

Patty Kappaz: Hey, everyone. Thanks so much for joining us for today's webinar. We're gonna give folks just another minute or so to log in and we'll be getting started soon. Thanks again for being here.

[Break in conversation from 0:00:13 to 0:00:57]

All right, it looks like attendees are rolling in this morning. Give it another maybe 30 seconds and we'll get started.

All right, well good morning again. Let's go ahead and get started. Hello, everyone. Welcome to the 2023-2024 Better Buildings Webinar Series dedicated to bringing you the latest actionable insights from leading industry experts. This annual series is a chance to explore the topics, technologies, and trends that affect your organization as well as efforts to accelerate decarbonization and energy efficiency adoption.

So today's webinar we're really excited to bring you is called "Home Energy Score 101: Assessing Efficiency and Savings." But before we dive in, I just wanna cover a few housekeeping items. First, please note that today's webinar will be recorded and it will be archived on the Better Buildings Solution Center, and we'll be following up when the recording and slides are made available. Next, all attendees are in listen-only mode, meaning your mics are muted. If you experience any audio or visual issues throughout the webinar, please just send a message in the Q&A box located on the bottom of your Zoom panel.

So my name is Patty Kappaz. I'm gonna be your moderator today. I have been working on the home energy score program at the Department of Energy as a support contractor for a little more than a decade now. Our wonderful program manager at DOE, Megan Plogg, is unfortunately home sick today, and so I'm filling in kinda last minute, and I'm also on the tail end of COVID, so bear with me. I'm gonna do my best, but I'm really happy to be here with you all today to hopefully share some great information about the home energy score program.

So if we can go to the next slide, I'll quickly give an overview of today's agenda. So we're gonna kick off with some polls in just a minute, and then I'll turn it over to our wonderful speakers. We have my dear colleague, Torsten Glidden, who is a technical lead for the home energy score program. I'm gonna start out, give a little high-level over view of the program. I'll hand it over to Torsten to dive a little bit deeper into more of the technical side of things, and then we'll hand it over to Erik Cathcart from Earth

Advantage, who's gonna share some great information about how home energy score reports can be customized by our partners and things to best meet the market needs of their stakeholders. So it looks – I think we're gonna go now to – and then we'll end with a Q&A.

So first let's – we really wanna learn about you, so let's start off with a few polls. So please join us over at Slido to respond to the following questions that we're gonna pull up. And if you have any issues, please message our tech support team by using the Zoom Q&A function. So we're gonna get started with a question. So which sector best describes your organization. It's hopefully an easy one. I'll give you all a minute or so to respond. Okay, great. It's shifting a little bit between local government and NGO, but it looks like nonprofit or NGOs has taken the lead followed closely by local government. Contractors are kicking up here. It's a great mix of NGOs, contractors or consultants, some local governments, utility programs. We've got some state government folks, higher ed represented, some multifamily. There's a nice, long list. So thanks for playing. It's good to know who's on the call with us today.

All right, we've got one more poll here. How familiar would you say you are with home energy score? See who's gonna take the lead. It's kinda fun watching the bars moving. I'm easily amused. Okay, let's give it another ten seconds. Get your votes in. All right, it looks like about a third have minimal familiarity with it. About another third are somewhat, maybe quarter to a third. I'm rounding up. Not at all about a quarter. Moderate about 15 percent, and then let's see extremely if we could scroll down a little bit. There's a few that are extremely familiar, and maybe that's all of us on here, and maybe that's some of you out there. So that's great. It's a good mix. We're hoping that, for those of you who are already familiar with the score that hopefully hearing some of this information again or in a different way may be useful to you. And if you're brand new, we hope that – we hope it's really helpful to your efforts. Excellent.

All right – oh, there's one more. Were you in attendance at our Better Buildings Residential Network in June? Yes or no, and it's okay if you weren't, obviously. Okay, it looks like most folks were not at the Better Buildings Residential Network. Oh, the webinar I'm remembering now. There was a peer-to-peer exchange call back in June where folks – home energy score was the topic, but some folks were requesting kind of a deeper dive to better understand the program, and that's what led to this webinar today. So great. I think that's it for the polls. Is that right, team? Yes, okay.

So I'm gonna kick things off with a quick kinda higher-level programmatic overview of home energy score. So if we can go to – one more slide. Great. So the Department of Energy created the home energy score to be a low-cost miles-per-gallon type rating for homes that's easy for consumers to understand and can be used to reliably compare the estimated energy use of one home to another anywhere in the country. So whether you're a homeowner and want to better understand the condition of the house you're already living in and some ways you can improve it, or maybe you're a renter or a homebuyer and wanna know what you're getting into before making a big commitment, the home energy score can help provide that insight. Home energy score can also be a powerful tool for program administrators using the aggregated data collected to get a better understanding of the housing stock, which can help inform where their programs need to invest resources.

So the primary target market for the score is existing single-family homes and attached homes like townhomes and row homes. And we're really excited that coming very soon the scoring tool will be adding the ability to score manufactured homes and individual units in some types of multifamily buildings, so we're really excited about that. I'm not sure if – Torsten might be talking about that, so be on the lookout for that added capability to be able to score some types of multifamily buildings and manufactured homes.

So home energy score is considered an asset rating as opposed to an operational rating, meaning that it's really the score is based on the structure and major components of the home, and it assumes standard operating conditions for things like thermostat settings and plug loads and things like that. So if you look at this nice little triangle graphic here, everything within the dotted line is considered an asset. So typically those are the things that are kind of fixed to the house and convey in a home sale, so the building envelope, obviously, so the walls, windows, roof, attic, foundation, whether or not the home is air sealed and insulated, and then the major equipment in the home like the heating, cooling, and hot water systems. So that's what we mean when we say it's an asset rating.

And then on the right-hand side of the slide, you can see a sample score report, or really the first page of the DOE-produced score report, and this one you're seeing here is really the most simple option we have. I think Torsten's gonna go over a few of the different options, but our partners are also able to create their own

customized reports with their own look and feel that highlight the metrics that they – that are important in their markets, and so Erik at the end is gonna dive in deeper to that. So home energy score, kind of a basic level, it's an easy-to-understand one-through-ten score with ten being the most efficient and one being the least. Really a ten means it's a home that's estimated to use the least amount of energy. One is gonna be the biggest energy user. It includes an energy use estimate broken down by fuel use, fuel type, and it also includes a list of cost-effective recommendations for saving energy that pay back in ten years or less.

So one of the really great things about home energy score is how versatile it is. It's currently being used by local governments in disclosure policies, both for home sales and renters. It's used by states to create consistent statewide labeling frameworks that cities can use for mandatory policies if they choose to do that. It's integrated into utilities existing programs where the score really is an easy add-on to the services utilities already providing. It's used by community action agencies and others to help low-income homeowners find ways to save money, and it's also linked with mortgage financing products offered by Fannie Mae and Freddie Mac where the recommended improvements can be financed as part of the mortgage.

So here's just a snapshot, and this map is a little bit outdated including we need to add Florida there as one of the – the City of Gainesville has a rental ordinance that includes the home energy score as part of all of its rental inspections. So this is a little bit outdated, this map, but it's really just a snapshot of the numbers. So our partners around the country have scored more than 220,000 homes. We have over 400 certified assessors that have gone through DOE's free training and passed the test and been mentored and are out in the field scoring homes. And there are about 14 active application programming interfaces or APIs, meaning about different tools that are linked with our software directly to make it easier to enter the data and things like that, which is great.

So this is kind of a snapshot of all the different states and local governments that have some sort of a home energy score policy or program, and it really has been growing in the last number of years. The Cities of Berkeley, California, and Portland, Oregon, were really the first to require the home energy score in real estate listings, so when a home goes up for sale, they're required to disclose that information to prospective buyers and include it on real estate listings. And since they did that, a number of other cities have been following suit, primarily ones in Oregon, kinda

following suit of Portland, but now there's others cropping up in other parts of the country, and I need to add to this the City of Ann Arbor, their logo isn't included here. I believe they just recently passed a very similar policy that would require – that will require home energy score in real estate listings, which is exciting. I mentioned the City of Gainesville requires a home energy score as part of its rental inspections, and then there's a few other different use cases for how folks are using it at point of major renovation or in reach codes, a couple smaller cities in California. And then I mentioned some states, the first one being the State of Oregon that has this framework that creates a standard way of recognizing official home energy scores in the state, and now the State of South Carolina is getting ready to do a very similar voluntary statewide program but one in which local governments can kind of lean on it to promote their mandatory policies should they choose to. So there's a little snapshot.

So here really just to recap that home energy score can be used in a variety of ways and has a number of benefits to both consumers and programs in helping to transform the residential energy efficiency market. So for consumers, it's a great way to help homeowners, renters, and buyers understand how much energy a home is expected to use and what that could mean for their utility bills and provides a list of cost-effective improvements that can help cut costs and energy use. For program administrators like cities, states, utilities, and others, all of the data that's collected can provide insight into the state of the housing stock in a particular area and can help decision makers determine where to target program resources or incentives for upgrades, and all the data can also be used to help track the impacts that that is having in the market and help really drive real estate market interest. And finally, but getting more and more home energy scores integrated into the real estate transaction, for example, in places where it's required in real estate or rental listings, it will help build that pool of data that's necessary to enable valuation of energy efficiency and ultimately can help drive consumer demand for that efficiency.

So here I just wanted to quickly show one example of how home energy score data can be collected, aggregated, and shared in different ways. So this is a screenshot from the Green Building Registry which Earth Advantage out in Oregon built. It's being used in Portland, Oregon, and other markets to house the home energy score and other home energy data that is then publicly available for consumers to see. So you can go into the Green Building Registry, type in an address, and if there's a home energy score or other data for that home, you'll be able to see it. And I

think the next slide shows a little example of an individual home. You can see that there's a home energy score and what that is. You can download the full score report. You can also see the estimated energy bills and things like that. And then the real estate professionals and customers can access that information directly.

I think I have one more slide. So there's been some great research that's been done that looks at the impact of home energy score on home sales and user behavior when it comes to real estate and rental listings. So last year, the Lawrence Berkeley National Lab, or LBNL, put out a study that showed that in cities where home energy score is required in real estate listings, so where there's a high concentration of scores, essentially, that a higher home energy score was associated with a higher purchase price. Specifically, they found that 0.5 percent higher purchase price for each point increase on the home energy score scale. And similarly, that for every \$100 increase in estimated energy bills, that was associated with a 0.4 percent decrease in purchase price.

Another set of studies was done by ACEEE. They did a couple of controlled studies that put energy information like home energy score on mock real estate and rental listing websites, so these fake sites and got users to participate in the study, and they found that including energy labels encouraged renters and buyers to select the more efficient listings more often, and they also showed that listings with the home energy score and the corresponding one-to-ten scale and estimated energy costs led to higher click rates of energy-efficient properties. So that's interesting kind of on the consumer behavior, user behavior side of things. So this is all really exciting and encouraging and validating of the home energy score's value and role in helping to transform the market for energy efficiency.

So thanks a bunch for hearing me out. I'm gonna switch it over to Torsten Glidden, my good colleague. So Torsten is the technical lead on DOE's home energy score. He heads up the program side efforts to maintain and develop the software user interface, API, and backend database environments with representatives from three national labs: the National Renewable Energy Lab or NREL, Pacific Northwestern National Lab or PNNL, and Lawrence Berkeley National Lab, LBNL. He also supports partner and assessor participation in home energy score from onboarding and training through program design and operations, data analysis, and quality assurance oversight. Torsten is awesome. He does a huge amount of work, and we're so grateful to have him on the team. So take it away, Torsten.

Torsten Glidden: I'm not sure I deserve all that, Patty, but thank you. I do appreciate it. Well, good morning, everyone. Welcome to our overview of the technical side of modeling and impact with home energy score. And so it all kinda starts with collecting data in a home. So the way home energy score is designed, partners manage assessors, they get them registered to be candidates for training. Those that are qualified to do so typically have an existing credential like they're a HERS rater, they have a BPI building analyst or building science principles certificate, they're a home inspector, that sort of thing. And then once they go through this training of ours, which is a 3-D simulation training that's available online for free, 24/7/365, takes approximately anywhere from half a day to a day to get through depending on someone's comfort level. It can take longer if you've got to sort of mix it in with regular work activities, of course. And strategies for getting assessors through training so we can, if someone's interested, sort of elaborate on that sort of thing a little later.

But anyway, once they get through training, then they conduct data collection on their mentoring home, and they would use a form like this, the home energy score scoring tool data collection form. It's effectively the form and structure of how and what data is collected on a home in order to generate a home energy score. This example of it here, it's linked. Let folks peruse at your leisure. I don't think my cursor activates any of these things, so I'll move on from trying to get you the URL image. But then also, if you're more interested in how the home energy score works, there is a methodology paper that can be found online linked here in this set of slides which will be available to attendees after the presentation.

So again, an assessor collects data in a home. These are the basic categories, sort of where the home is located, what its relative size is, those things about the home, its age, number of bedrooms. And then characterizing the building envelope, the windows and the skylights, the heating and cooling, and any additional key asset-based equipment. And that next sort of rectangular bubble on the bottom left is the sort of landing page login for the home energy scoring tool online, and that's the main interface that PNNL manages and provides for users or assessors to enter their data to generate a home energy score and manage the scores they have already done as well as for partners to manage assessors' work within their partnership and perform QA on their work and so on. QA requirement is 5 percent of all official score activity. Official scores are characterized as initial scores, final scores, and corrected scores. There are other types of scores – test scores, alternative

EEN, which is sort of like a way to demonstrate different scenarios, so running hypothetical improvements on a home, as well as QA type, mentor type, and preconstruction for homes that don't actually have addresses yet and are really just working on a set of plans as opposed to something that's physically characterizable already.

And then from there, once data is entered into the home energy scoring tool, it's taking data from NREL's climate database, which is really TMY3 climate and weather data, and that's been sort of adapted for use for the score on the back end of the scoring tool, and defaults developed by LBNL, and then run through the modeling engine which is an energy plus based tool. It also produces, interesting to note, an 8760 file, so an hourly data file. So energy consumption estimates can actually be extracted and reviewed on the hourly level, so folks that are interested in time of use related energy consumption issues in homes might be interested in making – being able to make use of that, so hourly by end use. And then we actually use state average energy costs and emissions data, so there's GHG, a carbon emissions metric as well with it that the tool can output from EIA. That gets updated on a semi-regular basis, but it's not like a momentary snapshot in time. So for those seeking to make more of nuanced, up-to-the-minute determinations about energy consumption, you would be able to take this kind of data and apply other things that you know about characteristics in your specific area in terms of cost and that sort of thing to make use of that data.

So data comes out of the tool in two forms for those inside of the home energy scoring tool, it comes out as an exported CSV file. If the user is a partner or software provider is engaging with the scoring via API, then they can pull that data back by API in the form of a couple different data formats, actually. But suffice to say that it's very easy to make use of in both of those two different pathways. And the transfer of data can be done, again, either through the scoring tool directly or via API, but it does build under a partner's profile in the scoring tool, so they can always come in and use that as their dashboard to access data in case their API isn't working momentarily or for whatever reason. It's easier oftentimes to interact with the quality assurance side of things that way.

And then in the lower right is an example of what the typical report comes out looking like. That's the front page and the back page. We'll look at that a little closer in another slide upcoming, so let's move on to the next slide 'cause I think it's a little bit redundant to a coming slide.

So what does the score mean? These are scoring bins that runs from one to ten, as Patty mentioned earlier, one being the highest consumers, so you look down at that bin for number one, and you can see that it's homes that are expected to use more energy each year than 85 percent of US homes. And you see that it's a very large bin because what you're seeing is the full width and breadth of how inefficient a home can be, so that's a big – that number one bin is a big scoring bin. It's got a lot of little outliers in edge cases. And then once you get to the middle, right at a five, those homes are expected to use approximately each year 50 percent of what a typical home in the US uses. And then once you get to a ten, those above a nine are at the 90th percentile and they're homes that are expected to use less energy than 90 percent of US homes. And that's obviously the goal for most of the homes that would seek to get a home energy score. You want actionable information about how to make a home more efficient.

And for the sake of a little background, these – the comparisons to US homes are based on a residential energy consumption survey reqs. It's the slightly older version right now, but within a month, it'll be based on the 2020 reqs data, so we expect to see a little bit higher resolution coming out of scores sometime soon. And that gives you a general sense of how things work. You see that long tail because in order to get to a two, those homes have to be – have to start to have some energy efficiency. And then once you get up to the tens, that's a very small bin because you're running out of room to improve at that point, if that makes sense.

So again, there's the scale upon which it's based are these five basic categories that we sort of touched on before. It's interesting to note even though there are a lot of things here that go into the score, there are only about approximately 50 required data inputs. This is intentionally lighter than some of the other whole home characterization and modeling tools out there. I won't name any names at the moment, but it is designed to be a bit more user friendly. Now, of course it's not perfect, but what the national labs feels basically the minimum data points required to produce a home energy score. So you have things like, again, year built, number of bedrooms, stories above the ground so you're characterizing stack effect potentially in some cases, ceiling height so you're characterizing volume, conditioned floor area is the other part of that volume. The orientation's how much sun it's exposed to. The air leakage rate you can actually do inputs for performance-based measurements as well, so for blower door and a little bit further down the line for heating and cooling, the duct blaster

measurements can be entered as well. Is there professional air sealing done, what type of home it is.

And then characterizing the building envelope, so the attic, ceiling, construction, roof, foundation area, the walls and whether they're the same on all sides, whether there are multiple attics and multiple foundations, this sort of thing. Windows and skylights, glazing types, you can actually enter specific a U factor and gain coefficient if you need to or have that information available. So heating and cooling, you can characterize multiple types, multiple areas served as the distribution system, so the ducts, their location, their level of sealing and insulation, and then of course the cooling equipment as well. And then water heating, water heating type, and we are actually working on getting the ability to characterize its location as well, which becomes more and more important as we develop out additional types of support for things like manufactured housing and multifamily. Especially when you're characterizing multifamily, you often have these units that are using shared equipment or they in many cases actually have their own, so there's an important distinction there in terms of energy consumption. And then solar PB, you can characterize the orientation, the size of the system, and that sort of thing.

And again, this is sort of a magnification of one of those earlier little images. This is the front page of a standard report. So it gives you the score and it can tell you other things that you wanna communicate to customers and so on. And things like annual energy cost and what the score basis was, as a percentage how much this home – how inefficient this home currently is, the amount of money on utilities you can potentially save each year, CO2 emissions reduction, all that sort of stuff is possible to show in a report. You don't have to. I think the next slide will show different options. But on the back end – and there are some pages in-between which I didn't have room for, but it gives you a rundown, like a list of the data entry and shows that to the consumer so it sort of fully characterizes what went into the score in order to generate that score and the recommendations on the last page here, which is on the right side. And you get what is produced with the score, which is a set of actionable recommendations based on a simple ten-year payback. So what's cost effective under these circumstances. And the repair now is like this is always gonna be cost effective, you do it right away and it'll make an improvement to the place. Replace later is more of a when you have a water heater go out, you might consider replacing this. When you have an issue with it's time to replace your heating system, you might –

or your cooling system, it's time to take a look at replacing the heat pump as well 'cause it'll save you this.

What's also interesting to note is that these recommendations are optimized so they're designed to be the best package. So while the individual recommendations might not be cost effective on a ten-year payback by themselves, as a package they are cost effective with a simple ten-year payback. With that in mind, it's also worth noting that upgrades to a home are not so much a destination in my cases for these homes; it's a journey, so it in its updated form may not lead to the same score you saw on the initial report. That's an indication of doing all those measures at once. So just something to sort of help manage expectations with people you communicate with, customers and so on. It's designed to be easy to understand and easily consumable, and this data populates to a partner's – an assessor's account but also a partners' account, so it's aggregable, and it is highly recommended for partners to take a look at their data and see where patterns are and where it might be good to try targeting potential customers with high potential for improvement opportunities of a higher impact and magnitude. And it's also designed to link to financial products in the industry to get people to be able to do these upgrades more cost effectively. I think we might – Erik might be getting into that a little bit later, so I'll move on.

Here's an example of the report options. You can see it's also customizable, so down in the lower portion, the footer if you will, you can add logos for your program, you can add the name of the program, the state it's in, that sort of thing, so it is somewhat customizable. One can also, as I mentioned before, you see that label types A, B, and C, there's varying degrees of added information on the page. Depending on the program, you might want a more – a heavier content on your page or something's a little lighter, sort of visually impactful and easy to communicate quickly.

Just real quick, this is kind of an indication of what sort of the current score and initial upgrade of the homes is. Year over year, there's not a huge difference. What's interesting to note is that when we moved from an all recommendations have to be discreetly ten-year payback cost effective to a system where the package needed to be cost effective, so not every single measure necessarily, as a package they were more cost effective, and we did get a slight bump on the high end of the scale between sort of how the home is today, the current score, and what the upgrade potential is, that score. There's a few other things to not here. I

won't get into too much detail, but it is, again, for some homes, we saw that long tail for bin number one. It is possible for a home to not have much opportunity unless they really do a lot of upgrades. So in some cases, depending on the cost effectiveness, it's still possible to see sort of a one-to-one, so it's important to have that in mind able to have those conversations with customers. Sometimes their home – targeting homes is a good idea, and sometimes their homes are going to require more work than is "cost effective." So just an important thing to keep in mind in advance so you're not surprised, you're managing expectations as much as possible.

And just an example of some of the impacts that home energy score has and has had in recent past. We do see this climb a little bit every year it seems like. The improvements to the scoring tool seem to work iteratively. So typical score today and then score with improvements, you get from a 4.6 on average to a 7. Twenty percent energy efficiency on average, again, that's with doing all of the improvements recommended, and it's worth noting that if you take the approach of doing a sort of alternative EEM, like good, better, best scenario setup, you can obviously get higher percentage savings on homes. It just takes a little bit of analysis work in order to make that happen, which can be done either by manual input or in theory one could set up an API to generate multiple alternative EEM scores. And I think Erik might be getting into something along those lines in his presentation, so I won't belabor that too much.

But over the years and on actually 4/22, we had a significant impact in terms of energy bills, at least in terms of what the potential is, \$13.8 million based on the number of scores we have and 48,000 tons of CO₂ potentially saved from the atmosphere, so there are areas of real potential to make energy efficiency and climatic difference out there. So these are some of the most popular upgrade recommendations that tend to be very cost effective, and I think I won't get into too much of that. these are kind of the usual suspects: air sealing, duct sealing, heat pump, water heaters, and insulation, that sort of thing.

I think just a quick set of links for folks that are interested in more information. For partners, becoming a partner, that first link, this is just sort of an example of where these really long URLs are and why the other ones are just embedded, but the Better Building Solution Center at energy.gov home energy score, and then from there, there's a bunch of things that tell you more about home energy score depending on what your interest in it is, becoming an assessor, becoming a partner, for partners you to fill out a partner

implementation plan, so that link is here. And then I mentioned earlier assessor need to hold a relevant professional credential to qualify them to take the assessor training. And you're always welcome to contact us at homeenergyscore@ee.doe.gov if you have any questions.

And I also want to point out that one can demo the scoring tool online on their own if they so choose. It's important to note that this is not an official score. The very least, the data wasn't collected by an official – an active home energy score assessor, but it is for demonstration and information purposes only, but it does give you a sense of how it's put together, what data points go into it, and what the resulting score label looks like. So if anyone's interested in that, you're more than welcome to check it out, but again, do not share it publicly because it is just for info and demo purposes. And with that, I will hand it off to Patty and to Erik. Thank you.

Patty Kappaz:

Wonderful. Thank you so much, Torsten. That was hopefully really helpful to all of you on the line. We're gonna kick it back over – or kick it over to Erik Cathcart now. Erik is the director for technology services at Earth Advantage. In his role, he's focused on partnering with the public and private sector to build or enhance IT solutions that help to reduce the climate impact of the built environment. For over ten years, he has worked on – I don't know how to say this acronym – SAAS platform development projects from UI to software architecture. He currently oversees the development of Earth Advantage's own green building registry and home energy fit software platforms. So I just – before I hand it over to you Erk, I just wanna give a quick reminder to our audience to send in any questions that you have via the Slido website. That's slido.com with event code DOE. So, Erik, please take it away. Thanks.

Erik Cathcart:

Thanks, Patty. As Patty mentioned, I've been working at Earth Advantage quite a long time, and during the course of that time, we've interacted with the folks at the Department of Energy and Better Buildings home energy score since its inception, really, on a number of different programmatic consulting issues, training and support. We do quality assurance all over the United States, and as Patty mentioned earlier in the slides, at the beginning, we built the Green Building Registry to hold home performance data that we can populate into real estate listings.

So we actually started working on custom scorecards, labels, reports, people have different names for these, before the home

energy score actually launched. There was a federal program that funded four states to develop home energy improvements using local programs, and we used at that time a different algorithm developed by Michael Blasnick called SIMPLE. Michael's now at Google Nest.

So the real launch for us in terms of customer reports came when we were approached by the City of Portland who is going to launch, as Patty mentioned earlier, the second mandatory home energy score program in the country and the first one to really focus on time of sale. And so we worked with them over the course of several months to create what they wanted in terms of branding and design and actual elements on the scorecard to produce what you see here on the screen, which is still being used today.

So over the course of time, we've worked on a lot of different custom scorecards. You can see there's some reasonable similarity between them. Different programs like to mimic what other programs are doing because they recognize they've been successful. In some cases, we work with the State of Oregon who then provides funding for various cities who want to go mandatory within the state, and so there's a kind of templated scorecard report there. So, you can see the City of Hillsboro, City of Milwaukee, City of Bend, Oregon, are underneath that umbrella of the State of Oregon, and they all have their own scorecards because they have mandatory programs. We've worked with the City of Fort Collins for quite some time, the State of Missouri. We've recently started working with the State of South Carolina, and we are currently working with the bay ran program in San Francisco Bay area, and we're actually in the midst of redesigning that scorecard on the top right you see there to launch in January of next year.

So there's a number of reasons why programs want custom reports. I won't read through the list. You can read it yourself, but essentially comes down to really wanting to shape the brand of what they're trying to do and also highlight different features and recommendations over what home energy score might produce in the standard report. In many cases, we also add localized utility rates to our calculations to produce these scorecards. As Torsten mentioned earlier, normally it's an average over a state. We will literally apply whatever the local utility rates are for where that scorecard is created, that report was created.

So what's moving forward right now, the HEEHRA program on electrification of homes is having an influence on these report designs. There's a much greater focus now and awareness of

carbon reduction than there used to be. That used to be sort of the hush-hush not talked about out loud. And of course, there's the Inflation Reduction Act of last year which is going to push a lot of federal rebates and tax credits, local incentives across the country, which is the specific city and state requirements. And then we're gonna see, and I believe the home energy score has the ability to do this, time of use utility rates, which as you might realize if you use your electricity in the middle of the night, you're gonna get a lower rate than you do at peak times. And then there's a push toward easier shortcuts for homeowner resources, so using the report as kind of a gateway for homeowners to get to more information.

So last year, a team of us at Earth Advantage anticipating HEEHRA and other movements toward electrification, designed a sort of templated electrification pathway report is what we call it. The idea would be to actually hit the API for home energy score four separate times. You heard Torsten mention the EEM method there to produce different scenarios related to different phases of home fully electrifying, all the way from improving its shell and the core recommendations to fully electrifying the home, being no gas at all, no other fossil fuels, no woodburning stoves to adding solar and battery.

The other component that we've been working on is alignment with in anticipation of the Inflation Reduction Act. So we created, in this case, a template for allowing assessors to provide an unofficial score that shows how they might achieve in this case 35 percent standard energy savings related to the IRA, and there would also be a 20 percent one. And this would also allow them to create scenarios that the assessor could create scenarios, hit the home energy score API until they got results they wanted, and then they would create the scorecard, which would be a snapshot for a homeowner to set them on the path to get the IRA rebates and tax credits.

In addition to that, obviously you're going to want to capture work that was done in the home that actually achieved this goal, and so in alignment with that, we created another template which we call almost a certificate, which would be an official score but would capture actually what was put in and installed in the home, and you can see in this case it has a state stamp. This is not official. Oregon is not actually using this yet. It's just an example.

And you can see how the back page of this report would look. We're actually a little bit tiny, but it's actually listing the various

components that were installed in the home that achieved that 35 percent level in alignment with the IRA. And there's a history that we have doing this. This didn't just come out of thin air for us. It relates to different separate programs. So we worked with Fort Collins for some years now. They have what they call the Epic Homes certificate, which is a home energy score report. They do an initial score, which is just a single page to get a baseline on the home, and then they track within their program what was installed in the house and what the upgrade resulted in in terms of savings and a new score. And they provide this information to us directly at Earth Advantage through an API connection with their program that supplies that data, and then we produce a report and we store it on the Green Building Registry.

A similar instance, we've been working with the State of Missouri for many years, and in their case, they produce a gold and silver certificate related to work that's been installed in a home, and when a homeowner achieves a certain level. In this case, home energy score of eight or better generates a certificate. So when you visit the Green Building Registry on certain homes in Missouri, you will see they have both a home energy score report and they have this custom certificate which would align with what I showed you earlier in our design for capturing Inflation Reduction Act installed entities.

And that wraps it up for me. If you have any questions, feel free to reach out to me directly. I can put you in touch with anybody on our home energy score team related to either the Green Building Registry or our program support, our consulting with states and municipalities. We do a lot of different things around the home energy score as well as quality assurance I should mention. That's the link for the Green Building Registry there. If you want to visit it, it's free. Anybody can type in an address and search for it. If we have data on it, it's in – you'll find it and it'll bring up the relative home performance components, including the home energy score if we have one in there. And you can also visit our website. Thanks so much.

Patty Kappaz:

Wonderful. Thank you so very much, Eric, and again, Torsten. That was great. So I wanted to just say before we transition to the Q&A, I wanted to encourage folks to download our additional resources handout that was, I believe, shared in the Zoom chat box. The handout contains links to resources from Better Buildings and our speakers on today's topic, so we hope you find that useful.

So let's go ahead and move. We have a few minutes left for questions. Let me just switch over here real quick. If you haven't already, please join us at [slido.com](https://www.slido.com). #DOE is the event code to submit and upvote any questions. So we're gonna – let's see – we've got a lot of great questions in here. I'm gonna try to hit the few that have been upvoted the most. So Roshina Hamm had a question. In locations where there is not an organized effort to support his, is there any potential for a homeowner or renter to calculate their own home energy score? And Torsten covered this, I think, on his last slide that we have that – you can produce an unofficial score on your own through a user interface we have. Torsten, is that right?

Torsten Glidden: Yeah, that's right. One can, again, use that guest scoring tool to produce – to get a sense of what things probably would be. Again, it's not an official score, can't use it for programs or incentives or anything like that, and if someone were to need to, they would then need to find out who can come and do an official score in that area. And we'd like to see more partnerships start up in places that don't already have that, so reaching out and contacting us and saying, hey, here's where I am, I'd love to have an official score or home energy score in general, and there don't seem to be any assessors I can find in this area, that helps us have conversations in different parts of the country and encourage growth of partnerships there.

Patty Kappaz: Absolutely. Thanks, Torsten. Another question came in, the DOE supports both home energy score and building performance institute, or BPI, certifications for energy auditor inspectors. What are the differences and why aren't they combined? Torsten, do you wanna take that one?

Torsten Glidden: So home energy score is a way to collect data and generate a score through a specific tool. Building performance institute certification is an approach to interacting with buildings and being able to collect data for many different uses. So our use case, build BPI is the sort of – is the certification that gets auditors or assessors or data collectors to a level of understanding that allows them to interface with and interact with a lot of different potential use cases for building data collection. I think that's the best way I can characterize that.

Patty Kappaz: And we do – so there's a set of credentials that we require in order to even – for an interested assessor to take our training to become a home energy score certified assessor. You have to meet some sort of building science or building-related credential, and several of those are from BPI, so we do accept those certifications.

Torsten Glidden: Many of BPI certifications are prerequisite – a prequalifier for taking our assessor training for the home energy score use case if you will.

Patty Kappaz: Great. Thanks, Torsten. This one's just a comment. When I mentioned back during my slides that I believe that Ann Arbor had recently passed an ordinance, and that is indeed true. We have Zach from the City of Ann Arbor just confirmed that, so thanks so much. So home energy score will be required at time of listing. That passed just about a week ago. Awesome. Glad to have you, Zach.

Okay, next question. What do we have? We've got a couple more minutes. So why is age considered part of the energy score? If an older home has been updated, it should be valued similarly as a new home. I think that that question probably was from my slide on what asset scores are and the triangle and age is down at the bottom. So maybe we can just clarify that, Torsten, if you understood the question.

Torsten Glidden: Yeah, I mean, it's not a huge impact. it doesn't change the calculation by itself. It is just one of my inputs, and something you consider in a holistic sense, but of course in so many cases, homes have been modified, they've been added onto, they've been updated over the years, and we actually have guidance that basically if more than half the home is of one vintage versus another, you enter the one that is predominant. So it is a small component of consideration and there's some basic assumptions behind the tool, but it by no means is a really heavily governing component because there's so many other factors that are impactful on home energy score and consumption estimates.

Patty Kappaz: Great. Thank you, Torsten. There's a lotta great questions in here. I'm gonna just cover one more and then we're gonna move on 'cause we have a few things before we wrap up. I just wanted to reiterate a question that I answered in the chat from Rick. He had a question, just to make sure everyone understands, if home energy score is calculated on a per-square-footage basis or for the whole home. It is for the whole home. So all things being equal, if two homes are constructed identically but one's larger than the other, the larger one is gonna score lower 'cause it has a higher volume of space to heat and cool.

Torsten Glidden: You can – just on a side note, Patty, though, you can get an EUI metrics out of the export or by API.

Patty Kappaz: Thanks for that, Torsten. Perfect. Oka, great. so thanks so much for those questions. I'm sorry we couldn't get to all of them. We'll try to – maybe amongst us presenters we'll try to respond to as many as we can directly in Slido.

Torsten Glidden: Patty, I think you're on mute, unfortunately.

Patty Kappaz: I sure am. Thank you, Torsten. I just wanna thank everyone gain for participating today. This webinar is part of the 2023-20234 Better Buildings webinar series. As you can see, we have a great lineup of presentations through March, so please visit the Better Buildings Solution Center to learn more and register for those.

We hope you'll join us on Tuesday, October 3, for our next webinar titled "The Grass is Always Greener: Best Practices for Water-Efficient Landscaping." That's fun. Join this webinar to join – to learn from partners about best practices for curbing water use to cultivate sustainable landscapes.

And if we go to the next slide, we want you to please mark your calendar for the US Department of Energy's 2024 Better Buildings Better Plants Summit, which will be held April 2-4 in Washington, DC. This event will feature engaging and interactive sessions as well as opportunities for attendees to network with industry peers and national experts. So registration details will be coming soon.

We also want you to check out Season 1 of the Better Climate Challenge Road Show. Our energy experts hit the road to see how our partners in the Nashville area are reducing their emissions. Watch as we visit Nissan, Whirlpool, and Chemours to see decarbonization in action. Are our partners on their way to meeting their goal of reducing emissions by 50 percent in ten years? Will our hosts survive trying Nashville hot chicken? Tune in to Season 1 on the Better Buildings Solution Center and find out. Ooh, this is exciting. I love it.

So with that, I'd like to again thank Torsten and Erik for speaking today, and very much to all of you for taking time to be with us. Feel free to contact our presenters or myself directly with additional questions, or if we couldn't get to your question during the Q&A portion. I encourage you to follow the Better Buildings initiative on LinkedIn and Twitter for all the latest news, and you can find our handles there by their respective icons on the left-hand side of the slide. You'll receive an email notice when today's recording, slides, and transcript are available on the Better

Building Solution Center. And in the meantime, thank you all so much for joining and enjoy the rest of your day. Bye-bye.

[End of Audio]

Additional Speaker Q&A:

Better Buildings does not endorse or recommend any product or technology provider. The answers in this document are solely the opinions of the speakers based on their professional knowledge and experience.

Additional Questions

Audience member: With multifamily, could this be incorporated into an affordable housing Utility Allowance? Is anyone planning on doing this? How?

Megan Plog: I definitely think that this could be used in an affordable housing utility allowance but will need to double check with HUD. I am not aware of anyone actively doing this, but the Home Energy Score team is working on an affordable housing campaign.

Audience member: Does the home energy score system mitigate the need for the traditional Home energy audit?

Megan Plog: This depends on what context this is in. The Home Energy Score Assessment functions very similarly to a traditional audit, and some of our Partners include blower door tests in their audits. If you are looking for guidance on compliance for a particular program, please reach out to homeenergyscore@ee.doe.gov

Audience member: What would you recommend cities do while their states consider standing up a program? Does it make the most sense to wait for state guidance for consistency? What can jurisdictions can do in the meantime?

Torsten Glidden: It would depend on what kind of investment cities would be willing to make in terms of getting to know, explore and understand Home Energy Score in anticipation of state program guidance. As long as a city is willing to make a long-term investment in a Partnership with DOE on Home Energy Score, the city would likely just be adding additional funding and/or use cases for Home Energy Score when their state does stand-up a program state-wide. Any jurisdiction can have their own Partner program if they comply with DOE requirements for Home Energy Score Partners...it could make statewide reporting a little bit more complicated, as data could not be shared automatically, but there aren't any specific restrictions beyond cooperative agreements for data-sharing. See <https://betterbuildingssolutioncenter.energy.gov/home-energy-score/home-energy-score-partners-become-a-partner> for more information.

Audience member: Is there any consideration for the embodied carbon of upgrades?

Megan Plog: Not at this time.

- Torsten Glidden:* Partners could make use of the Home Energy Score's 'carbon savings' data (available for export by Partners) to run a custom calculation for their own report, but there are many approaches to characterization of embodied carbon, so a predetermined version has yet to be settled on.
- Audience member:* How are you factoring in behavior? Homes score higher when the thermostat is kept very low, use cold water to wash dishes, etc. Usage, and therefore the score is going to change based on behavior of the resident.
- Megan Plog:* Home Energy Score is an asset-based score and does not take into account behavior of its occupants, so the Score only takes into account the home's assets rather than the home's operation.
- Torsten Glidden:* Home Energy Score makes assumptions about 'typical' user behavior for each home. See https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Home_Energy_Score_Methodology_Paper.pdf for more information.
- Audience member:* Is there any consideration for the embodied carbon of upgrades?
- Torsten Glidden:* Partners could make use of the Home Energy Score's 'carbon savings' data (available for export by Partners) to run a custom calculation for their own report, but there are many approaches to characterization of embodied carbon, so a predetermined version has yet to be settled on.
- Audience member:* Where does Georgia stand in this Initiative?
- Torsten Glidden:* Recommend reaching out to NASEO on this... (<https://www.naseo.org/>).
- Audience member:* Is solar hot water heating included in the score?
- Torsten Glidden:* Not at this time, although there is a data entry workaround for solar hot water that can help more accurately characterize energy consumption on a site-specific basis. Solar PV can be directly input for Home Energy Score calculation.
- Audience member:* Regarding home energy score, why is air leakage in the Home category and not in Envelope?
- Torsten Glidden:* That's more a question for the original user-interface designers than an indication of any sort of philosophical/building science based decision. However, it's worth noting that the "Air leakage rate" described here is for the whole building envelope, whereas the Envelope 'list section' breaks-down subcomponent parts of the

envelope and, in this example, is really more for organizing bulleted items on a slide than a specific characterization of the data-entry flow or philosophy (e.g., Windows & Skylights are also part of the building envelope).

- Audience member:* How frequently does the recommendation include air sealing and insulating? That's a huge contributor to energy efficiency.
- Megan Plog:* This is typically the first recommendation the Score produces.
- Audience member:* Do you have any metrics on how many of these energy improvements/ upgrades are actually undertaken?
- Megan Plog:* It varies from Partner to Partner. Some track improvements, particularly those programs that provide "before" and "after" Scores.
- Audience member:* We sold a home in Portland, OR in 2000, and I was surprised to learn that it scored a 10 with a natural gas furnace and range. Has any thought been given to more explicitly considering fossil fuel use in scoring?
- Torsten Glidden:* Yes -- this will be an optional approach, for each Home Energy Score Partner to select, if they so choose, whether they want their upgrade recommendations to focus on Electrification (available in an upcoming software release).
- Audience member:* On the slide showing the average HE score, it showed the average amount saved to be around \$430/year. Is there an average cost to achieve that? Was it roughly 10 x or \$4300?
- Torsten Glidden:* The answer to that question is not that simple, as each home has a different 10-year payback profile based on numerous variables. This is simply an average of all the unique scenarios that characterize all of the homes in the Home Energy Score dataset.
- Audience member:* Please provide link to software tools to assist both new build and renovation energy audits to assess and estimate energy efficiency upgrades.
- Torsten Glidden:* There's a list of Home Energy Score compatible third-party software at <https://betterbuildingssolutioncenter.energy.gov/home-energy-score/home-energy-score-partners-partner-resources>. However, it's worth noting that any Home Energy Score Partner may use DOE's own online Scoring Tool for free if they comply with the requirements to become a Home Energy Score Partner (see <https://betterbuildingssolutioncenter.energy.gov/home-energy-score/home-energy-score-partners-become-a-partner>).

- Audience member:* @ Torsten - What credential options are required to become an assessor? Does it differ state to state? Further where do you look to see if this will be a future requirement in your state?
- Torsten Glidden:* Requirements for becoming an Assessor (including qualifying credentials) can be found online at <https://betterbuildingssolutioncenter.energy.gov/home-energy-score/become-assessor>. State implementation and requirements (for those not already engaged in an existing Partnership or becoming a Partner with Home Energy Score) are being tracked by NASEO...(<https://www.naseo.org/>).
- Audience member:* Custom reports were noted as preferable in some instances. Including local utility rates makes sense, but why allow mods to the recommendations? I see issues in hostile states pushing to outlaw or inhibit renewables relative to new fossil.
- Torsten Glidden:* Home Energy Score provides a methodologically consistent Score, calculated data and simple cost-effective (10 year payback) recommendations. However, specific marketplace and utility rate circumstances vary widely throughout the country. Each Partner must provide access to the full Home Energy Score, but they each know their own markets best and what custom approach may be most effective within them. Any Partner that fails to comply with their Partnership Agreement can be reviewed for continued access to Home Energy Score resources on a case-by-case basis.
- Audience member:* Are there some ways folks are using the energy efficiency data for carbon credits?
- Torsten Glidden:* Some Partners make use of Home Energy Score to help them meet their climate action plan goals, but there is not currently a direct carbon credit market tie-in with any Home Energy Score Partner program.
- Audience member:* The energy use yardstick is per square foot, correct? Similar to a commercial building EUI?
- Torsten Glidden:* Home Energy Score has multiple energy consumption datapoints that are output from a calculation, resulting in multiple potential values/metrics (see https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Home_Energy_Score_Methodology_Paper.pdf for more information).
- Audience member:* When the 1-10 rating is given, is that relative only to other homes with similar unchangeable assets (age, orientation, stories above

ground)? Or is an efficient 1950's house being compared to a group including 1990's construction methods?

Torsten Glidden: Neither of the proposed assumptions/questions represent the whole picture. Home Energy Score has 50+ site-specific data collection inputs that are required to generate a Score calculation. So, because Home Energy Score is based on a home's overall estimated energy use and is normalized for local weather (e.g., for local cooling and heating needs), one home's Home Energy Score can be compared to any home's Home Energy Score anywhere in the country regardless of vintage or construction type (see https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Home_Energy_Score_Methodology_Paper.pdf for more information).

Audience member: I'm a certified home Inspector, and home energy auditor. How can I have access to the simulator/training?

Torsten Glidden: Qualified professionals interested in becoming a Home Energy Score Assessor must get in contact with a Home Energy Score Partner in their area in order to participate (see <https://betterbuildingssolutioncenter.energy.gov/home-energy-score/become-assessor> for more information).

Audience member: How long is the score good for?

Torsten Glidden: There isn't currently a specific 'expiration date'. However, change happens -- codes, equipment efficiency, software features/modeling accuracy, energy cost data, etc. -- therefore, re-scoring homes every few years (or sooner) is recommended, when/where possible.

Audience member: Recognizing HES is for existing homes - what scoring option are recommended for residential new construction? Is it different for ENERGY STAR or ZERH?

Torsten Glidden: Home Energy Score is different than Energy Star and ZERH, although there are similarities and some overlap. However, it's worth noting that Home Energy Score can be used for new homes to 'benchmark' or demonstrate some forms of code compliance...and, over time equipment efficiencies change, so recommendations for upgrade opportunities can begin to enter the picture with future re-scores.

Audience member: What are the costs of integrating an API for Home Energy Score?

Torsten Glidden: There is no cost to the implementer from DOE's Home Energy Score. However, software development for an API-based approach can incur significant cost, which can vary widely depending on the software

developer. As with most services, it would be best to develop a set of requirements for multiple software developers to bid on and select the best balance of cost and quality/experience. If you're interested in speaking with other Partners that have been through this process, we can try to put you in contact with one or more of them to get a sense of what their experience and related costs were like for them (email homeenergyscore@ee.doe.gov if interested).

Audience member: How do you reconcile energy bills with modeling results

Torsten Glidden: Home Energy Score doesn't currently include utility bill calibration, as it has focused on making average/typical assumptions about user behavior from a methodological perspective (see https://betterbuildingsolutioncenter.energy.gov/sites/default/files/attachments/Home_Energy_Score_Methodology_Paper.pdf for more information). However, BPI is currently working through their BPI-2400 standards committees on an update that will likely address energy modeling and utility bill calibration for some portion of Home Energy Score use cases. Also, it appears that Home Energy Score may also be looking at developing utility bill calibration capabilities in the future, although a specific timeline for this has not yet been determined.

Home Energy Score 101: Assessing Efficient and Savings

Additional Resources

Learn more about the topics discussed on the webinar by visiting the resources below.

Better Buildings Resources

- [Become a Home Energy Score Partner](#)
- [Become a Home Energy Score Assessor](#)
- Home Energy Score Information [Website](#)
- Better Buildings Home Energy Score Partner [Resources](#)
- Home Energy Scoring [Tool](#)
- Home Energy Score Scoring [Methodology](#)
- Home Energy Score Partner Implementation [Template](#)

Explore more resources on the [Better Buildings Solution Center](#)

Other Resources

- [Oregon Department of Energy](#) Website
- Home Energy Score Non-Assessors [Resource](#)
- DOE's [Save Energy. Save Money. And Save the Planet Too.](#)
- ENERGY STAR's [Energy Efficient Products for Consumers](#)
- [EnergyTrust of Oregon](#) Website

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