And it's a reasonable amount; the ESCOs feel somewhat justified in that cost.

We base it on the distance for them. As Lars mentioned, one of the costs is just getting there, and the amount ranges between 20 and 30 cents a square foot, depending on a straight calculation from how far they are from Denver. In this case, actually we were arrogant enough to use the office building that we worked in as the central point, so – it didn't really matter, but that's always our instant fun trivia for state energy program geeks. Anyway – and that TEA is reviewed and included as a part of the final EPC, and the TEAs are reviewed for consistency and accuracy.

This is probably the most – well, there's two really critical items that we did, we provided as technical assistance in Colorado. One is review and then validation of that TEA. Every time, we have some comments. I mean sometimes they're very minor in nature, but there were always things that helped to make them stronger. And then the other one is looking over the final EPC to make sure everybody understands what's in there and what's not, et cetera – it's really critical for making sure that these are carried through the way they're intended to.

And just a couple results – we averaged about \$30-\$40 million in total statewide construction activity annually here in Colorado, and the program has been recognized as both an early adopter and national leader, so we've done pretty well for ourselves in that regards. A couple of lessons learned – I'm almost done – playing outside of the system can only be limited, and not eliminated. There's certainly those that come into Colorado, and they don't have to be one of our pre-approved ESCOs, so it does happen.

And there are certainly even our pre-approved ESCOs sometimes will try to cross that line a little bit of offering these audits for a discount. And certainly there's a difference between what is a technical energy audit and what is just a walk-through audit, and can they provide the walk-through audit for free – which we typically allow some sort of just very initial audit for free, so that can still happen. But you just have to know that you can't – in this case, we didn't have the regulatory authority to make sure that it wouldn't happen.

The market appreciates certainty. It's certainly seen a significant growth period in Colorado as a result of the state stepping in and providing that third-party technical assistance. We take a lot of credit, and I actually believe rightly so, although the program, again, this is one that predates me. I was only there for a couple of years. But it's really increased the amount of facilities retrofitted statewide, and has a pretty significant impact in terms of carbon and energy savings – water savings, for that matter. Better audits really do lead to better projects.

It's really important to recognize that the TEAs that are completed and validated will lead to better projects in the end, and more comprehensible, and everybody's happier, which we always like to see. And then the next one gets a little too detailed for me to spend much time on; it's just sort of a program point. So finally, some of the takeaways and conclusions – as Lars mentioned, energy audits don't do anything, but they do have a great impact on how things are done, so that should be obvious, but I feel it's worth restating.

Consistent standards equal consistent results. This is true in both the actual audits as well as the measurement and verification protocols, which we in Colorado came up with pretty closely following the international measurement and verification protocols, slightly tweaked for Colorado. These consistent standards for a massive program like this just make it – you’re gonna hear some griping and moaning about trying to fit their model into a Colorado model, or whatever state you’re in. But at the end of the day, it just makes life easier.

And they’re willing to do it because they’re still making lots of money off the business projects. My key point, storytelling data, whether from the audit or otherwise, should generally be tracked, and be thought about strategically from the beginning. What information do we want to get at the end of this that is going to tell our story to DoE, to the public, to whoever it is that you’re trying to tell? And really think about that on the front end, and I think that includes really getting the right balance of information.

So if you have more information than you need, most of the time, that’s a good thing, as long as it doesn’t take too much effort and cost too much to get it. If they’re already there and they’re already tracking something, and there’s a question of, “Hey, do you guys really need this,” in that case, specifically, I like to use the answer of “yes.” And then you can see later on whether it actually helps. But if there’s extra effort, then you’ve really gotta think strategically about it.

Not leveraging energy audits is a missed opportunity – I can’t stress enough that they’re really a fantastic thing just for energy staff to ride along with. Anybody that has the time to take out of their day, you will learn things, and you’ll get out, and that’s always a good thing, too. And then to be useful, they must be comprehensive. I think just sort of if you call a lighting company and they come in and give you a lighting audit, that’s helpful. But I guess I shouldn’t say to be useful, but to be very useful.

In that case, a lighting audit might help you figure out what to de-lamp, and what ballast, and how to do that, but they won’t look at the overall effects on, say, the age factor. Oh, I got more of these – great. The energy auditing business is a tough one. From a business standpoint, it’s really tough, with the tight margins and the amount of time and effort to go into putting these things together. So just auditing on your own, especially if it’s not coupled with the improvements – which in most cases it’s not, although there’s a lot of people that are doing both now – it’s just be aware that it’s a tough market.

And there is a need for continued third-party verification. There's a lot of standards, RESNET standards, and on the residential side there's ASHRAE standards; making sure the people are adhering to this is important. And then finally, programs that foster the growth of energy audits – I can't really read what that says – consider total demand and – okay, it's a very important point. Read it. I'm sure it's incredibly important, thoughtful, et cetera. I can't quite read it; the screen's a little black here. So thank you very much.

We're gonna leave it on this. The one point, actually, before I get too commercial here – the one point I wanted to make is earlier that I think is really critical as well is with regards to deep energy retrofits. And there is a tendency with these audits to go after just those no- and low-cost measures. And if you're thinking about it from a comprehensive energy solution, especially when you're thinking about it from a financial standpoint, you could be having a significantly missed opportunity there.

The way that for example the energy performance contracting model works is that it takes one of those quick-payback measures – say a lighting retrofit, with a 1.1 year payback – and it uses that to leverage some of the measures that you just wouldn't be able to do anyway. The boiler replacement that may be a 20-year payback – and you bundle those together so you get an average of say, I don't know, a 12-year payback. So just think about – I wanna redo that concept, because I think it's really critical that sure, the low-cost measures are great.

Sure, definitely the no-cost measures are great. The low-cost measures, before going after them, you wanna take a comprehensive and strategic look to see if those can leverage some of the other energy measures that will get you deeper, that you won't be able to do without that leverage. So that's my final slide. We'll take some questions. This is the company I work at now. Please feel free to reach out and get in touch with me. I love talking shop, so let's see what we've got for questions.

Oh, there we go – okay. Standard work spec agents – I'm not – is that familiar to you, Lars?

*Lars Lisell:*

I am not familiar with that either.

*Conor Merrigan:*

Michael, please feel free to follow up with us. I can certainly look into that. I'm not sure how you – I don't know about the standard work specifications. I think it's a great question. I'm not sure if your question is relating to whether they have standard work

specifications for audits, or whether it's more general. If you could maybe follow up, we could research that and get back to you.

*Molly Lunn:* Hi guys, this is Molly Lunn from DoE, and the Standard Work Specifications are an initiative out of DoE, from our office, in fact. And again, if there's a – I'm happy to follow up with any specific questions, but there are in fact – auditors are one of the pieces of the Standard Work Specifications. So that certainly is a resource, if that's the question. And again, I'm happy to follow up with additional questions.

*Conor Merrigan:* Okay, we asked the right question at the right time, Michael. Let's see.

*Lars Lisell:* There's one easy one here – where are the slides from today's presentation going to be posted? Erin, do you know how to answer those?

*Erin Nobler:* Yes, those will be on the Solutions Center web page – the Department of Energy's Web Technical Assistance Program Solution Center web page that you saw the URL for a little bit earlier in the slides, when Molly was presenting. We will make sure that those are posted in upcoming weeks.

*Lars Lisell:* Okay. And then there's another question – this one's from Kevin Hamlin. It says, "Can you provide specific examples of documented energy savings after measures were installed – case studies, for example?" And the answer to that is "yes." There are a ton of different case studies of energy efficiency measures, post-energy audit savings, you know, all of that stuff. A good resource for that is FEMP web site; if you go to the FEMP web site and go to – I'm not sure exactly where it would be.

But if you search case studies on the FEMP web site, there should be a ton of information there. And also if you go to the NREL web site, NREL.gov, and search the publications database, there'll also be a bunch of examples there.

*Conor Merrigan:* There's a question here about – I think it's directed to me, from Cameron Carey – can your standardized processing contract documents be made available to us? Absolutely. These I think are one of the strongest resources that we make available to other state energy programs. This is something we've spent a lot of blood, sweat, and tears developing, so if you can leverage this and use them as templates, please do.

Those are available on the [www.colorado.gov/energy](http://www.colorado.gov/energy) home page, and then just go to Energy Efficiency, and then I believe it's Commercial and Public, or the other way around. It's been a little while and there's been some redesign. But if you go to the Energy Performance Contracting section, all of those documents are available. And I've talked to a number of colleagues at the time in different states and directed them to those contract documents, and they found them to be greatly helpful.

*Lars Lisell:*

There are a couple of questions up here about auditing tools, so I'll try to address those all at once. One was will Simuwatt be easier to use than eQUEST? And the answer to that question is Simuwatt is gonna be a different tool than eQUEST, but eQUEST is an energy modeling tool, whereas Simuwatt is an energy auditing tool. And I guess to drill down a little deeper, I would like to say, "Yes, we're hoping it's gonna be easier to use."

The actual energy model that comes out of Simuwatt will be auto-generated based on the input, so it should be a lot quicker than developing an energy model, just from scratch. And then another question was what is your opinion about virtual vs. traditional walk-through audits? That's from Chris Castrol. And I personally, I like virtual energy audits a lot. This again goes back to the question of what are you trying to accomplish, and selecting the right energy audit. So if you need an investment-grade audit, a virtual energy audit is not gonna get you there.

But a virtual energy audit is really nice and low-cost way to get into the energy auditing process. So doing a large portfolio of buildings with virtual energy audits, using those to identify the facilities with the highest savings potential – that's a really good workflow, so you can circle back around and then use a traditional auditing method for the high-potential buildings. So there again, you just gotta use the tool as it's meant to be used for the virtual energy audit. So I guess that's how I'd respond to that one.

*Conor Merrigan:*

I can respond – there's a question "repeat the information about the certification recommended from Phil Thomas." That is the Certified Energy Manager, the CEM designation, from the Association of Energy Engineers. It's really comprehensive, and again, thanks for the chance to plug it again. I also had a question as far relating to the program, what I define as small commercial – really, it ranges from everything from Mom and Pop Main Street stores that are gonna be very similar to a residential type of building and have the same sort of energy issues, to sort of large-format retail.

Certainly not like a big box, but maybe – for example, we had a great Harley dealership in Lakewood that was really one of our stars there. And they had a really big showroom and shop and everything, and when they replaced all their lighting – first of all, they just loved working back there a lot more. But they just keep going deeper and deeper and coming back for more improvements.

*Lars Lisell:* And there's another question on here from Cameron Carey. This question says, "Would ongoing monitoring of each mode be useful, and would they pay for it?" The answer to that is absolutely, it would be useful. Adding monitoring into an O&M plan, or into an M&D plan, is a great way to verify that you're getting savings year after year, and that things aren't creeping back to where they were originally. The question of would they pay for it, when you say "they" I'm assuming you mean an energy auditor – the answer to that is –

*Conor Merrigan:* Or an ESCO.

*Lars Lisell:* Or an ESCO, yeah. So if it's an ESCO, you could negotiate that into the contract terms, potentially.

*Conor Merrigan:* Absolutely.

*Lars Lisell:* For an energy auditor, the answer is no. After they finish their data collection, they're not gonna continue monitoring your building. But it's a very useful thing that you could potentially sit down with your energy auditor, or your ESCO, and try to come up with a plan for long-term monitoring. And with an ESCO, they potentially could go out as long as the performance contract's term, but after that term, then they would either remove their equipment or you'd have to pay them to continue monitoring. But it's a very, very useful data stream to have.

*Conor Merrigan:* Yeah, and I would just add that typically with an energy performance contract, because it is a guaranteed savings process, there is an annual EM&V effort that the ESCO will conduct to verify that those savings are – everything is actually working as installed. There's a lot of details there. If you get into sort of the rigidity of that process, it can range from everything to stipulated savings, which means that they're just essentially taking the manufacturer's word for it, to actually measured with data loggers that are there for a day or two weeks or whatever.

So there's a lot of nuance there, but essentially that is going to be done on an annual basis. And if you have a good ESCO that's committed to continually working with you, then you will be able

to continue to optimize. And just the final thing I'd make on that note is there's a hot term now in energy management called continuous commissioning, and that really is sort of what this question to a certain extent is getting after.

If you have some integrated controls that can tell you when things are getting hot, can tell you when conditions are out of what the specs were to a greater detail than even a basic building energy management system, then you can both do some preventative maintenance and really catch these things and continually make them better. And that's really where energy management is heading, and there's a number of firms that will help you and monitor remotely. And then there's also just putting some more tools in the hands of your energy managers if you have a large building.

*Lars Lisell:* Wow, lots of questions –

*Conor Merrigan:* Lots of great questions, folks.

*Lars Lisell:* Yeah, these are great questions. So Chris Castrol has another question here – what are your best practices to gathering the necessary utility information from the building manager/owner? Is there an easier way to approach the utilities or to receive this information? Will Green Button open this opportunity? And Chris, I'm sorry – I don't really have a good answer for you on this one. It would be great if there was an easy way to just pull this data.

But I guess the way that we do it is you just have to interact with the building owner and get the data in any form that they have it. Sometimes they can authorize the utility to give the data directly to you, and if you're lucky, you can even get interval data in 15-minute intervals, which is really nice for diagnosing systems and diagnosing issues before you go on-site. But I guess the best practice – there really isn't one. And I'm not super-familiar with Green Button. I've heard of it, but I haven't researched it at all, so I guess I can't really comment on how Green Button will change that.

*Conor Merrigan:* What I might add, Chris, is that this is an issue that has been a huge one for any state energy office interacting with any utility. It really comes down to your specific utility. And some are less reticent than others; some have the capabilities to actually send it over in digital format; some are – it's been amazing to me, being on the inside of this, is going over these utilities that you think

have everything in such technological wizardry, and finding how analog some of these systems really are.

There are a number of these systems that they can't even provide the data in a useful format because they just don't have it in a useful format. And at the end of the day, it's something that we tried to pass legislation for. There's folks working with – Energy Star has something through Portfolio Manager where they've had an agreement with certain utilities that they can actually get that data in a Portfolio Manager-ready format, which is fantastic. As long as the utility's on board, and there's certainly a number of utilities that are moving that direction.

It's just with the industry being as entrenched and – I guess I don't have to watch what I say anymore, but sort of dinosaur-like, it's really hard to get them to move in that direction. And hopefully, there's a lot of people throwing a lot of spears and prodding these dinosaurs along to get them moving that direction. It's definitely the direction things are heading.

*Lars Lisell:* There's a question here from Donna Flanders. How long is the NREL Energy Assessment Training course? Can anyone do it? And the answer to that, Donna, is that it's very customizable. We can do a five-day training, we can do a three-day training – depends on how in-depth you wanna go. Shoot me an e-mail if that's something you're interested in, and we can talk specifics.

*Conor Merrigan:* Jason, it's continuous commissioning.

*Erin Nobler:* Okay, great. I think that is all the time that we have today for our Q&A session. Again, I wanna thank Lars and Conor for participating; they did a great job. And also a special thanks to Molly Lunn at the U.S. Department of Energy. So we will be posting the presentation slides and audio on the Solutions Center web page which I mentioned earlier. All of you will be receiving an e-mail with resources and links for all this information, so rest assured that you will be hearing from us again.

And with that this concludes today's webinar, and thank you for attending, and have a great day.

*[End of Audio]*