

Harry Bergmann: So, good morning everyone. Welcome to the Better Buildings Better Plants Summit. And this session is a workshop called Collecting and Managing Building Data. That's great. Before we dive in, I want to go through a few quick housekeeping points. First, today's session will be recorded and archived on the Better Building Solutions Center. We'll follow up with today's recording and slides are made available so you can dig into those for reference. Next, for all of you attendees, you'll each have the option to share your video as well as unmute yourself. That said, we ask that you keep yourself muted during this session to avoid any background noise.

We have a pretty big group with us today, and that'll say, I think, pretty sizable in breakout rooms. So, making sure that you're muted if you're not speaking is going to be really important. If you experience any audio or visual issues at any time, please send a message in your chat window at the bottom of the Zoom panel. And then, we are also, as I alluded to earlier, going to be using Zoom's breakout room functions during today's session. We'll be breaking into these smaller groups, then coming back together into the main room to finish up with some Q&A and discussion. Next slide, please.

My name's Harry Bergmann. I'm with the Department of Energy Building Technologies Office. I've been working on this Building Energy data portfolio for about five years now. We're really excited to dig in and share with you what we've been working on, and highlight some of the great work that our partners have done over the last few years, as well. My background is really in environmental science, and I've spent a number of years working with local government agencies across the country, so that's some of the perspective that I bring to bear here. And we have a lot of great local government partners today, as well.

So, digging into the agenda, I'll kick off with a few points just about why data is important, and we'll get some poll questions out to you all just to understand who we have with us in the room today. We'll intro some of the tools, and then the particular tools we're going to dive into today as well as our speakers that'll be highlighting each tool, and then we'll get into our breakouts. Those are going to be 45, 50-minute sessions, and that's really going to be the core of today's session. Then we'll come back with some wrap-up about additional resources, websites, case studies, different places that you can turn to get help with your building energy data efforts.

So, I think with that, let's go ahead and dig in with Slido. We'll be using Slido today so you can go in your browser window or on your phone to Slido.com. There's also a link in the chat at the bottom of your Zoom window, and you can use this to submit questions, see what others are saying, and then vote on some of these polling questions. So, let's see, the event code is DOE data. You should be able to enter that. You can also scan this QR code, and it'll take you right to that page, and then we will have four rooms there that you'll be able to see. So, please go ahead and select the main room since we are still currently in the main room, and we will have some polling questions coming your way.

Great, so our first question, which sector are you from. Different sectors have different types of data and challenges, and we'd love to hear who's here in the room with us today. Great, a lot of state and local, industry, higher ed. Awesome, a great mix of folks. For some of the folks in the other category, it would be great to hear where you're coming to us from, so it would be great if you could put that in the chat or into Slido. We'd love to see that. Sorry, I'm going to follow along on my phone here as well. Great, service providers, awesome, okay. Good, well, it looks like we're plateauing a little bit on the number coming in here, so, I think let's go ahead to our next question.

What type of building and use type are you looking at today? And this is something where, you know, it'll show up sort of like a word cloud, you can enter sort of free form. Is it commercial, residential, mixed use? Oh yeah, there we go. Electronics manufacturing, great. A lot of commercial. Wow, this is awesome, okay. Thank you, everybody. Medical offices, court houses, roller coasters. That's new. I don't know if we have tools for roller coasters, but we can consider it. Awesome, okay, great. Let's keep on rolling here. I think this is really helpful to understand. Thank you, all. And what type of building data do you bring with you today? I know in the session description, we really pitched this as a bring your own data type of workshop to be able to get hands-on experience with the tools. We'd love to hear what type of data you dug into and have handy today.

So, a lot of portfolio-level commercial, great. We'd love to hear from some of the residential folks, too. The single building and portfolio level, is that single-family home, is that multi-family? What type of datasets are you looking at there in the residential space? And then, would love to hear, again, from some of the folks that are marking other here, too.

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- Scott Votre:* Scott Votre here. What we're looking for is single and multi-family residential in the income-eligible or low-income segment.
- Harry Bergmann:* Great, yeah. Thank you for sharing.
- Ashley Polly:* This is Ashley Polly from Live Corp. We're looking at multi-family market rate housing across the nation.
- Harry Bergmann:* Great, thank you.
- Interviewee:* My name is Susan Marcotte. I teach at MIT, and we're looking to transition MIT to heat pumps, possibly, for some of its buildings.
- Harry Bergmann:* Great, yeah, so that's probably a good mix of different building types and data that you're dealing with there. Fantastic, okay. Let's see, I think we have one or two questions left here. So, yeah, on a scale from one to five, one being pretty easy and five being a complete headache, how tough was it to get your hands-on data for today's session? I imagine there was a pretty wide range of experiences here, but curious to see if it leans to one end or the other. Would love to hear from some of the folks on the fours and fives – what were some of the big challenges that you faced in getting that data? Was it just figuring where it was, was it privacy and permissions, was it cost?
- Ashley Polly:* So, for a lot of ours, we have – we still have issues getting the resident data. We can get our owner-paid expenses, but we have to have at least that language in our leases in order to have the utilities release the information, if they're even willing to release the information.
- Harry Bergmann:* Yeah, yeah.
- Scott Votre:* I'd like to ditto that, ditto that as well, and metering. You know, what's available for metering, and then how often has the residence changed hands.
- Interviewee:* For me, at least, I work with Andover as a volunteer, and I have worked extensively with the building management software. We have developed very specialized apps to extract the data, process it, and then to make it easy to understand. So, I think that's why the difficulty was I would say between four and five, because raw data that is exported has a lot of lives, and we have to do a lot of data analytics to get the data out of it.

Harry Bergmann: Yeah, all familiar challenges, and those are certainly what we're hoping to address here, as well. So, thank you all for sharing that. That's great, and thank you all for entering in the chat box, as well. A top question, brick versus haystack, let's see. That's something we can get into at the end of the session here. That's definitely a big question. So, yes, stay tuned for when we come back to the main room, and we'll dig into that. Great, so, I think if that covers it for polling questions, let's dig into the session here and really kick things off. So, the fundamental question here is what role does your data play? And the way that I like to think about it is, you know, we have some really ambitious energy and climate goals that we're trying to get to, right, and we need to find those energy and emission savings, and we are just walking into a hedge maze.

We can put our hand on the wall, and if you keep your hand on that wall, you will make it to the middle of that maze eventually, but it could take a long time. You could have a lot of nasty detours, and you're not going to be able to optimize that path at all. What data lets us do is take a step back, find what pathways work, and then draw out a map so that we're able to optimize for energy, for emissions, for equitable outcomes, for energy cost burden, and really figure out what is our best pathway toward those energy emission savings in order to reach our goal. Without data, we're just staring at these hedges, and we can't see over, and data really gives us that bird's eye view in order to move forward. So, next slide, please.

DOE has a whole mess of tools that address different parts of this challenge. We're not going to be talking about all of these today. We'll just be talking about a select few of those, and so that's the unique building ID, audit template, asset score, and Seed. And so, we have different partners with us today to highlight those. So, the first thing we'll be talking about is the unique building identifier, and you can think about this as needing to understand, like, where the hedges are, how many hedges are we dealing with in this space. And you have a building, a building can sit on a corner, and when you're a human trying to get to that building, having an address is fine. You know that you can get to the front door on Main Street, or you can get to the front door on First Avenue. But, when you start dealing with, you know, databases and computerized systems, a computer doesn't know that that's just one building.

So, what we wanted to do is create something like a VIN for your car, except for a building, that no matter who you are, you have this alphanumeric string, and you're able to understand that you're looking at the same building. And so, we have Marta Marello and

Chris Sanchez from Miami Dade County Office of Resilience with us to talk about some of the really great work that they've done. And so, to introduce them quickly, and Martha Marelo is a Resilience Energy Analyst with the Office of Resilience, Miami Dade County. Her main role is to work with large buildings to improve their energy and water efficiency through the Building Efficiency 305 program, or BE305. Before joining the county, she worked for Boston University on its first climate action plan, as well as on a research project about energy efficiency in public housing. Marta holds a Master's Degree in International Relations and Environmental Policy.

And with her, Chris, also from the Office of Resilience in Miami Dade County. His role is to lead analysis, communications, and reporting related to the county's greenhouse gas emission inventories. Prior to joining Miami Dade County, Chris worked at Arizona State University as a project manager for Urban Green infrastructure monitoring, and extreme heat mitigation programs in partnership with the City of Phoenix and Maricopa County. So, again, folks that want to just get a handle on how many buildings you have, where those buildings are, and just thinking about how big your effort needs to be to address those buildings, Marta and Chris are going to be in the first breakout room talking through a lot of that.

So, next we have our last three tools, which are really building that app, right? So, you figured out the hedges. Now you need to figure out what the possible roots are and then pick your pathway. And so, for the first two tools with audit template and asset score, we have Fernando Liano from El Paso, Texas joining us. So, Fernando joined the City of El Paso in 2018 as a sustainability coordinator after working in the private sector for more than 10 years in the field of energy efficiency, climate change, and sustainability. He currently oversees sustainability and resilience projects for El Paso, including energy audits, energy management, and renewable energy assessments. A Spain native, Fernando holds a Master's in agricultural engineering from Universidad Politencia de Madrid, and is a Certified Energy Manager and a Certified Measurement Verification Professional by the Association of Energy Engineers.

And so, Fernando is going to be walking us through audit template and asset score. And so, you can think about audit template as measuring those hedges. So, UBID tells you how many you have and where they are; audit template is figuring out how tall they are, how thick they are. And you can think about that in terms of your building as just accounting for your basic attributes – your HVAC

system, your lighting, your windows, your insulation. It's all of that up-front due diligence. And then, once you have that data, you can go one step further with asset score and find all the possible routes, right? So, asset score says, okay, based on those underlying elements, we think your building should be performing in about this way, and if you want to improve the performance of that building, here are some pathways forward. And so, it's saying, here are your hedges, here are the possible routes through those hedges, and then you can start picking which one you want to take.

And so, then, to make those decisions, our last tool here is the Seed platform. And so, that is going to be with Andrew Held from the Washington D.C. Department of Energy and Environment. Andrew's a program specialist with DOEE and he works on development and implementation of the nation's first building energy performance standard, or BEPS program. Additionally, Andrew manages DOEE's Seed database, which we'll be talking about today, and that serves as the primary repository for building energy benchmarking and performance data. Andrew also enjoys hiking and a good index match formula.

So, with Seed, we'll be digging in and figuring out, okay, you have an understanding of how many hedges you're dealing with, what those hedges look like, and all of the different pathways that you can take through those hedges. Now you need to pick one and what Seed does is it pulls all of that data together. It brings in sort of your building count, your covered buildings list. It brings in all of your attributes and performance data, so you can look at HVAC systems, your envelope, your lighting systems at the scale of a portfolio. And so, then you're able to think about how you want to prioritize different technologies or outcomes to optimize for energy savings for emissions or anything else in order to achieve the goals for your program, for your portfolio, or your organization. And so, Andrew will be digging in with us there.

So, with that, you can go back into Slido, and you'll be able to select your breakout. So, this will all be self-selected, and we won't be doing anything here in the main room. So, as a quick recap, breakout one is just understanding how many buildings you're dealing with and where they are for unique building ID with Miami Dade County and support from Pacific Northwest National Lab. Breakout two is asset score and audit template, so really doing that due diligence on building by building basis with El Paso, Texas and support, again, from Pacific Northwest National Lab. And then, breakout three is Seed and picking your pathway and setting programmatic goals. That's with Washington D.C., and

support from the National Renewable Energy Lab and Lawrence Berkeley National Lab.

So, I think we are going to give folks a minute or two here. Again, that code is DOEdata on Slido.com. And you should be able to go and –

Jonah Saacks: Harry, they'll be prompted in Zoom to select their breakout rooms. It should be a prompt in the lower corner of their screen.

Harry Bergmann: Awesome, great, thank you Jonah. Great, so looking forward to seeing you all in the breakout rooms, and then we will reconvene here in the main room at about 12:15 Eastern to wrap up with a last few resources and Q&A and discussion.

UNIQUE BUILDING IDENTIFICATION BREAKOUT SESSION

Kevin Keene: Thank you, everyone, for joining the Unique Building Identification breakout session. I'm going to do a quick background about what UBIDs are, and then turn it over to Miami Dade to go into more detail about what they've been doing and give them most of the time. My name is Kevin Keene with Pacific Northwest National Laboratory, and feel free to reach out to me with any questions about UBIDs or reach out to Sarah Newman, who is the project lead, and you have both of our contact information right there. So, without further ado. So, before I jump into what a UBID is, I'm going to frame it with a little bit of context about why we even need UBIDs. So, Harry already gave a little bit of a background, but I'm going to go into a little bit more detail.

So, the purpose of UBIDs is to find a way to compare and identify different buildings between datasets for a variety of purposes. And so, the most common way that buildings are identified are through addresses and addresses come with a variety of issues. A few of them are listed here. A big one is there is differences in terminology and syntax, whether words are spelled out or abbreviated. A big one that's really hard to correct for is misspellings or errors in the address names, and also they're oftentimes not unique for a building. There's buildings that can have multiple addresses for different entrances. And there's some stats here on the right about the difficulties with matching addresses. You can see success rates can vary between 50 to 80 percent, and it can take a lot of time to cleanse and put addresses in a way that they're comparable with each other.

So, the purpose of UBIDs is to make this easy by having one unique way to identify a building based on its geospatial properties, and that can easily be used to compare different datasets. A common application for UBIDs is benchmarking. So, here is just a quick example of how this can look in benchmarking with addresses. All cities and counties will have a covered buildings list, which typically comes from assessor data or other property-related data. It has an address associated with it. And then in Portfolio Manager, reporters enter their information, which may or may not align well with the assessor's database view of what this is going to look like for energy benchmarking where there's a covered buildings list with data that comes from property data or other spruces. And then an Energy Star Portfolio Manager, you have user-entered information, which may not align with the information from the covered buildings list, and it may not align with information from other datasets in the jurisdiction.

So, Harry mentioned before, a UBID is sort of comparable to a VIN for a car. So, here is just a little view of what that can look like. You can sort of tell some characteristics about the car based on its identification number. So, similarly for UBIDs, the string that's used to identify buildings comes from characteristics of the building, looking geospatially, in particular. So, this is what a UBID looks like. So, say you have a building footprint on the left in step one. The first part of the string is an identification for the centroid of the building, and that's based on open location code, which is a way of basically dividing up small rectangles across the globe and giving it a unique string. So, the first part of the string identifies the centroid of the building based on open location code, and then from that, the UBID is basically the bounding box around the footprint itself.

So, you can see the boundary box is created, and then the remaining portion of the UBID string is the extent from the centroid to the edge of the boundary box in the northeast, southwest directions. And so, I'll show – I'll give a quick demo at the end of these slides to maybe help shed some clarity on that, too. Here's some of the main use cases that we were focusing on during the creation of this project. So, energy benchmarking is a big one, creating UBIDs for covered buildings, and being able to cross-reference with other building sets, green building certification or any other types of building certification, really, is an application to apply some sort of ID to a specific project within a building. And, third is real estate data management, so looking at property data and adding UBIDs to buildings, properties, and

parcels in order to streamline datasets and use for real estate transactions and other uses.

And, finally, an area that we talked about but not really dived into is the Smart Cities, so looking into using UBIDs for more specific types of things that could be used for more futuristic purposes. Here is a list of some of the resources that are available for UBIDs. If you don't have time to write these down, I can put these in the chat. Just let me know. The first one is software packages, so this is available on our GitHub website. There's open source uses in four different program languages, in API and CLI, and this helpful for creating UBIDs for portfolio levels or large number of buildings, and also streamlining it into workflows.

We have the UBID demo site, which I'm going to show you very shortly, which is helpful for visualizing and creating individual building UBIDs. We have a react component also on our GitHub website. And so, this is something that we've created recently. You can use this – there's modular components, and you can basically take this and put it into any sort of website or other application and basically get any of the functionality of the demo in whatever application you need it. Finally, we have the DOE and the PNL websites where you can learn more about UBIDs. So, feel free to check out either of those websites.

And now, I'm going to switch over to a demo. Okay, so, I have the website bookmarked, but it's UBIDdemo.labworks.org if you would like to follow along on your own computer. So, here you can enter a UBID if you already have one. I suggest going right to the map feature and expanding out both of the sides, just so you can get everything at once. And, on the left, if you don't have a UBID already, you can also create one in this tool. You can search for an address. You can put in lat/long coordinates, or you can put in well known specs that describe the footprint, if you have that available. So, I'll just put in an address where I work.

So, it zooms right in, and it automatically encodes the centroid. Here you can see this little green box. So, I'm going to zoom out just a tiny bit so you can see the whole building. And if you click on this pencil feature, it lets you basically modify this shape so that you can trace the footprint to match your building. And you can do any sort of shape. It doesn't even have to be a square. So, you get, like, a pretty close approximation to what your footprint is. And it'll pop up if you click the pencil again.

And so, you can see the UBID visually is the bounding box that's around the footprint with the centroid in the middle, and the extents. So, on the right, you can get some properties of your UBID that you just created. On the top is the centroid, and on the bottom is the centroid with the extents, measured in meters. And you have it also down here, if you would like to copy and paste it. So, I'm going to stop sharing my screen and turn it over to Miami Dade. If you have any questions, I can answer them when they are done.

Marta Marello:

Thank you, Kevin. And hello, everyone, good morning. My name is Marta. As you heard, I work in the Office of Resilience of Miami Dade County. I'm joined today by my colleague Chris, and we also have a couple of folks from the IT department, because they were critical in making this project happen. And we're also just really excited. This is the first session of the Better Building Summit, so, you know, I hope you'll attend many more. I now I will. And so, with that, let's start. So, we're going to talk about UBIDs. Next slide, please. So, the plan is to introduce our office, just very briefly, and then tell you, you know, how we came across UBIDs. And so, what is the history of the project, how we're currently using the UBIDs, and, you know, we'll give an example of a practical application that we're using the UBIDs for.

And then, we'll also give a live demo of the Find My UBID tool that we developed. And then, you know, there will be plenty of time for Q&A. And so, I know that you should be able to post in the questions in the chat. I'd say, you know, since this is, like, kind of a smaller group, so, you know, if you think this is a clarifying question that you have to ask, you know, feel free to just to unmute yourself and ask it, and then, you know, we can always say, too, that we'll address that later on in the presentation or at the end. And so, I think with that, we can get started.

So, next slide, please. Thank you, Chris. So, we're in the Office of Resilience of Miami Dade County. We work on the causes and consequences of climate change. So, we have three different groups in our office. The first one, the mitigation group where Chris and I work, deals with the causes of climate change. So, how do we reduce greenhouse gasses emissions. And so, we primarily look at energy efficiency, renewable energy, and transportation, you know, how to reduce vehicle miles traveled, you know, how do we transition to electric vehicles, and similar. And then, another group in our office deals with the consequences of climate change, and, you know, mainly sea level rise, since it's a big one down here, as you can imagine.

And now we are also stating to address heat. So, the mayor just appointed a Chief Heat Officer, since it's something, you know, that affects, especially, older populations. I know it's hard to imagine, but there are houses here and buildings that don't have air conditioning. So, it's a huge issue. And then, the third group, the third team, is the communication team, and they support everyone in making sure that all of our messages are on point and get to the right audiences. So, we work with the entire county. There are 34 municipalities in our county, so it's a pretty large area. But not, enough of that. We can move on and talk about the UBIDs.

So, as Kevin mentioned, and Harry before him, really, the purpose of unique building identifiers is to really be able to identify buildings accurately. And I don't know how many of you have tried to match different datasets, where, you know you have some building characteristics in one dataset, and some other building characteristics in another dataset, and you have to, like, match it, really, and you have to find a common denominator and then try to make the match. And it's a nightmare. I know some of you probably have tried it. It's dreadful, I'm sorry, you know?

And so, even if you haven't tried that, but even sometimes, you know, you're trying to look up a building, and you know what it looks like, and then you type in an address, and then Google Maps, you know, shows a different building, or it shows the back entrances. And you're like, wait, this is not where I need to go. It's a problem. And so, you know, when we're trying to identify buildings, you know, to, you know, for our own programs and policies, we need to be able to do so accurately. And merging different attributes for a same building is very important, you know?

And here I have a few examples of how, you know, how powerful this mechanism can be, you know? Because a lot of information is contained in the property appraisal dataset, you know, information such as the square footage, you know, the owner, you know, the actual address, and, you know, the folio number, and similar, you know? But then there are other things that you might want to know about the building, and, you know, just from, like, a resilience perspective, you know, we have different maps and databases that tell us, okay, what is the sea level rise exposure? We're looking at heat exposure, we're looking at the energy burden. We want to maybe overlay some demographic information, especially looking at equity. This is something we're

really trying to look at. So, this becomes very, very powerful, and we need an accurate way to do so.

And so, this is why, you know, we're very excited that we created, you know, unique building identifiers for all of the buildings in the county. And, as Chris will tell you later on, you know, the one application where we're going to start to use them very, very soon is for benchmarking purposes. So, tracking energy and water consumption of buildings. And so, be able to connect, you know, the different building attributes, you know, and along with the energy and water consumption. So, that will be what we mostly discuss today. Next slide, please.

So, how did we come here? The history is that the Office of Resilience joined the Department of Energy Building Energy Data Analysis Accelerator, the EDA Accelerator, back in 2018. We learned about the unique building identifiers developed by the Department of Energy and the Pacific Northwest National lab, and so, we decided that we were interested. This was something that was going to bring value to our operations, you know, not just to the Office of Resilience, but also to the rest of the county. And so, we started working together, and the IT department provided PNNL with the county's building footprint layer, and the PNNL developed UBIDs for each building in Miami Dade County, and then ITD took this layer and integrated it into, like, a geospatial database.

And I know that other cities did this step differently, so I'm going to let some of the technical people explain this if you have specific questions. But from my understanding, we use, like, an ASII based, so ArcGIS-based database, and some others have used Python. So, not geocoded database, basically. And then, like, the last step of the process is that ITD developed a Find My UBID tool, because, you know, one the UBIDs were assigned to every building in the county, then, you know, we need a mechanism, an interface for the users to find, you know, to find out the UBID that is associated with their buildings or their building that they're managing. And so, IT developed this neat interface that we'll demo at the end of the presentation. Next slide, please.

So, I just wanted to tell you a little bit about the current architecture, you know, how we set this up. I think I alluded to it in a previous slide, but we have a UBID layer, which is hosted by the IT department, and will be updated regularly to reflect, you know, demolitions and new construction. And there's a lot going on here in Miami Dade, so we still need to discuss, like, a schedule, you

know, like do we want to update this database, like, once a year, twice a year? I think it's going to be more in the once or twice a year timeframe, but, like, we can do it, you know, more frequently, as we've been told. So, that's great. And so, the UBID layer is hosted via a geocoded database. In our case, it's like ArcHub in ArcGIS. And you can see, you know, here on the slide, I have an example for the American Airlines arena.

You can see a picture of the building, and then on the map, you know, on the Find My UBID tool, you can see, at the very top, you can see the UBID, the UBID string, and then you can learn other attributes about the building, you know, the folio number, the building height – in this case, it's not accurate – the address, the zip code, you know, the commissioner, the string number, and things like that. And I think we have a second – we have more attributes than that. So, these are all information that we wanted, you know, so rather than just, like, UBID or, you know, just like the building information. And the last thing I want to mention is that there are about – there are over 550,000 buildings in the county. And so, we have UBIDs for all of them, all of those structures, which is really great. Next slide, please. And I think this is where I hand it over to Chris to explain, you know, the practical application of this project as it relates to benchmarking.

Chris Sanchez:

Great, thank you so much, Marta, and thanks, everyone, for joining us today. We're really excited to be able to talk about our experience integrating UBIDs into our work. So, as Marta mentioned, right, we now have UBIDs assigned to about five and a half hundred thousand buildings, and it would certainly be way too much to bit off to try and do that all at once. So, what I'll do now is just kind of talk a little bit about how we got to that point, how we developed this model, and how we implemented it, and how we're sort of going through some testing right now to try and gather some feedback and, you know, improve it as much as we can. And then, I'll end with a little demo. So, we'll show you how the tool works and talk a little bit about what users will see from their end when they try to interact with UBIDs.

So, I guess a precursor to this explanation is to say that this is sort of aligning really well with another program that we have in the county that's called Building Efficiency 305, also known as B305. And we thought that the Building Efficiency program would be a great opportunity to sort of develop and test this model so that we could kind of start with a manageable model size and number of buildings, and then start to expand out to the full 550,000 that Marta mentioned. So, Building Efficiency 305 really tries to

voluntarily ask owners and managers of large buildings in Miami Dade County to register and start to try to benchmark and also reduce their energy and water consumption in the buildings. And really, the goal of the program was to focus on large, existing buildings that were larger than 20,000 square feet, and when we pooled that list from all of the buildings in Miami Dade County, it came out to about 12 and a half thousand, 12,265.

And so, this was sort of our starting cohort to begin to assign and develop the protocol for UBID assignment in buildings in the county. We worked really closely with our ITD department and hats off to them, because this is a lot of work and they were extremely helpful throughout the process; a lot of back and forth. And so, essentially, the key dataset that we started with was our property appraiser dataset. And so, we basically assigned UBIDs to all buildings using the folio number as a starting point, again, pulling that information from the property appraiser. Now, the challenge what that, as you might understand, is that folios often contain many different building footprints associated with them. And so, in order to sort of refine this model, we basically used the – at the parcel level, we eliminated the extra building footprints by using a model to only obtain that centroid of the building that you saw referenced in the earlier demo so that we could eliminate the extraneous buildings that weren't associated with the B305 building list, again, that 12 and a half thousand.

So, once we were able to narrow it down just to those buildings, we were able to, then, sort of troubleshoot and find out, you know, where there were maybe some issues with UBID assignments and tweaking the model to make sure that everything was matching up correctly, and actually reflected, you know, the true building footprints that we wanted to capture in this process. So, in practice, you know, once we had that model developed and we were able to successfully assign UBIDs to the buildings that we wanted them to be assigned to, we began to roll out this UBID process as part of our broader benchmarking efforts, again, tying it into that Building Efficiency 305 program.

And, you know, the typical workflow that we would imagine is that a building manager would use our tool that we've developed, this Find My UBID, which is, you know, sort of a public-facing tool that allows anyone to look up a UBID for a building, and then the participants in Building Efficiency 305 could, then, add that UBID to their Energy Star Portfolio Manager account, which is the benchmarking tool that we've chosen to work with, and when they share their buildings with us, through Portfolio Manager, the

Office of Resilience then has an easy method to consistently track buildings for compliance with that benchmarking process.

And as benchmarking continues to be a more and more commonplace practice here in Miami Dade County, and we have some municipalities that are talking about looking at, you know, building performance ordinances, these are things that we'll additionally continue to build on and help, you know, provide that consistency and compliance throughout the process. So, you know, in terms of actually testing this process, like I said, we're really using our Building Efficiency 305 cohort as a testbed for this. You know, we're asking folks who are participating, as they do their benchmarking process, to also consider looking into a UBID, and assigning that UBID to their building in, you know, the benchmarking platform that they're using.

And we've got a wide variety of challenge partners. I believe we're up to over 50, at this point, which are all across different sectors. We have private buildings, non-profits, in all sorts of different shapes and sizes. So, it's been really useful for us to see, you know, the entire spectrum of capacity and knowledge and know-how that different building managers have in this space to be able to really see where some of the pain points might be in using this UBID information. So, we still have remaining questions. There's a lot of work to be done. So, the first thing is, you know, when we think about the broader context of this work, right, our office – you might ask yourself, why is the Office of Resilience working with building IDs.

You know, we really serve – we're a small office. We're only about 15 people, but we serve sort of this enterprise-wide role in working across all county departments to help, you know, make things consistent and do all of that in support of achieving resilience in many different angles. So, you know, not only are we linking different datasets, right, but, crucially, eventually, once this is fully rolled out, we'll also be able to link different programs across the county, and like Marta said, start to see some of those multiple angles. You know, you're not just looking at building information, but you're also getting information about sea level rise, about energy burden, and so it really helps us to kind of coordinate at an enterprise-wide level when we think about strategically using building data.

So, we do have remaining steps. So, a lot of the building data that you'll see in our tool, which I'll demo in just a second, does pull from our county's property appraiser website. It's a great dataset;

it's very useful. But it's not perfect. And so, as Marta point out, right, one of the buildings that we highlighted in a previous slide had a height of zero. Some others have some strange inconsistencies in square foot, you know, building area reporting. So, we do need to kind of go through and evaluate that dataset and try to identify ways to resolve some of those issues as we pull data from different places, and also continue to sort of integrate this into some of the other work and databases that we use as an office also across the county.

We're currently working with our ITD folks to publish this tool. So, you'll see sort of a behind-the-scenes sneak peek today, and we're working to go through the process to get all the approvals and final communications review to get this tool published so the public can then access it. And in the future, right, as municipalities begin to roll out these building performance ordinances, we would love to see this tool start to be used as the standard method for building owners to identify their buildings. All right, so with that, I'll take a pause for a second and switch screens here, and we'll do a live demo of the tool.

All right, so, like I mentioned earlier, right, our tool is called Find My UBID. It's pretty self-descriptive, right? We want folks to use this to identify their UBIDs for their building. And it's built, again, on that backdrop of the ArcHub system, so it's been a very useful platform for us, just in being able to have many of our tools and websites connected. It's presented in a very sort of basic Google Maps style view, which we hope will be very familiar to most users. And there's kind of two main components. So, on the right side of the screen, you can see we've got a map, which we're able to scroll and zoom in and out. And then on the left-hand side of the screen, we've got some useful contextual information that helps the user understand what the reason of the, you know, for the use of the tool and how to use it.

So, the nice thing about this platform is we're also able to embed additional information. So, you'll see right now the panel that I have highlighted on the left is focused on, you know, what is a UBID, how to use the tool. But, as you go through that information, you also arrive at two other panels that we've developed. One, the first, which links to our Building Efficiency 305 program. So, again, it's really easy to start to build that connectivity between this UBID dataset and the programs that we want to see it used for. And then, we've also got a Contact Us page, you know, so that people can get in touch with us and ask any questions they might have.

So, you know, finding your property on UBID, you can do this two different ways. So, you know, you can manually zoom all the way in until the layer is activated, and you can start to see some of those building footprints populate. But what we expect most users to do is to use the search feature that we've developed. So, I'm going to go ahead and type in the address of our main county government building here and hit search. And the nice thing is this tool is also pretty good at picking up different address formats, so you can see, I typed in just the, you know, the street address, and it automatically was able to still locate our building.

So, now that we found our building, we can zoom in a little bit further. It'll take us down to the layer level so that we can start to see some of those building footprints populate. And so, what you can see here is we've got our Stephen Clark Government Center. And if I click on our building's footprint, you'll see the pop-up come up that you saw earlier that has all of our information. So, you know, first and foremost, you can very easily obtain your actual UBID, but, again, we're linking all of this great information from our property appraiser dataset; you know, folio number, building, again, building height doesn't return correctly – we've still got some work to do to correct that – but you get your address, your county commissioner's name, your county commissioner's district, what municipality your building is located in, you know, year built.

So, these are really all useful characteristics that allow us to kind of view information about a lot of buildings really quickly, and for those building owners who may want to verify something, or to just see, you know, some of this information they may not know, this is really helpful. And then, last but not least, we've got an automatic link built into our Energy Star Portfolio Manager. So, for those who will be using this for benchmarking purposes, it's really easy to toggle back and forth between the two. So, that's a quick preview of what some of the, you know, actual building UBID information looks like. It's that easy. You know, unfortunately, there's not a lot to demo. You type in your address and you get your building's information. It works like it's supposed to.

And so, I'll just, you know, show you real quickly on the site here, as you, you know, continue to navigate through the tool, if you're interested in learning more about our Building Efficiency 305 program, we've got some quick information on the left, and we were actually able to program this in a way that it will pull up, you

know, the relevant website, so you can see a preview of our B305 hub page here on the right, which has a lot of additional information about the program. And then, last but not least, just, you know, simple Contact Us, the links to our website. So, it, you know, on the surface, seems like a really simple tool, it works very simply, but we, again, have to give a lot of credit to our ITD partners for all of the work they did on this.

Even after we got things running, right, there was a lot of back and forth just to iron out some of the issues you might find in the specific data about different buildings, or, again, just to double check that the model is working correctly, and that, you know, you're actually assigning building footprints and UBIDs and centroids as you might expect to. So, with that, I will go ahead and bring our Power Point back up here. All right, and so, thank you all for taking the time to listen to our presentation. You know, we hope that you found this useful. We're happy to take some time now to answer any questions you might have, and we do, I believe, have some of our ITD folks here with us to maybe tackle some of the more technical questions. Marta and I did our best to walk through the model development, but as anybody who's worked in this field may know, right, it's very complicated and a lot of technical details along the way. So, thank you all, again, and happy to, yeah, chat with you and answer any questions.

Tyler Grubbs:

Thank you very much, Chris and Marta and Kevin. Hi, everyone. My name is Tyler Grubbs. I was helping on the back end to facilitate today's session. I had a bit of trouble getting into the breakout session, but it looks you all did a seamless job of getting started without me, so thank you very much to our presenters. In looking at the questions, I do see we have a few. So, I will just dive right in. Marta and Chris, how do you plan on communicating the UBID to the covered building community?

Marta Marello:

Yeah, that's a good question. I can start, and then, Chris, feel free to jump in. So, I think what's great is that, as Chris mentioned, you know, like, we know what project we want to pilot this with, and now that we have all of the pieces ready, we're going to start with a selected group of buildings that are a part of the B305 challenge, you know, which is one special component of the B305 program. And so, we will basically let them know that this UBID tool is available, and so, if they benchmark, they can integrate their UBID number into Portfolio Manager, because now Portfolio Manager has a special slot for standard IDS. And so, you know, I think we're going to send them an email, let them know. It's like, please, you know, test this tool, use it. We're going to give them some

instructions, you know, the link to the Find My UBID, and then they can go in. And so, I think, like, doing this with, you know, 50 or so buildings will be a great way to kind of test it out and see, you know, how we can fine tune our message once we go out, you know, to the larger group and let the community know that this is available. Chris, do you have anything else to add?

Chris Sanchez: Yeah, I just think, you know, as we start to continue to expand our emphasis on benchmarking, you know, through voluntary programs, and, like I said, you know, municipalities across the country, but, you know, within Miami Dade County, especially, are starting to talk more and more about building ordinances, you know? But we'll start to really amplify that messaging around how to use this tool and how to obtain a user UBID; not just, you know, get it, but how to use it in multiple applications as well.

Tyler Grubbs: Thank you, both. I do see – so, we've got several – I would say more technical questions. So, this – maybe you guys can field these, or maybe your ITD team wants to jump in. But, let's see, Emily asks if the area – does the area calculate the footprint area or the building area, and is there any way to add the number of floors or something to get total building area?

Kevin Keene: I think that was from my part, talking about the demo tool that I showed. And the area that I mentioned is for the bounding box. It's not for the footprint itself. So, there are tools out there if you want to trace a building and get the geographic area of that, you can do that. Or, you can do it in, like, ArcGIS or a program like that, and then attach the number of floors, if you have that information available.

Tyler Grubbs: Okay, great, thank you, Kevin.

Marta Marello: And, I guess, I'll add that, in case the question was for us, I think, and Stephen – we have Stephen and Yvonne here from ITD team. But the – it was the county that provided the lab with the building footprint area, so this is something that we had in-house. And then the, you know, as for the square footage area that you see in the tool that pops up, that's the square footage that comes from the property appraiser data. So, there's no calculation there. It's just, you know, an attribute that is pulled out of a dataset.

Stephen: Right, and, I mean, you guys did an incredible job explaining. All the information on the county side that we get comes from the property appraisal, as Marta mentioned, and Chris. Also, there might be issues, I mean, because the data, again, is not perfect, so

there might be issue with the data itself. The way we process this information is we – the GIS portion of it is a derived dataset that we get that information from the property appraisal and bring it into the GIS, and we grab different property appraisal databases on to make one dataset, and this particular case, is the parcel database. And there may be issues there in the back end. So, when you start running through some of these tools, you might start seeing some of these things not having the correct information in there, and that's when you have to dig a little bit deeper on the back end to clarify some of this. And that's part of the process that we're going through right now in the model.

Tyler Grubbs: All right, thank you, all, very much. We had a question from Rob, who asks, we're a municipality just developing their covered building list. Is the PNNL tool something we could easily apply to develop a list of UBIDs for a portfolio? And then he asks, do we need to collaborate with PNNL to start?

Kevin Keene: So, one of the links that I mentioned with the software tools in my presentation has a place where you can create UBIDs in mass. You do need some basic programming or command line tools, but that is publicly available and open for anyone to use. Or, if you want PNNL to do it, we have some money for technical assistance at the moment, but not forever, so.

Marta Marello: And if I can add something, it would have been nice to have the UBIDs when we developed our list, because we really had to merge three different lists together, and that's where we had our planning department and then IT department involved, because that's not something we could do with an Excel file, and it was really complicated. So, it would have been nice to have that tool available, and I think that's also why, you know, basically the main reason why we pursued UBIDs afterwards.

Tyler Grubbs: Thank you very much. We had a question, anonymous question, asking, is there a sense of how widely UBIDs are being used by different organizations, programs, or ordinances. So, Kevin, I imagine you might have something to say about that, but just in my experience supporting DOE, I know that, for example, the Building Energy Data Accelerator that Marta mentioned as having found UBID as part of Miami's team, there were 13 partners – a lot of local governments, we had some private industry partners who wanted to use UBIDs in the context of commercial data management and insights. And especially, I think, as you see more and more cities adopting benchmarking, or even going further, like Miami plans to and DC already has with the building performance

standard, they are finding that UBIDs are very helpful in just being able to manage all the data that comes in. So, Kevin or Marta, if you guys wanted to add anything about what you're seeing or what your thoughts are on how widespread UBID adoption is, I'm sure our audience would love to hear it.

Kevin Keene: Yeah, so the participants in the accelerator, we've talked with other third-party groups, like Lightbox and Microsoft, throughout the years that we've been working on this, and they've used it for some applications, and there's a field and Portfolio Manager for UBIDs now, so that's sort of a sign of adoption, of sorts. That's what comes to mind for me.

Tyler Grubbs: Thanks a lot, Kevin. Going back into the questions queue, here's one from Jim. With all of the office of resilience throughout the US, do you know of a conference that brings together these ideas like UBID as well as best practices? It also says great panel, so nice job, everyone.

Chris Sanchez: Yeah, I'll take a shot at that. So, I don't know of any specific conferences that are focused on, like, office of resilience and, you know, tools like UBIDs, but we've had a lot of success in Miami Dade County connecting through our Florida Sustainability Director's network, and also our – I think it's the Southeast Sustainability Director's network, which Marta is involved with, as well. And so, that's been a really good resource for us to connect with similar offices across the state and the Southeast to share these kinds of best practices. I don't think we've actually done a ton of connections around UBID, but it is a tool that, like, you know, once we have it published and a little bit more publicly available, we'd love to kind of share that with our colleagues. So, that's been a really useful resource for us for all kinds of topics. So, you know, this could definitely be one of them.

Marta Marello: And I guess I'll add that, I mean, this summit is great. I think it does really do a good job of bringing together all of these different, you know, topics and that are, you know, somewhat more technical, but as well as less technical, and, you know, and focusing on other, you know, I think it really focuses on the whole spectrum. So, I think, you know, we try to attend every year, and we just find a lot of value. And, you know, as Harry was introducing, you know, the different breakout rooms, I, you know, I chatted with Chris, and I was like, ah, man, I wish we could attend break room number two, because that seems really interesting. And so, I think we'll have to go back and look at the recording, you know, because it aligns very well with, like, some

of our programs. And so, you know, even if you're not able to attend all of the summit, of course, it's impossible to attend every single session, but, you know, the website offers, like, just a great amount of resources, especially around building efficiency and benchmarking. So, I would really check it out.

Tyler Grubbs: Thanks to you, both. And Trevor asks if, or, it says I may have missed it, but is this UBID accessible to the public to use yet? So, absolutely, Trevor. It is free, open source, and available right now. Kevin mentioned that he put several helpful links in his presentation, and so, I'm sure that we will be sharing this presentation with everyone with us today as well as the recording. You can also just search UBID or UBID PNNL on Google and find that right at the top. Duncan asks if there is any altitude, Z-axis capabilities to be able to track building energy in least floors, et cetera.

Kevin Keene: So, we've talked about adding dimensions to UBIDs before, and have done a little bit of work into it, but still sort of in preparatory stages. I'm not exactly sure where that's going at this moment.

Tyler Grubbs: Thanks, Kevin. All right, I think maybe another one for you –

Chris Sanchez: I'm sorry, Tyler, do you mind if I jump in on that one, too?

Tyler Grubbs: Oh, yeah, sorry, Chris; please do.

Chris Sanchez: No worries. So, one thing that we found is, you know, even though the Z-axis isn't, like, baked into the UBID itself, when we pull in our property appraiser database, we pull in building height as one of our characteristics. And, unfortunately, in both of the examples you saw today, it's zero, right? So, something's not quite right there, but, you know, once we get that connection corrected and we can find out, you know, what the true building height should be through the property appraiser, that's a really easy way to link that information, as well. So, in our database, you could sort UBIDs by height, you know, however you might want to do that.

Marta Marello: And, Chris, if I can add, you know, that's a really good point, and not only do we have height, but you know, in the second example, when you were demoing the tool, you could see that our, you know, the main government building downtown has 31 floors. So, you know, floor numbers is another one that you can use to tackle that. And I think, you know, I'm not – it's going to be interesting, you know, as we start using it for benchmarking purposes, I'm curious to see, you know, what are going to be the factors that will

become the most relevant, because I think, you know, looking at, you know, each floor per floor, I think it depends from the, you know, the building systems, and, like, the building use type and things like that. Yeah, I guess that's something to keep in mind.

Tyler Grubbs: Thank you. A couple of questions that I suspect might be related. The first, if our GIS department was already able to pull building footprints from a property layer, is there a way to bulk upload to get a list of UBIDs? And then another question, is there an API available to retrieve UBIDs?

Kevin Keene: So, I can answer that. I mentioned the software package. If you have footprint data available, you can use that. It takes chip files, and can make UBIDs from them. So, that link was in my presentation, and it's in four different programming languages. So, you'd need a little bit of basic program experience, or pull in someone who does to do that. And what was the second part of the question, Tyler? I feel like there was something else.

Tyler Grubbs: I'm sorry –

Marta Marello: I think ADI.

Tyler Grubbs: the second question was is there an API –

Kevin Keene: Oh, API?

Tyler Grubbs: available to retrieve UBIDs.

Kevin Keene: Gotcha. So, there is also, in the software packages, and API available for – I think it's just – I think all four of the languages have an API available, but I'll have to double check. And then, I also mentioned the modular react thing, so that doesn't have an API for doing them in mass, but it does for individual buildings, and that component can be taken and used.

Tyler Grubbs: Thanks, Kevin. Did you want to jump in, Marta? Okay. That does bring to mind another question – how would you characterize the learning curve or, like, the technical sophistication? You mentioned, you know, you need some degree of programming or coding skills to be able to implement the UBID. How would you generally characterize that? Do you need to be an expert or do you think this is within the reach of most cities out there, given their, you know, their staff and their capabilities?

Kevin Keene: Well, I can start, and maybe Marta or Chris can jump in to talk about their experience, but, I mean, I learned how to do it, and I'm no a programmer, so it's definitely doable. So, yeah, you just – and the instructions are pretty good, too, the read me on the GitHub, so, as long as you are somewhat computer savvy, I think you could do it. Or, I think also, like, you know, a lot of jurisdictions could probably have expertise somewhere to find someone to do it within their portfolio.

Marta Marello: Yeah, I mean, I would say, in our experience, there was, I mean, there was somewhat of a learning curve, but, honestly, like we – all of the most technical parts were delegated, and so, you know, to the expert at IT. So, I would say that, you know, we were taken care of. We were very lucky that we had in-house expertise that could support this project. So, it's great to hear that, you know, even someone who, you know, does not have a programming background, you know, can actually tackle that. And maybe, you know, I'll let, you know, Chris or Stephen, you know, jump in, but, you know, I wonder, you know, I have a follow-up question, you know? In case somebody does want to adventure into the UBIDs and try to create them for their local government, could, you know, is there a forum or, you know, another – I don't know, some other way to, you know, ask questions or read about other people experiences? I don't know if it's, you know, something that'll have to go to stack overflow or something. Oh, and I see that Marissa, we're going to close this room soon, so I'll stop talking, pass it to Stephen.

Stephen: No, I'm just going to say, just to add, that it all depends on the resources available, right? And in the county's case, it's basically we have the GIS portion available. Some cities might not be so lucky as to have that, so they're going to have to go and scrounge up the information, little by little.

Kevin Keene: Thanks, everybody.

Stephen: Okay, perfect. So, we're done?

Tyler Grubbs: Thank you.

Stephen: Bye.

SEED BREAKOUT SESSION

Andrew Held: Great, all right. Welcome, everyone. As Harry already said, my name's Andrew Held with DC's Department of Energy and Environment, and I'm here to be talking about how our energy benchmarking program and Seed and how to utilize this great open source tool from the Department of Energy. Real quickly, I'm going to give a quick history of energy benchmarking in DC. I think that sets up nicely how we ultimately chose to use Seed for our purposes. So, starting in 2008, [inaudible]. This is, to the best of my knowledge, the first piece of legislation –

Interviewee: Sorry, Andrew, I muted you. There was a – we had a couple audio issues, sorry. You should be able to unmute.

Andrew Held: There we go, you can hear me now?

Harry Bergmann: Awesome, yep, loud and clear, thank you.

Andrew Held: All right, where'd you lose me?

Harry Bergmann: Just start of history of benchmarking here.

Andrew Held: Okay, so, yeah, 2008, Clean Affordable Energy Act was passed. This is the first benchmarking legislation in the country. This was a requirement for all large buildings in the district, 50,000 square feet benchmarking data to the district for disclosure. Took us a couple years to, actually, land implementation. The first year, we actually implemented our benchmarking requirements was in 2013. This was back in, like, old school Portfolio Manager, everything was managed through Excel spreadsheets. I wasn't around for it, but I imagine it was very cumbersome. So then, going off of that, USDA launched the Seed project, designed to help building, or help jurisdictions manage these kinds of building energy data. We took a couple years to switch over to Seed, but we finally did so in 2018. It became our primary compliance database, which was just in time, because we had a lot more –

Harry Bergmann: Andrew?

Andrew Held: Yes.

Harry Bergmann: Sorry, we're getting a couple of comments. Your microphone is, like, fading in and out a little bit. So, I don't know if there's a way to stay a little bit closer to the mic or anything like that.

Andrew Held: Yes, how's that?

Harry Bergmann: So far, so good.

Andrew Held: Okay, if it cuts out again, let me know.

Harry Bergmann: Okay.

Andrew Held: So, yeah, 2018, the Clean Energy Omnibus Act was passed in the district. This increased the number of buildings that were required to benchmark. It also implemented or mandated our first energy performance standards. These are requirements for buildings to actually make targeted reductions on their energy consumption based off of these benchmarks. So, we're actually putting that data to work to measure buildings against themselves and promote an effective change in our city. In 2018, that was when our first standards were established and went into effect, and we are living in a post-BEPS world now.

So really quickly, just to cover the benchmarking process so we're all on the same page, this, again, is an annual reporting requirement for private buildings, 50,000 square feet and above, and public buildings 10,000 square feet and above. These buildings report their annual energy and water utility data, building characteristics, and gross floor area to the district through Energy Star Portfolio Manager. And then, we take that data, we perform data quality checks, send compliance notices, and disclose that data for public consumption. So then, how does Seed fit into this? So, Seed is our primary repository for storing these benchmarking reports. It also stores all our tax log data, AKA, our covered buildings list, the buildings we publicly say need to report their data to us. Seed provides us a way to match those reports to the tax logs, and it allows us to apply data quality checks and data quality labels to our reports.

And then, one of the fancier parts of Seed is that it exposes these API endpoints for partners, such as our sustainable energy utility to access the data for utility incentive programs, and for our technology officers to release the data for public disclosure. I've lost my mouse, okay. Let's really get into the actual fun part of the presentation. All right, are you able to see Seed?

Andrew Held: Great, okay. So, this is what Seed looks like. This is probably the page most people will see when they first log in. This is the inventory screen. For anyone familiar with any sort of database software, this will look very familiar. It is our data table of reports we have received with varying fields that we pull in from Portfolio Manager or are reported to us through our tax assessors. Seed lays

it out in a very nice way to view all our data in a relational database, columns and rows, et cetera. It allows for basic filtering of the data, so I can look for scores over 50. It'll pull all the property reports we have received and allows us to then export that data into Excel if I want to play around with it there, or perform other different functions in the database.

All of this is very customizable, so all the columns that are displayed are decided by the program, decided by the jurisdiction, based off what is actually loaded into Seed. And all of it can be exported on a dynamic function as well. These reports are organized in multiple ways, obviously, through the relational database that underlies Seed. We also have data quality labels that we can apply so we can look at all our compliant properties. We're looking at 390 compliant properties we have tagged manually basically as a way to just navigate our dataset, splice it in different ways, export it in different ways, manage it in different ways. I can also choose to delete the selected datasets, I can export the data, I can add and manage my labels as I want to.

Seed also has a very nice geocode functionality built into it, so if you're working with non-geocoded datasets, you can easily apply lat/long coordinates to it, or easily displays on maps. If you are working with a lot of fields where some might be blank – this is really common with Portfolio Manager data – you can choose to only show populated columns to easily filter down your data to the important stuff. There's even, for those who, well, people who are jumping back and forth between this presentation and the UBID presentation, there's also UBID functionality built into Seed to easily encode and decode UBIDs that are loaded in.

One of the really great features in SEED is that it has built-in data quality checks. So, I can select a couple different public properties here, I can run my data quality checks on them. I'll just flag them. I'm using a demo stage, so this might take a little bit longer, but we can see three of the six properties I selected do not have an Energy Star score. This is a great report for just posterity's sake, but then I can also click into one of these properties and it'll take a second to load, but then we will see that the label has been applied to the individual property itself. From this page, I can view all the data that has been submitted for the property across time, so we've done a number of different data pull for this property, and I can see how reports have changed over time. So, let's say tomorrow they submit a report with a score, I can see where that score change happened, and I can also see where the label has changed as well.

Again, this is very similar to the other screen. You can define which columns are being displayed. There's a very helpful notes field in case you want to pass notes back and forth between reviewers. And then, there is a very nice functionality called cross-cycles where Seed will automatically – let's say you have data back until 2010. I think I have back to 2014 for this property. I can see all the final reports back to 2014. I can see how this property has changed over time. Source EUI over the years. It's getting better, then slipped a little, it's slipping some more, and I don't have a compliant property right now, so I can't fully evaluate that building. And Seed lets you define all this. So, all these cycles are defined by us that match our benchmarking cycles. Each of them represent the calendar year, and all this analysis can take place across multiple cycles.

Then, let's see here, the other nice function about SEED is that it helps us match these property reports we receive with our tax lots, our covered building lists. So, for some quick context, DC requires that certain tax lots report their energy data. It's in the nitty gritty, but a tax lot could represent a building, part of a building, multiple buildings, and so could a property report. So, it's really important for us to be able to match those two numbers and make sure that we are confirming that the right property report goes to the right tax lots so we don't end up fining an owner of the tax lot because they didn't submit their data because we couldn't match the report to it.

Then, and this is built out to handle anything from a one-to-one relationship, a many-to-one, a one-to-many, a many-to-many; it's flexible and dynamic and addresses sort of all the nitty gritty details that we'll get into with any sort of building energy dataset. So, then it comes down to viewing your data, exporting it. I do want to give a little bit of a demo into how you actually work within Seed to upload your data. I'll give it a second to load for a bit. And you'll see, once it loads, again, non-demo staging runs very efficiently. So, these are all our datasets that we manage. You can see – we're were hearing some very kind of random management over the years, and then, suddenly, we developed web services through Portfolio Manager and we can pull a lot more data now.

You can add more data files to this screen, adding to any cycle. Seed supports a various number of upload functions. So, you can just upload spreadsheets, based on file, you can upload a Portfolio Manager meter usage. But then, one of the features that we use pretty commonly allows you to actually automate your upload of

Portfolio Manager data from Portfolio Manager itself. I'll try not to show my password here. I think we're good. And this will actually look into Portfolio Manager, look at the data requests that we have put out there and that building managers have submitted data for, and I can pull the data myself. I'm not actually going to demo this right now.

But looking into the data itself, you can see all the reports we've pulled, you can download and delete the various numbers of spreadsheets we've pulled in here. Seed allows you to then manually select how you map columns in your upload dataset to your Seed data, which allows really flexible adaptation to anything from, like, a Portfolio Manager column name change. I'm not going to show that right now. But then also, you know, if your tax data changes year over year or changes based on whatever
[crosstalk]

Harry Bergmann: Andrew, your mic is still going in and out a little bit.

Andrew Held: Oh no, okay. I will try to talk *[crosstalk]*

Harry Bergmann: We lost that last little bit after you were talking about import here.

Andrew Held: Here, one second. I'm going to try to turn off my automatic adjusting. How is that? Is that better?

Harry Bergmann: Yes.

Andrew Held: Okay. I played around with the setting. We'll see if that works.

Harry Bergmann: Awesome, thank you.

Andrew Held: Yeah, so, anyway, I was just kind of detailing how data mapping happens in Seed. The other thing I wanted to show really quickly is Seed has a lot of function that automatically assist cities or jurisdictions or organizations matching data. It also enables everything to be done manually, in case you notice a mistake and you are, you know, you're matching tables, or you want to be very targeted in sort of how you, like, align your datasets, so there's a manual parent table. That will take a second to load, but once it does, if it does – that's sort of the hazard of live demos, you know?

Harry Bergmann: I think while – okay, there you go, never mind. Go ahead, Andrew.

Andrew Held: If not, I will skip on.

Harry Bergmann: I was going to say, while this is loading, I think this import and mapping process is really important to highlight, because it is, like, how you get your world set up in Seed. It's also something that Seed right now, even though right now this is a demo staging server, and typically it's been something that you need to stand up sort of on your own with your own IT resources, we're going to have a publicly-available instance of Seed going live this summer, and so, that'll be something where you're able to go and create your own account, you know, just as easily as you would any other sort of typical website. You know, login with an email and password, and then create your sort of world there, so you don't need to learn so much on your own internal IT folks. But then, the first thing you're going to have to do is this sort of data import and mapping and matching, so I think this workflow is important. But, anyway, all right. We're all loaded up. That was the plug I wanted to make. Andrew, back to you.

Andrew Held: Perfect, perfect segue way. So, yeah, this is the pairing stage. This is, basically, how you would pair your property reports you receive with your company list, your tax log data. This is not really set up for offload pairing right now, but you would normally see a column with a bunch of addresses, and you can match them with the addresses on the backlog list. You can also use any sort of local tax log identification number. We have our eight-digit code here, and you can pull that for the reports that we receive, and we can – it's just a very simple, you know, drag and drop kind of functionality that is moving a little slow right now. We'll actually pop it over there. It's not liking the screen sharing. Also, I have a helicopter going overhead.

All right, this is not letting me right now, so let's skip past this. So, but, anyway, this is designed to be dynamic and – there we go, it popped up. I paired two properties with this tax lot and then I removed one. This is all very dynamic and easy to use. And that's how you basically align your reports with your tax lot. So then, again, as I sort of alluded to, a lot of this is all customizable and can be built for the city itself. You can go into the actual settings and define the actual – you can define the names of the columns in your database, you can determine what order they will be used for geocoding, define the data entry and whether or not they're used for match criteria.

You can also, at any time, go in and edit your mapping from existing datasets. So, one of the nice things that Harry was talking about, you know, your setup is you're going to upload that data, and you have to do it once, and that becomes arduous to have to

always select which field each column in your input dataset go to. But, Seed has a nice functionality where it'll remember the last matching you used, and autofill to automate that process for you, and then come in and define your data quality labels. I'm only using one right now so a lot of these are greyed out, but there's a wide range. You can use any column in your dataset to define new quality labels, check conditions, whether it's required, whether it's not null, look at a range, look at must contain values. And then, what you can do is on the back end of that, decide what label gets applied so you can easily filter your datasets. Sorry, again, there's helicopters going overhead.

So then, off of data quality management, again, save that, you can go in and manage your cycles. This is all part of the program timeframe for each cycle how to organize your data, and any labels that you want to use. So, some of these are applied automatically, some of them manually. It's really up to the jurisdiction to define how they want to manage their labeling functionality. And so, that, I think, covers everything, unless, Harry, there's anything else you want me to desperately show before I go off this.

Harry Bergmann: I think that was a pretty good overview. Thank you for walking us through your world in Seed here. I don't know, Nick or Robin, if there are things you want to highlight, or if folks have questions, you know, we'd love to see those in the chat here. Or, if you have those coming in in Slido.

Andrew Held: Yeah, and I'll say, after this demo, I do have a couple more slides that detail some other functionalities. I think before moving back, though, I just want to say, like, Seed is really lovely because it's so flexible and it is so dynamic, and it is open source. So, while you're dealing with this great out-of-package option, there is additional customizations you can make on the back end to make it really fit your jurisdiction or your organization, which is what DC has done.

Harry Bergmann: So, a couple questions are coming in on Slido, and so I can just run through these quickly. The first question is where is the data coming from. So, short answer is it can sort of come from anywhere. If it is in a spreadsheet or a CSV, you can bring it into Seed. In this case, let's see, Andrew, you're using data coming in from Portfolio Manager, which is EPA's tool. You're also using data from the Office of Tax and Revenue, is that right? What else am I missing? What other data spruces have you pulled into Seed here?

Andrew Held: That's it for us, but you could, I mean, again, if you're switching back and forth between presentations, you can easily pull in audit template data from others.

Harry Bergmann: Sorry, can you say that again, but get a little closer to your mc?

Harry Bergmann: Sorry, yeah, again, you can use any data source. So, if you're switching back and forth between presentations, you can pull in that audit data, that audit template data that other folks are talking about.

Interviewee: Great. And let's see, so, we have two questions that I think are fairly similar. So, can you talk through, I think, a little bit more explicitly about the benefits of using Seed and how you can use it for, like, how they're terming intervention decisions, and sort of how can you use Seed to guide action and policy? And I'm wondering if that gets into a bit around some of what you're thinking that you're able to share around the building performance standard in DC an sort of how this data informed that and how you leaned on Seed to work through that process.

Harry Bergmann: Yeah, so, Seed is really great as a way to organize your data into a way that is then easily digestible into any analysis you want to conduct. So, this is our living repository of building and energy data in the district, and it is our most current record. So, it is what was used to determine our building energy performance standards. This is the data that directly fed into determine what the median Energy Star score was for our buildings, and it is basically the direct influence on how we tell buildings to make improvements. So, that's the most obvious, tangible outcome of this data, and what Seed really enabled was the proper organization and the proper compliance tracking to enable that. That's not all it can be used for.

In other contexts, we share this data actively with our sustainable energy utility, which, in the district, is our entity that manages utility incentive programs. So, if you're in Maryland or any other sort of jurisdiction, it might be the actual utility, like Pepco, or Comed. But, in DC, we have it all managed through a government agency, or a government entity. And we share this data with them actively, and they use this to, then, go out and make targeted pitches to these buildings and provide incentives to them to incentivize improving energy efficiency. So, a lot of this data has fed into decisions that we have made and also has come back and reflected to us improvements in buildings so they can actually use this data to then track performance in a kind of a light NNV kind

of approach to benchmarking. It also feeds into a lot of our other, you know, district-wide reports.

So, we have a green building report we reflect every year that goes out to the public and we've been able to track energy performance over time through that, and splice it by building typology and determine where we need to make appropriate savings. It also kind of reflects improvement in data quality over the years, which is probably something that everyone can relate to here about your acutely – what you're feeding into any sort of analytical system. For example, you know, our multi-family data has gotten a lot better over time since we have mandatory requirements for utilities to provide whole building data. That's not, obviously, in every jurisdiction, but in DC, we can definitely see that happen year over year as more buildings report whole building performance to us.

And then the last thing I'll talk about is sort of on the horizon but there's a lot of other really wonderful USDOE-sponsored tools here, and Seed is working actively to integrate with them. So, for example, those who are familiar with the BETTER software, that's kind of a light energy audit turning point or changepoint modeling software that you can use Seed data to run analysis on a portfolio of buildings, on a single building. But, the Seed team, in the future, plans to actually integrate those reports directly into Seed, so it's not just, you know, you have to export data and upload to another software. They're directly tied together. Harry looks like he wants to say something on that.

Harry Bergmann: Yeah, well, so, that was a great segue way into a series of questions that are coming on Slido and in the chat right now. And so, these are all getting at what sort of analysis can be done and how Seed can enable decision making toward decarbonization goals, toward efficiency goals, toward picking which buildings you want to do interventions on. And I think you got at this a little bit where you were talking about how Seed enabled you to set sort of the median Energy Star score for your building performance policy, right? And I think the idea is then you were able to go and engage with the folks that are under the median score.

And for folks that are thinking about, well, you know, I wish that was just the UI, or I wish that was in the emissions metric, in your world in Seed when you go in and create the account and set things up, you can do that. We're adding capability into Seed this summer to let you create those emissions fields, so if you wanted it to be CO2 equivalent, you can do that. And it all really just depends on where that data is coming from to come into your program. So, if

you have benchmarking data like Andrew's been talking about, you can bring in that annual energy use, you can bring in monthly energy use. You can also bring in, like, time series data if you have it and work with that in Seed.

Then, also, as Andrew mentioned, there are tools integrations being planned. And so, a couple of questions came in about identifying energy-saving opportunities in Seed. So, Seed itself does not identify those opportunities. Those opportunities are identified in audit template and in asset score. That's where you're collecting sort of the underlying building audit data. But then, let's say you do, you know, you run 200 buildings through audit template and through asset score and you want to look at all of that together. You can do that here in Seed. You can say, okay, I want to pull in information on the HVAC systems for my 200 facilities, and I want to focus on all of the ones that are still using fuel oil. Seed lets you sort of filter through that and query all of that in the way that Andrew just walked through how you can look at different Energy Star scores and parts of that portfolio.

Then, sorry, I'm just scrolling through questions here. Data visualization and analysis. As Andrew mentioned, Better is going to be integrated here, and we'll be talking about Better briefly in the main room when we get back there at about 12:15. But then, yeah, I know, Andrew, you all have a map that you use in D.C. I'm wondering if you can show that. It looks like you're pulling it up.

Andrew Held:

Oh, I was just pulling up the Seed map, but there is a lot on that was well.

Harry Bergmann:

Yeah, and then, so, I wonder if you can talk about that, and then, Nick at NREL, I wonder if I can ping you to talk about some of the other folks that are using Seed and have developed on Seed. I know there are a number of data visualization platforms and sort of mapping capabilities. If you could talk briefly about those after Andrew shows us his map here.

Andrew Held:

Yeah, so really quickly, just to kind of demonstrate here, Seed is, obviously, our back-end database, but it leads to a lot of really wonderful front-end results and visualizations. So, Seed is the back end to our visualization map. If you look to any benchmarking ordinance at this point, they probably have something similar to this built on some sort of mapping software that displays the annual benchmarking reports in a very nice, digestible way. I don't mean to pick on one facility, but you can look through across this, and this also provides, you know, high-level dashboard summaries,

and allows you to filter building space off of the fields that are actually in Seed.

So, we can, you know, look at only the high-performing buildings, you can see where they're clustered or located. Obviously our downtown bed is probably where most of the buildings are anyway. And I think I'll just, you know, use that as a frame to quickly just talk about our general process before I hand it over to you, Nick, because one thing that Seed has really let us do here is automate a lot of our functionality, and provide a really great customer service to our building owners. So, because Seed is so open source and so flexible, all of this is automatable. So, we're able to pull in our data through web services, through Portfolio Manager. We're able to, again, perform all the Seed functionalities with ease, and then automatically send out data quality emails for partners to fix their data itself.

Again, that I alluded to, all this data is then accessible to our partners, and then it is also displayed on our disclosure maps. Nick, yeah, you want to take over?

Nick Long: Sure; thanks, Andrew, thanks, Harry. Yeah, so I was asked to talk a little bit about the other entities that are building visualizations or tools on top of Seed, correct?

Harry Bergmann: Yeah, that's right. Also, just for context for everyone here, so Nick leads the development team at the National Renewable Energy Lab that has built Seed and runs it. So, just context on who Nick is.

Nick Long: Great, cool, thanks. Yeah, I'll do that, and then I'll hit this slide. Andrew, if you don't mind, I can talk to this slide as well.

Andrew Held: Yeah, please.

Nick Long: But, yeah, before I jump into the slide, yeah, there are several companies and institutions who have built visualizations or functionality on top of Seed, and I'll just give you a quick foray into some of the various ones. So, a company out of Vermont is Clearly Energy. They're working on – originally what they were using Seed for was doing MLS listings for residential buildings. So, they have over a million residential buildings in Seed that they are tracking energy score ratings for those buildings, and then providing that to the MLS service. They worked with, if I'm not mistaken, Stamen to do visualizations on top of that. But, again, we can put you in touch with the right people if you have any questions on that side of things.

One other thing to talk about on the Clearly Energy side is that they're working on a layer on top of Seed to do building performance standards, and that functionality is coming soon through their library that they're developing. Another company out there is out of Canada, actually, called Open Technology. And they are working on – they're actually already using Seed to do benchmarking and compliance in several provinces up in Canada. And, same idea, they built their libraries on top of Seed so that they can do the visualization and understand what's going on. And then, I think the other one that I should mention is Earth Advantage. Again, they are a residential world as well, but they're using Seed for tracking residential data and, like we said, they built everything on top of Seed, and then they have their own libraries for doing visualization.

I do know that San Francisco as well is using Power BI, which is a Microsoft business intelligence suite, to pull data out of Seed and to use the visualizations. And so, if I find the link, I'll post it into the Slido comments. But, you can go and look at their building stock, benchmarking building stock in the San Francisco area, and all that data is coming from Seed as well. And I think the Power BI approach or any of these BI approaches are very interesting, because it's a very flexible framework that you can pull data in and out of any API, and Seed exposes all that data available for anybody to use.

So, with that said, I can unpack a little bit of this Seed functionality that has not been discussed today, or maybe was just glossed over a little bit in some other aspects. So, Seed is definitely a broad program that has lots of functionality, and a lot of that stuff we don't expect everyone to be using every day. The stuff that Andrew showed was perfect. That's the, you know, 80 percent of what Seed is. However, there are these other things. So, time series data is stored in Seed as well. So, if you have meter data, interval data, whatever you want to call it, you can store it natively into Seed and access that as needed. That can come from Energy Star Portfolio Manager through their spreadsheets that they can export. The second tab on the spreadsheet would have this time series data. It could come from Green Button XML, or you can inject it from the API.

One of the features that we know other organizations use are these organization sub-organization hierarchy in Seed. So, you can have an organization that oversees other suborganizations, and then the suborganization will inherit some of the data quality checks, for

instance, or the mapping profiles coming from the organization to make the data more consistent across the org. Self-registration, Harry already mentioned that one, the idea that we're going to have a public Seed that people can self-register on and upload their data, or use example data as their.... The advance filtering, there's, on the main screen that you see, it's the inventory list page where it lists all your buildings, you can do some pretty advanced filtering on those dropdowns. You can say, you know, is this greater than or less than some value or not that value. You can do that across all the columns, and then, you know, eventually constrain it the one that you care about, the one or two records that you care about.

If you're familiar with some building data exchange standards – Building Sync and HPXML are two popular ones out there around exchanging data – Seed supports both of those natively so that you can import and export both of those. Sales Force, everyone wants a CRM. Everyone wants a CRM that's well supported, and Sales Force seems to always be the go-to answer for some, well, for many reasons, right? And so, Seed does support Sales Force integration. It syncs limited fields across Sales Force and Seed at some interval. And so, right now this is done in a couple cities, and we're looking at increasing and making this more configurable in the near future so that you can specify which fields are going to be synced and, you know, at various Sales Force configuration setups.

So, that's happening, and then Andrew did talk about storing the data profiles, or the profiles for your lists. That was already there. And, I guess lastly, before we head off to the Better discussion later here, Seed does allow this third-party integration. So, this is new functionality. It's in early beta, and the idea is that any property that you have, you can say, go send it to an analysis that's been defined, and the analysis could be better. It could be, like, a decker analysis if you're in the California world. And this allows you to send the property information to the third-party service and then it will wait until that result's done and then it would return the data back into Seed. And the, yeah, I think that's it for the community functionality. I'm happy to answer any questions in the Slido stuff. And then, yeah, just to clarify, the Clearly Energy work going on in Vermont, that whole broader program is called HELIX, or the Home Energy Labeling Information Exchange, I believe is what that stands for. And so, if you google that, you can get more information, and then the parent organization I think that's managing a lot of that is The Elite, I believe. Anyway, great. If there's any questions, just let me know.

Andrew Held: Yeah, all the stuff, kind of just before I go onto this list, one of the things that we didn't talk about it, but this is a really actively-managed software, and so, a lot of the work we've done is with Nick, Robin, Terry, and their team, so it's really made possible by the fact that there's such an active software engineer backing to this. I think we have one more slide to just cover additional resources. Nick, I don't know if you want to attack this, also, or Harry?

Nick Long: No, I think just leave this up and let people see it when they look at the recording later. Just the first one's the most generic and then gets more detailed as you go down. There was a question that did come in, though, if I can answer it regarding sharing data anonymously. There is Seed public data sharing that you can specify which fields get shared. However, it probably needs, specifically for this concept of deciding what to – what data would be shared for a potential buyer, I think it could be updated a little bit. But there is basic Seed public data sharing so that people could pull data publicly. However, at the current moment, I don't know any company that's actually doing that.

Harry Bergmann: There is a little bit. That could be a good question to take to the folks at, like, Earth Advantage, running the Green Building registry. That's all-around transaction-driven data for residential buildings, and, you know, making sure that you're tracking and storing their sort of green or energy-efficient attributes. So, if there's anyone that is deep in the, like, potentially anonymous but data sharing world to drive real estate transactions, I think it would really be those folks. So, again, that organization is called Earth Advantage, and I'd recommend reaching out to them.

There's also one clarifying question that came in around Seed having the ability to store interval data. So, yes, it can use, sorry, it can store interval data, and it can also be used for analysis. We're still working on improving those analysis capabilities. We're also making sure that Seed has those bridges built to other analysis tools, like Better, which we'll be talking about back in the main room in a few minutes. But you can also connect to things like audit template asset score. You can also, of course, export things to Excel if you have your own sort of model set up in your own analysis. You can use that, and then we are looking in the next year or so building in some more native Seed data visualization capabilities. But really, where we've seen a lot of the data visualization stuff, like what Andrew showed with his map, what Nick alluded to a little bit ago, is really with these third-party software developers. Seed is an open source tool, and it's designed

to serve as a foundation for being able to leverage building energy data.

And so, we're here to support you and to support your service providers in building out that sort of bread and butter data visualization and advanced analytics service. So, if you have more questions about how to dig into visualization and analysis, we can talk about that. But, really, that's all in the software development world. Let's see, then, a couple other questions coming in. So, is Seed a standard approaching ubiquity, or is it one of the many tools for data-driven decision making. I think it's more the latter. There are a lot of tools out there for data-driven decision making. The challenge that we find is that there are not a lot of tools that enable you to look at all sorts of different types of building energy data on one place. And those that do exist tend to be fully customized solutions. And, you know, there are lots of organizations that are able to do that, and there are also a lot that aren't.

And so, what we're trying to do is provide that foundation through Seed that says, you know, hey, we know there can be all sorts of bells and whistles out there. This doesn't have a ton of that, but this is, you know, a way to build up a foundation to collect and manage your building energy data, sort of as a starting point. And if you want to make this more advanced and robust, you can, but you don't have to, and it's able to deliver that. Let's see, then this last question that just came in, so, the example is Washington D.C. Is this – so, okay. The federal government is not currently tracking any of this energy data. So, there is no, like, DOE version of Seed. This is all happening, like, Washington D.C. has a Seed instance, San Francisco has a Seed instance. There are a number of instances across the country, either at the jurisdictional level or, you know, with private sector organizations, and that's who's really collecting that data. We're here just developing the software for folks to use, so this is not being collected by DOE. There is the Building Performance database, and we'll be talking about that in the main room as well in a few minutes, and that's where DOE is collecting and anonymizing data, but none of this Seed data is coming into DOE. Then, let's see, another question, is Seed linked to the BGE portfolio manager tool? Sorry, can you clarify, Kelvin, what the BGE is? I know the EPA Portfolio Manager tool, and Andrew demonstrated the link from EPA's Portfolio Manager to be able to import your data into Seed. But I'm not familiar with BGE.

So, while that clarification is coming in, there's a question around cloud hosting. So, I think Nick or Robin, y'all can take this. But

you don't necessarily need a cloud hosting provider for the data. If you want to host your Seed instance on the cloud, like AWS or something, you can. You can also host it locally on your own servers. We're also hoping to, again, spin up this publicly-accessible version of Seed that means you don't need to worry about standing up your own instance, and it can be held securely, you know, in a third-party location. And so, that would end up being with the national labs, so DOE still wouldn't be able to have access to that data.

Nick Long: Yeah, on the deploying to the cloud, Amazon Web Services, Google Compute have both been deployed to. Actually, and Azure, so the three biggest ones out there with no problem. If there's any support needed, just let us know. It's a pretty well-greased pipeline at this point.

Harry Bergmann: Yeah, and so, there are a number of questions coming in around tool linkages. And so, like Andrew showed us the linkage to Portfolio Manager today, and so that's a really important one. And the linkages that we actively build are really linkages at the federal tool level. So, that Portfolio Manager with EPA, that's audit template and asset score and the rest of our portfolio here. We also are building a link to something like Sales Force, since that's, like, fairly ubiquitous, making sure that you're able to get this building energy data into your CRM. We're not building a lot of direct connections to other private-sector tools, but that being said, Seed is an open source tool. It does have a really robust easy-to-use API, or an application programming interface.

So, for those of you that are interested in connecting to some of the other tools that you're bringing up, that's a fairly straightforward and easy thing to do. You can look at the GitHub repository here for Seed-specific resources, and that'll walk you through how to work with the API. We also have technical support at Lawrence Berkeley Lab and the National Renewable Energy Lab that can help you work through that API connection. And if you're doing that, we'd love to see it. We're always excited to put together case studies and help support the folks that are using Seed and better managing their building data.

Andrew Held: I'll just clarify, Harry. The GitHub that's currently on the screen is our GitHub of our example of using *[crosstalk]*

Harry Bergmann: You're right.

Andrew Held: So, if you're looking for an actual case study, you can use that. It probably is horribly messy and hard to navigate. But there is also a separate Seed GitHub that I'll post to the chat for those interested in reviewing that documentation.

Harry Bergmann: Yeah, thank you for that clarification, Andrew. Yeah, so we have about five minutes left here before we jump back to the main room. Are there any other questions here, or, Andrew, closing thoughts? Nick, Robin, anything y'all want to add?

Andrew Held: I think I've kind of summed our use case in Seed pretty effectively, but just to reiterate, like, Seed is a really flexible, dynamic tool that we, as a city, have been able to utilize to really improve our existing programs, and serve as a really good foundation for building energy programs and supportive partnerships with our utilities and our rebate incentive programs. And a lot of this is built off of a very easy to use free resource that USDOE and LBNL and NRAL have all developed, so it's all on the backs of these folks that we have our success. They're still actively supporting it, so it's all possible to do this.

Harry Bergmann: Awesome, and thank you to whoever just dropped the GitHub repo for Seed core into Slido. So, those of you interested in digging into the GitHub repository, you can find the link there. Also, Andrew, with the last few minutes, if I can put you on the spot a little bit, it'd be great to hear about some of your plans going forward, sort of how you see building data in the district sort of driving some of your next steps and what y'all are thinking about doing, some questions that you want to ask about building data, especially as you see, you know, more information coming in the future.

Andrew Held: Yeah, so, I kind of covered this in the history slide, but we're about to start collecting a lot more data. Not only are we going to start benchmarking buildings down to 10,000 square feet district wide, we're also going to require those performance standards be met on a building level, which can range from anywhere from, you know, conducting an ASHRAE level two audit through audit template to doing a major retrofit to their building and performance basis. So, we're anticipating a lot of data coming in. We're also anticipating a lot of need to have really active real time data pulling from Portfolio Manager and other sources and being able to communicate that to – out to building owners that come in.

So, we're, you know, we're looking actively at sort of those resources that Nick referenced about the overlays on top of Seed that, you know, make use of it as a repository for data, but add on

additional functionalities. We've also tried to look at some of the analytical tools that they're starting to build in as a way to better communicate energy savings opportunities for building owners. So, we're actively involved in development of the Better tool, and are looking forward to that complementing to Seed as a way to automatically run those reports for our building owners and send off the data for them to then use to make informed decisions. So, there's a lot down the pipeline. I think we're close to time, but, Harry, if you want me to – if you want to peg me on one question, please, go for it. You're on mute, by the way.

Harry Bergmann: Ugh, I had it the whole time until now. No, I think that was a great overview. I think the thing that I want to underscore here is that, you know, the point that you made before, Seed is really flexible, and it lets you, as a user, be really creative in what questions you want to ask of your building data. And so, you can see a lot of what Andrew's done here, I know that, you know, for folks that are developers themselves, like, Andrew, you've created a lot of really impressive Python scrips that work, like, in and around Seed as well to help, you know, get to exactly the questions that you're trying to ask. And so, really, the sky's the limit. Seed is just your foundational resource here. So, for those of you that want to dig in and get involved with the tool, please reach out our emails are all going to be at the end of the presentation after the main session. But, yeah, Andrew, thank you for sharing with us today everything that you've been doing around Seed. It's really exciting to see. I'm looking forward to seeing where that goes next. And with that, we have one minute to jump back to the main room here.

ASSET SCORE AND AUDIT TEMPLATE BREAKOUT SESSION

Sarah Newman: Good morning, everyone. Welcome to our breakout room. My name is Sara Newman. I'm a data scientist at Pacific Northwest National Laboratory and the project manager for the Asset Score and Audit Template projects. So I'll be kicking us off with a short overview of the tools before getting into the interesting topic of how El Paso is using them. Next slide, please.

So Asset Score is a free web-based modeling tool for assessing the physical and structural energy efficiency of commercial and multi-family buildings. It allows you to create a building energy model with a fraction of the input information you would need to create one from scratch. So it provides an evaluation of the building energy assets. This is comprised of the building envelope. So roof, walls, and windows; and then major systems, including lighting, mechanical, electrical, and service hot water equipment.

So if you look at the graphic on the right, the components and factors that affect the building's energy use and are included in the tool are shown within the blue dashed line. The tool does not take into account user inputs to the items outside the blue box, such as operating schedules and occupant behavior to generate an asset score. So for those it uses standard operating assumptions.

So overall, Asset Score reflects the energy efficiency of a building based solely on its design, construction, and energy systems; which are the normalized for operational occupancy factors using, again, standard operating assumptions. So the score is really based on your building as built, and not as operated. So if you're familiar with Energy Star Portfolio Manager, that rates your building as operated; whereas Asset Score rates your building as built.

So when you enter your building into Asset Score, you get a score which is an energy efficiency rating for your building, as well as an Asset Score report, which gives you an efficiency and energy use by the individual building systems, as well as a list of energy efficiency to upgrade your building and the score that your building would achieve if you implemented those measures. So, an Asset Score report allows you to quickly compare the physical energy efficiency of your building with other buildings, communicate the building energy efficiency to the marketplace, and identify opportunities to invest in energy efficiency upgrades and improve your building. Next slide, please.

Audit Template is another free web-based tool that's hosted on the same platform, but it's a separate tool. And this allows you to collect, store, and report building energy audit data. So the base template used in Audit Template includes the fields from ASHRAE level 2 audit, but we've also created several templates for individual cities and states that include several city-specific input fields, generally the IDs that are used by those cities. It will then produce an audit report including tables on energy use and energy efficiency measures, and then you can also use the tool to submit the audit report to the cities or states for local ordinance compliance. And you can also export these audit reports in a variety of different formats, including CSV and building sync XML.

Currently, New York City, San Francisco, and Berkeley are using the template for their local auditing compliance. And to date, over 2,000 buildings have been submitted through the tool to those cities. And there are several other cities and states that are

currently considering using Audit Template in the future to help collect the building data for their local ordinances. Next slide, please.

So here's some resources. So this top website, BuildingEnergyScore.energy.gov, is how you can access both Audit Template and Asset Score. Below that, we have an overview website. This is if you would like to receive more information on the tools, you go to buildingenergytools.org. And then there are individual pages for asset score audit template, and then the other tools you can hear about this session. And then for questions or comments, please reach out to me at Sarah.Newman@PNNL.gov. I'd be happy to help you learn more about the tools. Next slide, please.

And so now I'll be kicking it off to Fernando to tell us about how El Paso is using these tools.

Fernando Berjano: Thank you, Sarah. Let me get in here. Good morning, everyone. Can you all hear me well? Yeah? Okay. Thank you, Rick. So, I'm Fernando Berjano the sustainability coordinator for the city of El Paso in Texas. And first I'm glad to attend the DOE and the Better Buildings team and obviously the Pacific Northwest National Lab for their help and inviting us to test both Audit Template and Asset Score and to share our experience here today with you all. So next slide, please.

So the first – thank you. The first why did we participate in this program? Why we felt it was important and interesting for us for this year for us? So, the first thing would be the alignment with the city strategic plan. And we have the City of El Paso have around 250 facilities and more than 1,100 energy accounts for electricity and natural gas. And adds up to a cost of \$12 million per year that we manage. So, as a consequence of that, the City decided to include the development of an urban energy plan and the reduction of operational energy consumption. But as one of their 25 strategic initiatives for 2025. It is a priority for the City. So that's the first reason.

We are currently working on that energy plan for both the community and for municipal operations. And on that plan now, we've identified that a complete assessment of building usage ONM costs and investment needs would provide a much-needed template to better manage our building stock. So when we were invited to use and test Audit Template and Asset Score, we thought it was a very good opportunity learning by doing, and using all the

help that the Lab Pacific Northwest National Lab had provided to us. So that's the reason we participated in this product. Next slide, please.

So now we're going to get into how was the process of learning, and using the tools, and what we think we can do with those tools in the future. The first thing out of those 250 facilities, we needed to select two or three. We, again, selected two. We, to do that, we contacted our internal building improvement department and all our departments that manage their own facilities, like the airport, mass transit, or even international bridges here at the border. And after that, we consulted our portfolio manager data to see which buildings made sense in terms of energy consumption and energy intensity to try to use for these pilot.

And we came up with two facilities: City Two, which is an office facility of 62,000 square foot that is used by two departments: capital improvement and information technology department. And what these department, it was good that we had a schedule renovation of the HVAC system and the controls because we have some issues that I'll talk about later. So we thought it was a good opportunity to conduct before and after assets score assessment for this office facility.

The other facility was the airport. The other one facility that we selected. And that was because it's our largest facility and our largest consumer. And they are exploring several energy efficiency and conservation projects, including solar right now. So those were the two selected facilities.

For the second step, collect information. So, that was not complicated, but more time consuming. So, for the first one for city two, this is an old building from 1915, but that was renovated in 2014. So we have pretty good access to the past builds and renovation information. So we were able to pull that information pretty quick with the help from our colleagues from capital improvement.

For the airport, which was renovated for the last mini renovation in the mid-90s, and then some energy projects included on an energy service contract in 2012 to 2014. That was more difficult to come out with the information for the tools. So, we'll see later what that resulted in.

So once we had the information, it was time to use the tools and we started with City Two and Audit Template, because we had

more information. So we started uploading the information. For the most part, we had everything that was required. When we didn't, we made educated assumptions of what to upload and what to include there to that tool. Once we had the resolved for us that – sorry for Audit Template – we exported those results into Asset Score to get our score and see the results of the problem.

So, what happened with City Two is something that we expected. We have a really efficient HVAC system with VRFs, and we expected a high score. But we know that the performance of that building is not that good. We've had some leakage issues on the refrigerant side. We've had some distribution issues, and we had some EAS from controls systems issues. So, the very high score of nine versus the performance; those don't match up, and that's why. We thought it was interesting to perform this type of score before and after the renovations that I mentioned before. So there is a lot of things that Sarah mentioned that the load, the power load, is not included in the model. So we have a lot of IT systems on that on that building, as well.

Now, the fourth step is to assess share and plan. After we've used this, we plan to share the information with the department. We intend to, we have pilots with different types of buildings here at the City; hopefully between eight and ten before the end of the year. And that's how we want to proceed with these three tools that we've been get to the first step without our energy assessment program in house. So, please next slide. I'm not seeing the next slide. There you go. Thank you.

So, now we wanted to share the challenges and opportunities that we encountered when using these two tools. So first for the challenges, I would like to highlight three from less to more challenging. The first one would be learning how to use the tools. I would say that for professionals with experience in energy management or building design or mechanical engineering, it's easy to learn these tools. So really a standard, everything that it's asked for. And also the help options that the tools come with are very quite thorough. And if not, we were lucky enough to have Sarah and Richard to respond to all our requests.

So, I would say this is a challenge, but not a very difficult one to overcome. So, just for you to know, we maybe from when we started out loading information without any previous knowledge of the tool until we got the results, it took us three hours per building. So, we felt it was worth it.

The second challenge would be the data collection and we've had a question before on the main room and this is going to depend or vary a lot, depending on the organization. But for us, and I mentioned this a little bit before, we have some issues with the airport when the last renovations were made and how the information is managed here. So it took us around one month to get the information that we asked for. And we were not able to get all the information for Audit Template, we just did Asset Score directly. But, hey, we still have to perform the Audit Template for the airport.

And the third challenge is, okay, we think these two tools are very useful. We want to use them to build our energy program. But who is going to own these two tools within the organization? Who is going to be in charge? And that's something that is tricky in some cases because of the workload of the different departments, how the City is structured. And that's something that is going to be discussed on the energy plan. But right now what we think probably capital improvement and sustainability might be the candidates to take over and the tools and integrating in the program.

And the opportunities we see, we currently when we do energy assessments, or any type of energy evaluation, we rely on contractors or technical assistance from this State of Texas with a couple of programs that they have. And that's for preliminary assessments to investment-grade audits. So the whole range of assessments we rely on outsourced projects. So what we want to do is build an in-house energy audit program that not necessarily has to be up to the level of investment-grade, but if we are able to go to ASHRAE level two, which this Audit Template provides; we then get a very good place to be in order to identify energy conservation measures and future renovations for our buildings.

Another opportunity that we want to explore is the information that is asked for in these two tools is information that you find in the as built and the layouts on all when we go for design contract. So, we're thinking about how feasible it would be to include some type of requirement to ask for an Asset Score report within our this time RFDs. So that's something that would be under discussion again on the energy plan.

And something that we saw with City Two that we expected, the underperformance of buildings, the identification of underperformance of the buildings using both the data from Audit Template and Asset Score, versus our data with for quality

manager. So we think it would be a good tool to identify those underperformers that sometimes you know of, but sometimes you don't. So, comparing the energy intensity that we get from Portfolio Manager, versus the energy intensity that Asset Score gives us back with their report we think might be a good opportunity to identify those underperformers on our building stock.

And that's all I got for today. Overall, we think these two tools would be very useful for the City of El Paso. We have challenges or we may encounter challenges on how to incorporate those in our procedures. But that's something to be addressed in the near future, hopefully, **here now**. So, thank you all for your time.

Sarah Newman:

Wonderful. Thank you so much, Fernando. Richard, before you start your presentation, I would like to just bring up one question from the audience. Richard – another Richard – is asking how does an energy asset score compare to EUI? Also, what level of audit does this let you perform compared to ASHRAE Audits? You want to address that before you dive in?

Richard Fowler:

Sure. Sounds like there are two questions that I'll address, if I understand the second one correctly, it's asking about an ASHRAE level two audit. Basically, the Audit Template can store all the inputs that have been collected in an ASHRAE level two audit. And the Asset Score question basically does actually uses the EUI to calculate against a scale to generate the score that gets displayed when you run the building model. So it'll take the EUI into account, and then compare that on a sliding scale based on the use type and location. So basically, you're comparing apples to apples, offices in Seattle to offices in Seattle versus instead of offices in Seattle to schools in Texas. Basically, you're comparing buildings by taking the EUI and running it through the model. And that's how the scale gets developed. And I'll bring up a score report, as well. And we also have some documentation that can explain how that gets calculated. That will be available.

So, thank you very much, Fernando, for the summary of your presentation and for participating in the pilot. I'm going to go ahead and see if I can launch the Asset Score tool so that everybody can see this. I'll try not to go too fast here. Basically, both tools that we've talked about that we're introducing in this room today are available, as Sarah indicated, and BuildingEnergyScore.energy.gov on our website. It's free for anybody to create an account and basically register, create an account, and login at any time.

Quick note about the page that you see here on the main page, there's a brief summary with the ability to connect to a user guide on this Learn More Link for both of the tools. There's also a quick start guide, getting started for both of these tools that could be useful to give you a step-by-step. If you've never accessed the tools before, it's a good place to start.

We have a Resources page. Today, I'm just giving you a super quick walkthrough of the tools. But on the Resources page, there are recorded webinars – Introduction to Asset Score and Introduction to the Audit Template – that will give more in-depth step-by-step guidance of the tools, some background, and walkthroughs. Those could be useful. There's also example files and a whole host of other documentation on this resources page.

We also have a Help Desk, basically this little button here, that is available throughout the tool, where you can submit a question to the Help Desk and our support staff could help answer any questions you may have. Also throughout both tools, there are these little question mark icons that take you to a user guide specific to whatever screen you're on that could help walk you through and answer questions. And so there's quite a bit of resources if you've never been exposed to tools.

I'm going to go ahead and log us in and take a peek at what we've been talking about here. So once you've logged in for the first time, you'll have a blank screen. But once you've started to enter buildings into the tools, they'll be listed at a table format here, which can be sorted by an ID number, or last time you've modified a building, or who the building owner is, basically you can – this refers to the fact that you can share buildings with other colleagues that have an Asset Score account. For example, I'm showing you the demonstration Asset Score account, but my own personal account, I've logged, created a building, and I've shared it with the Asset Score account; and that can be visible on this table here. The two tools we've referred to – Asset Score and Audit Template – are accessible from these tabs at the top of the screen. There's a third tool that we're developing, TSPR, Total System Performance Ratio, for the Washington State tool. But this actually is going to be removed out of the tool here pretty soon, and you'll just see the two: Asset Score and Audit Template.

I'm going to talk quickly about the Audit Template first. Basically, as we've heard previously, this could be a data, it's a data collection tool. It can be used for compliance, to prove that you've conducted

an audit. For example, the Cities of San Francisco and New York City have some compliance ordinances requiring that audits be conducted, and they're using the tool where users can submit to the city as proof that they've conducted the audits.

But it can also be used as a collection where you can store a collection of portfolios, portfolio buildings – as Fernando has indicated. For example, the City of El Paso may want to document and collect data, may or may not be necessarily formal collection process. But, once the buildings have been entered into the tool, you can then export them into a spreadsheet or a building sync XML file that can then be imported into other tools, such as SEED and some of the other tools that we heard earlier at the beginning from Harry. They're available from the Department of Energy.

There's also commercially-available tools that are starting to use building sync XML file formats, and the building's information that's been entered into the tool can be exported and then used in those tools, as well. To enter a building auto report, there's a big green button up here that says Add Auto Report. And here are some of the templates that are available. There's a generic ASHRAE level two report that will collect every, all the inputs that you see on an ASHRAE level two audit.

Some of the cities, as Sarah has indicated, have customized their templates. City of San Francisco, for example, is requesting that users enter some more detailed information about lighting – for example, watts per lamp, lamps per fixture – that wouldn't be asked for in an ASHRAE level two audit, but it's something, some information that they requested they wanted to collect and see in their audit reports. So we've customized some reports for cities, and we have more on the way. But you can, if you just want to play around with the tool, you can select the demo city report, or ASHRAE level two report; and basically just open the tool and enter and just kind of get your feet wet on how it works.

But I'm going to bring up an example report that we've created that has all of the inputs already entered. When you open the tool, there's a toolbar across the top that lets you navigate among various sections of the tool. You can collect contact information, basically who the auditor was that conducted the audit, who the building owner is. You can create a, we call it kind of a Rolodex of information, of contacts. You don't have to – if you have multiple buildings in your portfolio, you don't have to enter the same information over and over again if it's the same owner, or the same auditor. You can store that in a location for your contacts.

There's a whole section on facility information, building characteristics, construction. This would be your building envelope: roof, walls, windows, lighting, and HVAC. As you're going across the tab, you may notice that there's little warning icons across the top. The note says there are fields on this screen that need to be completed before city reporting. And, of course, finding icon in the various sections that that might be referred to.

For example, this is showing that this section is incomplete. If you have a whole bunch of notices, and you're not sure what you've missed, you can click on this little validation errors link. And it'll indicate what might be missing. For example, this is telling me that I haven't entered the number of floors and the building characteristics of the facility description screen.

So I can go to that screen and complete missing required field, which actually was identified by this red star here as a required field. And then when I save that missing piece of information, the warning sign goes away. And if there's no warning signs, basically it means you've completed all the required information, and you can submit the data to the city, if that's what you're doing for a city requirement, or if you're just for your own data collection purposes you've entered all the fields that are necessary.

I want to point out a few more data inputs that are available in the Audit Template. You can collect and store monthly energy use that might be metered and it might be collected in Energy Star Portfolio Manager. And that can be imported into the tool from Portfolio Manager. And there's some instructions on how to do that in our users guide. Another thing I want to point out is I had mentioned that you can export your information by selecting the Download button and Export to a CSV, or a PDF Report, or building sync XLM file that I've referred to earlier. And once again, there's guidance in our users guide that outlines each of those.

So that's just a super quick rundown of the Audit Template data collection tool. I'm going to switch gears now. Actually, I do want to bring up one quick thing. I think Fernando referred to the fact that they gathered their data in the Audit Template, then they exported data to the Asset Score so they can get a building model using that tool. And that feature is available with this blue button here. It will export building information and envelope information and HVAC information necessary to create a building model.

So let's jump over to the Asset Score tool. By clicking on the tab here, it'll open up an example building here. Asset Score tool will allow you to generate a graphical representation of your building's footprint. For example, we see here that we have an office building over a retail portion of the building, represented by blocks. You can move the blocks around, maybe the office was adjacent to the retail building. But in this case, we're identifying the fact that the office building is sitting on top of the retail portion.

Once you've created your building blocks, you could assign building assets to the building. For example, we have a section for use type. We currently can model 19 commonly-available building use types, and we're in the process of adding the capability to model commercial kitchens and hospitals. But most, the main common buildings are available to model.

In this example, once again, we've assigned an office building over a retail building. You could add the envelope components to your building. Roof. Every building needs a roof, wall, window, floor. And much like, as we saw in the Audit Template, there's a prompt here if there's anything missing. In this case, it's telling me that every block must have a roof assembly. So, I can assign that by clicking on the roof that I've created and dropping it right onto the office block. And once I've done that, the warning sign went away. And as you can see, there's no more warning signs. In which case, I can submit my model for an asset score.

Basically, I've entered all the lighting information, the HVAC, water heater, and operations. And I can score my building. I'm not going to do that, but once you've submitted a building for a score, it'll take a few minutes, and then you'll get an e-mail indicating that your building is ready, your report is ready to view. And we have a couple of scored buildings. Back on the main page here, there's a status column indicating whether your building has been edited, or whether it's been rated or scored.

This is a copy of one of the buildings that Fernando has scored. I think he had indicated building may have scored a nine out of ten, which is a pretty good score. Indicated that there's a chance to improve even more in the score report that you can download. Just take a quick look at it right here. It's suggested to basically upgrade the lighting, add some more LED lighting to the building, and maybe address some error barriers, possibly even a cool roof. And if they were to implement all of those upgrades, it could score a ten.

Getting back to our example building that was a mixed-use building, we'll take a quick look at the score report for that. This particular building had a little bit more room for improvement. It scored a three and a half with a potential of scoring a seven. Basically, it's a little bit older building, built in 1980. There may not be as many opportunities to score higher with the particular configuration. But your score report will give you your score for, if it's a mixed-use building, it will show right now, for example, this is the office portion of the building, scored a three. And the retail portion of the building scored a five-and-a-half. And then this is the cumulative score for the building.

And once again, we have upgrade opportunities. For example, it's recommending to add some insulation or upgrade the windows. And there's some opportunities to implement some control configurations to the building. And a ballpark range of how much that might cost relative to what the savings would be to kind of give you an idea of the bang for the buck. But basically, swapping out your LEDs would be relatively low cost, and it would get you a pretty good return on energy savings.

Let's see. Once again, this is a super fast rundown of both of these tools. I did indicate you can share your building. You can make copies of your building and run different models. What happens if I did, indeed, change my lighting? What would my score be? Or what if I did use a different HVAC system? What would my score be? You can run different scenarios on your buildings. Same thing with the Audit Template. You can make a copy of your building and change the name so you don't have to re-enter all your inputs all at once.

I think we might be getting a little short on time here, so I'm going to pause right here and turn it back over to Mariana to see if any questions have come through, and see if we can try and answer them.

M. Egea-Casalduc: Yeah. Definitely. So our first question on Slido reads, "Is there an audit report that can be download for offline compilation in Excel or CSV without a third-party software?"

Richard Fowler: So, presently we don't have an offline component to enter your data into the tool using the tool as it is. In other words, it's web-based. If you are doing a building walkthrough and you had a connection to Wi-Fi and you had a tablet, you can certainly use the tool to, as you're walking through, identify the lighting and the roof, windows components. Then you can go back to your office

and if you enter your energy efficiency measures that you might have identified if you're an auditor, and finish it up and then submit.

Auditors use many different tools or no tools at all. Some have just hard copy spreadsheets as they're doing a building walkthrough, and then they go back and they can enter it into the outer template. There's commercially-available audit collection tools that can be used, as well, and then transferred into the Audit Template, either manually or through building. It can be uploaded through Building Sync, then also with Building Sync, that could be exported, once again, to other tools that might be available.

I do want to – that's the Audit Template. Asset Score does have a hard copy data collection file – PDF file – that could be printed or completed online to collect your information. There is no automatic upload into the Asset Score program. But, it is another tool that you can use to collect your data and then manually enter it into the Asset Score program.

M. Egea-Casalduc: Great. We have a question. Does your Audit Template couple to BIM? Also, does Asset Score account for embodied carbon for each energy efficiency measure, since by 2030 it's important?

Sarah Newman: I can take this one. So, no, it's not currently integrated with BIM. However, we are implementing carbon metrics, both for Asset Score and Audit Template, right now. So, it's something that we're actually doing in a unified way across all of BTO's data tools, so that we're using the same methodology across all of them. And so that's something that we're hoping to have implemented in both the tools by the end of the calendar year.

M. Egea-Casalduc: Wonderful. Let me see. I have another question that I think we might have already slightly addressed, but I'm going to repeat it. Does the Asset Score tie approximately to the EUI and Energy Star target finder?

Richard Fowler: Okay. No. So, comparing Asset Score to Portfolio Manager, that's a common question. And basically the answer is no, they're not directly comparable. In other words, a score of three-and-a-half is not going to be reflected as a 35 in ESPM. However, you can use the tools in conjunction with each other. So for example, as Fernando had indicated, basically you may have a building that As may say, "This is a well-built building. It's got high-efficiency HVAC and LED lighting." And then Portfolio Manager is saying, "You know, it's not scoring very well."

Well, maybe that's an indication the building needs a tune-up. Maybe the set points need to be adjusted. Maybe there's some equipment leakage. Maybe they're keeping their windows open all the time. Or maybe the reverse would happen. Maybe Portfolio Manager's saying, "You know, you've got a really high-rated building." You enter it in Asset Score and it's showing you it's pretty low. What's going on here? Well, maybe it's operated really efficiently, but maybe there's room for improvement. Maybe to be even better, maybe if you upgrade your lighting, or add a high-efficiency HVAC system, there's some opportunities there. And then everywhere in between.

So the tools can be used in conjunction with each other, but we do caution that you're not looking at the UI from Asset Score and Portfolio Manager and also the actual scores themselves and want to see a direct correlation. Because as Sarah had indicated in the summary, basically as built, kind of like miles per gallon for your car, the rating might be pretty high, but you may gun it at every light and run it really hard. So, yeah. It's kind of looking at two different things. But they're designed to kind of complement each other.

M. Egea-Casalduc: Awesome. So I just got our five-minute warning from Marissa, who is our tech support. So I think this is, or might be our last question. Is Asset Score compatible with Energy Cap? Also, is Asset Score free?

Richard Fowler: Yes, Asset Score is free. You can create an account at any time. I may have Sarah address – I'm not as familiar with the first question.

Sarah Newman: So, currently, the tools aren't kind of directly integrated with any other tool, with exception of Portfolio Manager. You can export your data from Portfolio Manager into Audit Template. But, several different tools are now kind of integrating with Building Sync XML, which is the schema that's used for capturing information about building energy systems. And so you can export a Building Sync XML file from an Audit Template record. And so if other software like Energy Cap are becoming integrated with Building Sync, that could be a relatively easy way to directly import your data. As far as I know, they're not currently doing that. But that's something that might happen in the future.

M. Egea-Casalduc: Wonderful. Let's see. We might have time for one more question. Can Asset Score and Audit Template be tied with capital renewal

model, or deferred maintenance for facilities, especially in higher education? That's a tough one. So I'm not sure if we can, if we have the information to dive into that one right now. Yeah. Let's move on. Let's see. I might also have questions in the chat.

Can you explain how folks can reach out to you guys just one more time. I'm getting a lot of questions about how they can contact you both. So if you want to quickly explain that.

Richard Fowler: Sure. Generally, there's once again, we have a Help Desk button available within the tool that will send it to our user support location. More often than not, it'll be myself that answers questions or submitting to the rest of our team. But Sarah and myself certainly can be contacted directly. Basically our e-mail address is our first and last name – first dot last name – @pnnl.gov, and we'd be happy to answer any questions you may have.

M. Egea-Casalduc: Great. There is a question that reads, "Can these tools allow for a limited visibility for certain users? Example: a portfolio owner can see all of the info, but the single building owners can only see one building? Is that possible?"

Richard Fowler: Yes. We have a sharing feature available for both tools. Basically, you can kind of like Facebook, you can create a list of contacts. And if other members that you want to share with have an account in the Asset Score tool, you can send them a contact request. And when they have their tool, or when they are logged in, they can accept a request, and once you have established that set of contacts, then no matter which tool you're in, there's an options button on the column right here where you can select and say Share Building. And then you can identify which contacts that you want to share with, and then establish a connection that way.

M. Egea-Casalduc: Great. So, all breakout rooms will be closed in a couple of seconds. Thank you all for joining, and Richard and Sarah shared their e-mails.

CLOSING PRESENTATION IN MAIN SESSION

Okay, it looks like we've got a majority of the group here, so I think let's dig in. I am going to run through a series of other resources here that we have from DOE and the labs, and sort of how you can use them, what you can do with these tools, and then we'll get to the end, share our contact information, and then I'm going to do the best that I can with the time that we have left to run

through some of the questions here on Slido and in the chat. So, with that, I think let's dive in. The first thing I want to share is the energy data management guide. This is a great new resource that's really targeted to local jurisdictions or state and local jurisdictions. So, you can think about that as city, state, counties, K-12 school districts, anyone that has a large amount of publicly-owned facilities. It breaks the energy data management process down into sort of three more digestible chunks.

The first is generating buy-in by defining the value proposition, understanding and how to align with your organizational goals. Then, building a foundation by creating a central energy database, streamlining access to utility data, and then leveraging data management tools. That's really the core of the work here, and I think a lot of the tools that you heard about today, all of the tools you heard about today, are mentioned in those three middle chapters there. And then, finally, how to hard wire energy data management into your organization. You know, proactive energy management really is a culture. If we're going to get there, and I think if we want to hit these energy goals, if we want to hit these mission goals, you know, making energy data management a core tenet of your program is critical. And so, you can learn more at eere.energy.gov/energydataguide. That URL is down here at the bottom of the slide. It's a really easy to use, dynamic website. So, I encourage you all to dig in.

Let's see, next slide, please. I also wanted to talk about Better. This came up in the Seed session quite a lot, and I imagine it came up in a couple of other places. So, this is the Building Efficiency Targeting Tool for Energy Retrofits. And the idea is really what is the smallest amount of data that you can use in order to identify some actionable next steps for your buildings? So, if you have monthly energy data, let's say, and some basic information about the size of your building, its location and its use type, you're able to quantify operational costs, energy consumption, and emissions reduction potential in your buildings. You're able to identify potential measures. It's not going to have, like, the same amount of detail that you're going to get in something like asset score from, like, a level two audit. But, it can tell you, you know, hey, you should think about doing something with your HVAC system. There seems to be savings potential there.

And then, it can help you target your buildings for a deeper analysis, right? So, if you have three, four, or five buildings, this can tell you which one to dig into. If you have 50, 60 or 100 buildings, this can tell you, you know, what are the 10 percent of

your portfolio that really stand to save a lot, and that's where you're going to go and ask your operational team to dig in, your maintenance folks to dig in, and that's where you're going to bring your service contractor and do the more in-depth investment-grade level two audit. We've had some really great engagement from the private sector. You can see a testimonial here from Don Anderson at Blackstone. This is sort of a unique resource that it takes a remarkably small amount of data that generally is easy to get, especially if you're already benchmarking your buildings and you own those buildings, you're able to dig in and learn quite a lot about what you can do to improve performance here.

This also was really exciting in that it was an R&D 100 award winner in 2020, so we're thrilled to have this tool as part of the portfolio. And then later this summer, all of the functionality in Better, from its analysis to its reporting mechanism, will all be part of the Seed platform. So, for those of you that are dealing with portfolio-scale data, if you're using Seed, you'll be able to automatically run these reports from Better back into Seed and look at all of those in one place. Next slide, please.

Finally, there's the Building Performance database. And so, some of you may be familiar with the BPD. This last year, it got a bit of a facelift. We have a new slick user interface on it, and this is the largest publicly-available repository of real-world building data. So, there are over a million buildings in the Building Performance database, and we have real-world information on their actual energy performance, their use type, their square footage, everything like that. And this data is anonymized, so, you know, you're not going to get, you know, 100 Main Street in your city and be able to pull out that information. But, you are able to say, I want to understand how my medium-sized commercial building compares to similarly-sized commercial buildings in my city, in my state, in my climate zone, and it's able to give you sort of this histogram of peers, and you can sort of benchmark yourself against that.

This is a tool that's being used a lot in coursework and in instructional scenarios, and it's something where, you know, we really encourage folks to share your data with the Building Performance database. And so, what happens is you'll share your data with the BPD team, and they're at Lawrence Berkeley National Lab, and it doesn't just disappear. You'll get a report back in exchange, analyzing all the characteristics of the building data that you shared with the team, what some energy-saving opportunities might be, how your portfolio compares with similar

other portfolios, and then, of course, a really big thank you from all of us for sharing that data. And so, this is something that we hope to encourage as part of a virtuous cycle here. The more data that's in here, the more useful it tends to be.

Let's see, next slide, please. And then the last thing I'll highlight is we have a new website that just launched. This is buildingenergytools.org, and it has resources for owners, managers, software developers, public agencies, real estate owners, and, like, anything you can imagine, we have it for you here. We're really trying to make this appeal to all of your different perspectives and use cases. But the idea is that it breaks things down by desired goals and outcomes. And so, this graphic that you see is actually interactive, and you can mouse over each of these goal and outcomes squares, and that'll highlight in the tools block below which of these tools helps you reach that outcome.

So, this can let you dig in deeper on data collection, data management, analysis. It can also help you figure out what custom workflows you want to consider. If you want to do something that isn't necessarily ready to go off the shelf, who can you reach out to and work with who has expertise in these tools to build that? You can also click on each of these tool blocks, and it'll take you to its own page, where you're able to find documentation on software development, you're able to get an introduction to the tool, create an account, look at case studies, how to guides, training videos, everything like that. This is really your one-stop shop for building energy data. And so, thank you to Marissa for throwing the link to this site in the chat box, as well. So, we encourage you all to check that out.

This is also backed by a forum, so if you run into trouble or have questions or anything, you can reach us there, as well as our emails, which I believe are on the next slide. So, we have Q&A and we can dig into that with the last few minutes, but then I think if we can pop up the last slide here. Oh, also, the summit webinar series, I hope you all tune in for that. I apologize for not mentioning that earlier. We just have a lot to cover here and we can't fit it all into just the summit this week, and so we encourage you to all check that out and you can see that at the Better Building Solution Center below and register for these webinars throughout the summer. Great, and here are all of our emails and contact information. Again, thank you to all of our speakers and the labs for joining us today and walking through these tools. I hope that you all found it really interesting and helpful. And please reach out and contact us. We have committed resources and people here to

help you engage and use these tools, and, again, this data is going to be what gets us to these energy and climate goals that, you know, are set before us.

So, I think with that, I saw a couple of questions come in through Slido. Let's see, so, thank you Adam Guzo for linking the Energy Data Management Guide in there. Okay, so, great question about the Building Performance database versus CBECS. So, the data in BPD is broader than the data in CBECS. So, CBECS is a dataset that is included within the Building Performance database, but there's additional data beyond what CBECS has that's also in the BPD. And so, it lets you leverage that. So, the Building Performance database is also both residential and commercial, so if you're looking at single-family homes or multi-family, beyond just commercial buildings, you can do that as well.

But great question around Portfolio Manager. Portfolio Manager is really core to a lot of these tools. EPA has done a really great job putting that tool together and letting it be, you know, the starting point for building energy data collection and benchmarking and analysis. And that's really the starting point for a lot of what we do. So, Portfolio Manager is your real building energy use portal. That's where you can collect your monthly energy consumption and spend, and then asset score and audit template are the, you know, asset-based corollary to that, where you're saying, okay, I now have my actual energy consumption in Portfolio Manager.

I now have all this information and asset score about the underlying components of my building, so I know what HVAC system, what lighting system, what insulation is leading into the consumption that I'm seeing in Portfolio Manager. So, we really see those as complementary tools. And because they're complementary, and because those datasets are complementary, that's really the core use case for Seed is bringing that data together so that, you know, you're able to look at your performance data, and you're able to look at your asset data together in one place. And so, again, big shoutout to EPA. Portfolio Manager is a critical piece of all of this.

Brick versus haystack, thanks for the question. I think that's probably a little in the weeds for this group, but for those of you that are looking into getting into grid interactive efficient buildings and more advanced control systems and flexible assets and you're sort of building and configuring your energy management information system, or your EMIS, I am happy to talk about that all day. But I don't know that that's for this session. So, we can get

into that another time. Let's see. We have three minutes left, and I think that's everything that was on Slido. Thank you, folks, for sharing information about your building types and the work that you're doing. Okay, let's see. Other breakout rooms be available as recordings? Yes, they will be. Those will all be available along with the main room recordings. Eligibility criteria to work with the department. I believe that's all available online if it's through a funding announcement or through hiring. That should all be there, either through EERE exchange, which is our, like, our funding portal, or through USA Job, which is the hiring portal.

All right, if nothing else is coming in, I'd just to, again, thank you to all of our speakers and thank you to all of you for joining us. I hope you all have found the conversation useful and enjoyable. We'd love to hear back from you. Please be sure to give us some feedback in the survey that's going to pop up when the session closes about what was useful, what else you would like to hear from us. Again, all of our emails are here. Please reach out with questions, and thank you, again, everyone. Marta, Chris, Fernando, Andrew; great having you all here, and excited to keep working with you going forward.

[End of Audio]