Bri Colon: Welcome, everyone, we'll go ahead and get started here in a minute or so, thank you for joining. All right, we can go ahead and get started. A lot of content to cover so happy to dive in, go to the next slide. Hello, and welcome everybody to the 2022 Better Buildings summer webinars series, we're dedicated to bringing you the latest actionable insights from leading industry experts. This annual series really is a chance to explore the topics, technologies and trends that affect your organization, as well as efforts to accelerate energy efficiency adoption.

Before we start, there's a few housekeeping items we want to cover. First off, today's webinar will be recorded and archived on the Better Building Solution Center. We'll follow up when that recording and those slides are made available. Next, attendees are in listen only mode, which means that your microphones are muted. But if you do experience any audio or visual issues throughout the webinar, please go ahead and send a message in the Q&A box at the bottom of your Zoom panel.

Next slide. My name is Bri Colon and I serve as a fellow in the Building Technologies Office at the Department of Energy. Next slide, and I'm thrilled that you all are joining us for this increasingly salient topic. To kind of set the stage here, I just wanted to set the scene really, that over the past couple years really, we've seen that COVID has been a fundamental catalyst for taking into consideration the importance of healthy buildings. Knowing that indoor air quality for the theme of this webinar is a large, fundamental aspect of healthy buildings.

We've seen how buildings organizations have adopted and continue to evolve, new strategies to address these impacts. Thinking through additional ways that holistic health and wellbeing intersect with the large portion of time that we spend indoors. Some people in schools, universities and across organizations may be thinking about buildings for the first time in their organizations, and then others who have been in this field for a while maybe thinking about it in a drastically different way because of the focus on this topic and the current events.

Hopefully, it's been affirming of the importance and value that buildings, their operations, and that the dedicated employees who support their efficiency and upkeep have for a multitude of reasons. Next slide. Because of a lot of the changing landscape over the past couple years and focus on indoor air quality, there have been a variety of initiatives that have been catalyzed because

of this, as well as pieces of legislation. I wanted to share some information here to start, that's connected to that.

First off, there has been a piece of legislation, the bipartisan infrastructure law, there's a provision within that, that applies to the theme of today's webinar. That's this provision focuses on energy improvement in public school facilities, so it's going to hone in specifically in that K through 12 environment. It allows for new competitive grants for energy efficiency improvements, and renewable energy improvements at public school facilities.

These could entail repairs, renovations that reduce energy costs or lead to improved teacher and student health and achieve energy savings. Eligible entities for these grants can and consist of a consortium of one local education agency, and one or more schools, nonprofits for profits or community partners. Applicants will be prioritized for schools with improvement funding needs.

Those with high free and reduced-price lunch percentage or those situated in rural locales. The funding will amount to $500 million, and that will be spread across five years for 100 million, and it's overall an interagency collaboration connecting this provision. If you do have additional questions, my email will be provided at the end of the webinar, and I'm happy to connect you with our leads Sarah Zaleski at the Department of Energy for this bill provision. Next slide.

Additionally, we have an Efficient and Healthy Schools Campaign in partnership again with the Department of Education, and EPA. It helps to provide public K through 12 schools to identify practical HVAC solutions and upgrades to improve energy efficiency and indoor air quality. The Building Technologies Office at the DOE runs this campaign through our lab partner, the Lawrence Berkeley National Lab. It also provides opportunities for recognition of efforts in increasing energy efficiency, and overall promoting healthy schools.

In addition to the recognition piece, there's also technical assistance available to participating schools, and it's currently being expanded. But it also includes and consists of those items listed there, such as guidance on energy management tools, as well as information about managing and improving indoor air quality, to name a few. Next slide. Then finally I mentioned at the beginning, just some of the initiatives that have been built out of this increasing focus on indoor air quality.

One of those, for example that I wanted to share out with folks is the EPAs recent Clean Air and Buildings Challenge. This is a White House effort to improve ventilation and reduce the spread of COVID by providing guiding principles and best practices for building owners and operators. It was informed in large part by the Department of Energy's efforts in this sphere to reduce risks from airborne viruses and other indoor contaminants. Encourage folks to look into these resources and guiding practices.

Next slide. Now, we're excited to be able to transition into our interactive platform. We'll be using Slido for this, for question and answers, polling and feedback. If you could go to slido.com on your mobile devices, or open up a new browser on your internet Windows, and enter today's event code, it is #DOE or — DOE. If you'd like to ask panelists any questions throughout the webinar, you can submit them at any time through here, and we'll answer those questions at the end.

You could select a thumbs up to upvote particular questions of interest, and that'll launch them to the top of the queue or enter your own questions on this platform. We would like to transition into some polls now to start off and learn more about you, see folks have already hit the ground running and entered answers. This is perfect, want to understand where folks are coming from, what sector best describes your organization. I can see we have a good mix of contractors, state government, higher education, and K through 12.

As to be expected too as these focus on education spaces, but it's great to see where folks are coming from K through 12, nonprofit, local government. Perfect, thank you and please continue to input those responses, it's really helpful for us to get to know the lay of the land. We can go to the next question, that works. Now we want to know a little bit more too about what folk’s role are that are in our virtual audience here. We have a variety of different options here to choose from.

If you don't see something that best fits your role, there is another option. Then on our next question, folks can expand on anybody that enters other, so feel free to take a moment or so and enter in something that fits here. I see a lot of sustainability professionals, there's influx the energy management representation, students great to see that representation, principals, teachers, perfect.

Thank you so much. That's helpful for our panelists to understand who's in our audience. Great, and we can go to the next poll. If you

did select other if you could type in your role here. I think that's helpful just to understand more so where folks are coming from if they didn't necessarily fit into one of those buckets that were identified. Engineer, okay great. Policy wonk, love it, that's design engineers, building operations managers, solution provider. Perfect, fault detection diagnostics, a writer.

Great, we got a wide range. Thank you for expanding to more on these roles, the building performance standards fellow, wonderful. Feel free to keep entering in responses to this other option, and then we can go to the next poll. Now we're curious where folks focus in their roles, and really the thought behind this question is, do you specialize in indoor air quality and steam? Or are you working in facilities but indoor air quality is just one aspect of that role?

Where are your primary focuses coming in and where you see indoor air quality? Okay, seeing some items roll in here. Or are you a teacher and you're concerned about the health and wellbeing of students, faculty and staff and curious where those focuses are, okay seeing some specializations on indoor air quality in communities, public buildings, energy efficiency at large. For some folks, it's just one aspect of the role for designing and planning, great, health and wellbeing overall with students and staff.

Perfect, thank you so much for folks engaging in this, this is great to know this background information. All right, feel free to continue entering in options, we have just a couple more questions that we can go to the next one. For folks who are affiliated with the school, this could be university, K through 12, or a district, if your school or district is planning or have completed any indoor air quality upgrades, we'd love to know just a little bit more background and details about that.

If you have completed those upgrades and are planning more, or other, or if currently folks are in the planning process for indoor air quality upgrades, as well as if folks haven't planned or completed yet any indoor air quality upgrades and they're here to learn some more information, potentially before doing so. Okay, I'm seeing a majority have completed at this point some upgrades and are planning for more. All right, we'll let those roll in here a little longer. All right, feel free to continue entering in responses.

Then we have one final question, we can transition to it. If you are affiliated with an elementary or secondary school or district, we're

curious to know if folks have utilized any ARP ESSER or funds to do any of these specifically indoor air quality upgrades. This is referring also to the American Rescue plan elementary and secondary school emergency relief funds specifically. Thank you for inputting that information, seems like a split between unsure or no. Good to know.

Great, thank you for entering in that information applicable for our elementary and secondary school folks. Well, without further ado, I'm happy to transition into our panelists and start in on our presentations. We have a great lineup of folks and we're really lucky to be having a variety from different areas and expertises. We'll start off today's webinar with Anisa Heming, Anisa is the director of the Center for Green Schools at the U.S. Green Building Council and one of the nation's foremost experts on green schools.

She provides strategic direction to U.S. GBCs work in schools and coordinates an organization wide team to promote environmental sustainability, health and wellness and sustainability literacy in school systems across the world. Thank you so much, Anisa for being here with us. I will turn it over to you.

Anisa Heming: Right, thank you so much. Can you hear me all right?

Bri Colon: Yes.

Anisa Heming: Great. I'm very happy to be here with you all. I am going to walk through a couple of resources and aspects of our work that I think might be helpful to you, in thinking through the work that you're doing in schools related to indoor air quality. I have the privilege of going before Shannon Oliver, who's actually from a school district who can tell you a little bit about how what I'm talking about can apply on the ground in the K-12 school district in the best way, so we can go to the next slide.

Then the next one. The Center for Green Schools, our mission is to support and train those who do sustainability related work at the school system level. people who are responsible for system level contracts, programs practices, at K through 12 school systems across the country. As part of this work, we can go to the next slide, we convene a growing network of school district sustainability related staff, these are folks who do energy efficiency work, indoor air quality work.

A whole mix of things, some of these folks straddle the academic side of the house and facility side. All of them are looking to connect with people who are like them in school systems, and looking to learn from their peers. We do this work its free for school district people to join, it just serves our mission to make sure that sustainability practices can be incorporated into K through 12 school systems. We are overjoyed that there's so much interest in learning together, this is a learning community for these folks.

Then the next slide, we're kicking off right now a network, specifically for indoor air quality. People who are working at the school system level on indoor air quality issues. We are doing this in cooperation with BPS for Tools for Schools program, and with DOEs Efficient and Healthy Schools program, to make sure that the education these indoor quality coordinators at school districts are getting is consistent and provide them what they need to do the work well. Next slide.

As part of the work to resource these professionals, we do online education regularly, at least monthly, including on air quality topics, sometimes for the sustainability directors' group other topics as well. But there's one in particular that you'll have the link to here, that is on how districts have used the federal COVID relief funding to implement important indoor air quality improvements.

This one in particular featured Boston public schools, which is a great example of using that funding to assess what's happening in the schools, and then implementing monitoring and an ongoing tracking of indoor air quality metrics, and implementing some of the bigger infrastructure improvements that they needed. It's a really interesting presentation, and it's available again, for free on our website. All of this stuff, next slide, is on our education site, usgbc.org/education, so you can find all that stuff there.

Then finally, before we get into some of the more detailed resource information for indoor air quality, next slide, we also host the Green Schools conference. If this is a topic, if you love the intersection between energy efficiency and air quality that is like the sweet spot of some of what we're talking about this conference. It'll be in late February, in the southeast, we're announcing the specific dates and location within the next couple of weeks. Hope you can join us there.

It's always a great event to connect with people who are also passionate about these topics in K through 12 schools. The next

slide, one of the reasons I wanted to talk today to you guys is we work so much with these professionals who do the work of implementing things in school systems. That we know that the communication between those who know something about air quality and efficiency, and the people who hold the purse strings.

Also, who are sometimes the loudest advocates, that communication is some of the toughest linchpins in the system, that communication point is such an important one too, for us to help along because there is a lot of miscommunication within school systems when it comes to decision making around indoor air quality. This is the reason we created these two-page fact sheets on very specific air quality topics. We were noticing a gap in the resources that were gullible to school systems.

There's either the highly technical resources that a facility staff member or their consultants would be looking to, to understand what strategies are needed in a particular building. Then there's the sort of general like, you should increase outdoor air type of resources. There's nothing in the middle that we thought would be able to help with the communication between these groups. That is why we introduced these factsheets on these very specific strategies that's likely a school district will be adopting.

That then needs to be communicated to people who want a little bit more information about what exactly is happening in those schools. That's what these fact sheets are for. You can go to the next slide, I'm just going to walk through the pieces and parts of these, they have a pretty consistent structure so that you can understand what's there, and you can use them if you would like. Again, these are all free. This one is the one on ventilation, the first section is just the basics, sorry, go to the next slide, please.

This is the like what is mechanical versus natural ventilation, and what do we mean by ventilation? The second section is this visual of how air moves through space. This is a consistent visual of the classroom that's on all the fact sheets that just shows how the technology, whatever technology we're talking about actually works in this space. Then the next section is usually it’s the costs and benefits or a more detailed look at what's some of the data and some of the guidance that's out there about the technology.

Then on the second page, we have a section about a little bit one level into the technical information about how the technology works. In this case, for ventilation we're talking about why measuring carbon dioxide only tells you part of the story related to

indoor air quality, and what it can tell you. Monitoring CO2, what it can tell you about what is happening in the air and the space that you're in. That is like one more level for people that are really craving a little more detail about what's happening.

When we implement things like increased ventilation. Then the next section is about using this specific technology we're talking about to achieve an equivalent air changes per hour. The equivalent air changes per hour includes the effects of air cleaning, and of ventilation and bringing in outdoor air. We have put those together into a graph of different approaches to try to reach six equivalent air changes per hour. What six equivalent air changes per hour actually means, that's the little stop watch that you see there.

I'm trying to paint the picture for people of how to compare the effects of applying different technologies or a combination of technologies. Then the last section here is a section on benefits beyond COVID. Okay, and then I'll just show you one more fact sheets they're on the next slide, you see the one on in room air cleaners and this is a mechanical filtration air cleaners. The standalone HEPA units, for instance.

This just walks through what those are, and what their benefits are and what exactly you're getting out of running some of those as a supplemental source for delivering clean air. That is one resource I wanted to make sure you had a really good view on. Let's go to the next leg. I also wanted to tell you a little bit about, so that's like a resource to help people implement good strategies within classrooms. But we know that a lot of resources are coming, and we know that they need to be implemented.

We wanted to take a look at whether they're being implemented across the country, and we implemented a survey for school systems. This is the second survey we've done, we did one last year and this year so we can look at the differences between the two. Go to the next slide, to see how school districts have implemented air quality improvements during COVID. The next slide, is this year's report, the last one was the last year's report if you wanted to see that one. This is just as to sort of contribute to decision making.

Make sure that lawmakers and others know what they can do to support schools implementing air quality improvements, and what the gaps are. Next slide, we saw pretty good representation across the country, a lot more people responded from California, which

up dark, western numbers. But 88 school districts responded representing over 4000 schools. Next slide. Many more city and suburb schools, just keeping that in mind. The next slide shows what kinds of things were addressed in those school systems.

This is behavior in administrative controls, just to give us a sense of what other things these districts were doing related to COVID. What we found here is that our survey group is quite COVID cautious compared to the rest of the country. At the time of this survey, it was November, 2021 when people were filling this out, about over 90% of our respondents had some sort of mask mandate. At that same moment, about two thirds of school districts across the country had some sort of mask mandate.

You can tell that the group is a little skewed to the COVID cautious, but that just gives us a lens on the results of the rest of the survey. The next slide, shows what people were implementing related to ventilation. You can see that there was a heavy reliance on HVAC for the delivery of fresh air, a lot of reliance on the use of those mechanical systems. The problem was, which I might have to skip through the challenges slides a little bit.

But the challenges of that were that a lot of the buildings that these school districts are dealing with are not able to implement the recommendations through those building systems, because they either don't exist or they're too old to be implemented. There's a real gap in the availability of appropriate infrastructure and the recommendations that school districts are getting from authorities, about what they should be doing related to ventilation. I think Shannon's going to talk a little bit more about that challenge.

Can you skip slides? We've got two slot, okay well, you can just do that too. You'll get these slides afterwards, you can also read the report. This is the walkthrough of those challenges that I could elaborate on, but you can also read about in the report. Sorry, go back one, and I'm just going to wrap up the report. One of the things that we did see in the report was that there are a lot of school districts that are used to dealing with federal money, who appear to be using the ESSER dollars to make indoor air quality improvements.

Including school districts that have a lot of a high percentage of free and reduced lunch students, and the larger district. We think what's happening there is that they're used to dealing with federal funding a little bit more than some of the other school districts,

especially on new programs and trying to figure, they have a grant office that's used to dealing with this stuff.

We are doing some education outreach to school districts to try to even out the playing field of which districts feel comfortable spending that extra dollars on indoor quality improvements. I think I'm going to wrap up there, I had an example here from — public schools and facilities spending, but I'll let Shannon give the school district example here. Thank you so much for having me.

Bri Colon: Thank you so much, Anisa. That was really fascinating to see the survey results and takeaways, and additional resources that you shared. Appreciate it. Next up, we'll transition to Shannon Oliver, Shannon has over six years of experience with air quality and environmental regulatory compliance, for the oil and gas industry and as the manager of Energy and Sustainability at Adams 12 School District in North Denver, Colorado.

Recent focuses of Shannon's work how I've included working with universities in the region as well, to investigate the impacts of air quality on student performance and health, and multiple projects to improve HVAC control for energy efficiency and indoor air quality impacts. Thank you so much for being here with us Shannon, take it away.

Shannon Oliver: Yeah, happy to be here. Every one I'm I sounding good out there? All right, yeah, great work Anisa, thanks for the information that national level pictures it was good to hear about. For those of you on the call, that hadn't worked much with the Center for Green Schools, highly recommended, they've been an amazing partner for us here in Adam12 Schools. Next slide. As mentioned, I'm the manager of energy and sustainability, and so I deal a lot with our systems and the ventilation practices that we've gone through during COVID.

For those of you that don't know, we're located in the north metro area of Denver, Colorado, we serve about 36,000 students and 4700 staff in 60 buildings. Then I directly manage a seven and a half on the dollar per year utility budget. Then over on the right side of the slide, here we have some of our indoor air quality practices, the ones in italics have been updated or impacted by the COVID pandemic. We are now utilizing MERV 9 as the standard for our filters in our buildings.

We have previously been using eight, not a huge increase there but every little bit helps. We can actually, essentially keep our budget

flat update to that level of MERV and have that increased indoor air quality. We really also seek to economize whenever possible, our climate zone here in Colorado, allows for really, four to six weeks in both the fall and the spring semesters that would allow us to bring in essentially 100% outside air with a fairly limited impact to our energy budgets.

We do have very few operable windows, I think again, this is probably partially due to our climate, but also just our building stock and — a lot of it was built in the '80s and '90s when that wasn't as much of a design choice. We do have a standalone HVAC unit in every room. Again, these were purchased during the COVID pandemic. Our setpoint here is 75 degrees for cooling and 68 for heating. We did actually expand that setpoint during the pandemic to accommodate that increased ventilation approach.

We would bump it up 78 during the cooling season and step down to 65 for heating. Helped us keep those systems running while also providing that air exchange benefit. We have complete monthly CO2 sampling in our buildings, this was increased from a quarterly sampling prior to the pandemic. This is done by our custodial staff, and in conjunction with our environmental manager. I will say we don't use this data to do much in the way of proactive maintenance unfortunately.

But it's something that we are doing, and I think we can probably improve in that area. We also provide occupant guidelines to all of our staff and the buildings around, kind of do's and don'ts of the buildings. A lot of this is tied to ADA compliance and other kinds of things. But there's a section on air quality, such as not bringing in plush furniture, not bringing in plants and animals or aerosols and instances of these kinds of things. Then we try to stay engaged on research and engagement of our students.

Next slide here, I wanted to show you guys a little bit of some data, this is our total energy cost of gas and electricity costs. By month for just our school facilities, I took out the support facilities. I've also included some heating, cooling degree days, just to help show that generally that these years were relatively similar. This is the last three school year, so really spanning back to the beginning of the pandemic. I mean, if you see on the next slide here, initially pre-COVID if you will, we had our standard design ventilation.

We call it 100% occupancy, sort of normal amounts of students and staff in our buildings, and our standard setpoint that I showed you there were 75 and 68. You can see how much energy we use,

we also spent about $4 million. Then if you move to the next slide, you can see during the pandemic, this was when we had implemented that COVID ventilation, those kind of targeted so five to six air exchanges per hour. We had fluctuating occupancy fall semester, we brought some students back then sent them home.

Then in the spring semester we were mostly back, although a lot of students stayed remote, so we were maybe 75% occupied. We had that expanded setpoint I mentioned, so that we could accommodate the ventilation. Did spend a bit more about 400 grand more on energy for that period. But then if you go to the next slide, you can see this last school year, we were back to essentially 100% occupancy, we maintained that expanded setpoint and we still had the code ventilation.

Then we did spend about 400,000 more than the previous year, and there was a jump up in energy use as well. I should say probably about 400,000 of that amount is due just specifically to the gas prices that are through the roof as many of you know. It's an interesting consideration for us, as an energy manager, kind of historically my approach has been ensure thermal comfort first, and then make sure we're being energy efficient and saving money second.

Really kind of coming through the pandemic here, I've extended that idea just to think, obviously thermal comfort first still, because people tend to notice that pretty quick and you get hot and cold calls. But then perhaps we could consider some indoor air quality second. Is there is there a middle ground where we go up to maybe four or five air exchangers and bump out that setpoint a little bit to bring in that better air quality, while maybe not having as strong of an impact on the budget, as we could see here.

Next slide. We did as I mentioned, get a portable HEPA unit in every room, these were purchased during the pandemic, we spent 564,000 to buy them, and they came with one set of replacement filters. We went ahead and actually bought a second set of replacement filters for another 162,000. All of that was funded through the Cares Act money. These provide essentially one extra air exchange per hour, we initially installed them in spring break 2021, we purchased units that only required a once per calendar year filter replacement.

We were able to swap those filters out here in the spring break 2022, we'll do that again in 2023. Then really, again, the take home message for me here is what's after that? We don't necessarily have

a maintenance plan once that last year of replacement filters is up. Initially, I was hesitant to have these put in our buildings, I was concerned about the plug load impact and energy use, and really that's been pretty minimal.

We've had very good support from our custodial staff and teaching staff, to make sure these are turned off when the rooms not in use. They actually operate based on I think its CO2 levels in the room. If it does get left on, it will kind of pare down its operation if no one's in the room. I think again, hopefully we can keep these, I think that extra air exchange an hour is great. Ideally, we can get some additional filters for the future. All right, next slide, please.

Yeah, just wrap up here a little bit on some of the research engagement we've been involved in. We worked with Colorado State University, this is actually about three years ago now. But they were working on EPA funded study to investigate the impact of a variety of indoor environmental quality metrics, such as thermal comfort, indoor air quality, energy efficiency, a number of things, and how do those metrics affect student performance?

Essentially, what we wanted to know is, if you do a building improvement that improves light quality or improves indoor air quality, does that translate to an improvement in student performance? There's been some interesting findings, there's a few articles being published from that study, that do indicate a correlation between indoor environmental quality and student performance. Interesting stuff there.

Then throughout the pandemic, we've got a couple scientists from NIOSH, it's National Institutes of Occupational Safety and Health. Came in our buildings to investigate this HVAC back programming to achieve the increased ventilation rate but what does that actually do to the air quality? There's sort of this assumption that if you make these programming changes to increase your air changes, then that should improve air quality. But we wanted to verify that, they were very interested in watching CO2 decay rates and things like that.

Then most recently, we're working with University of Colorado on another EPA funded study to investigate indoor air quality levels, compared to ambient air quality conditions during regional fire smoke events. Huge hot button issue right now here in the West, had a very bad fire season last year in Colorado and some extensive days of just terrible air quality. I think the hope here is to find out if we could provide recommendations on physical activity.

If it's a super smoky day, doesn't make sense to bring recess inside, have P.E class inside.

Is the air quality better inside to promote that? Interesting to see what we find with that one. Then lastly, we really try to engage our students and staff in the space. We actually are part of the Love My Air program. It's the name that city and County of Denver provided to this EPA funded program, to provide ambient air pollution monitors to schools and parks. These are actually installed at a couple of our schools.

There's a bunch of them installed throughout the region, the students have access to that real time data, they can utilize it in a variety of curricular activities. Ideally again, we may be able to at some point use that to inform physical activities, or make recommendations to folks that are impacted by asthma, those kinds of things. We also have a number of student led problem based learning projects that have happened, and PBL approach is where students are provided a real world problem, and then asked to create solutions to that problem.

Then they present those solutions to experts in that space. These can range from space travel, to screen time on phones, to environmental stuff like idling programs at schools. There have been a few PBLs around this idea of fire and smoke, and how that affects students, and a couple other preexisting interesting ones. Then lastly again, due to the pandemic we had to do a fair amount of staff education around this idea of thermal comfort and increased ventilation.

We were expanding that setpoint, so it was going to be a little cooler or a little warmer at times in the building. We wanted to make sure they still let us know if it was extraneous, we certainly don't want our students freezing or boiling. But we also didn't want every building calling us every day, because it was a little warmer than they were previously used to.

We had to really demonstrate that correlation between the ventilation and those temperatures that we're seeing in their buildings. Yeah, that's what I have for you guys today. I think that was my last slide, and appreciate you all being here. Happy to answer any questions you have.

Bri Colon: Thank you so much, Shannon, that was great to hear about your experiences in a variety of different research projects, as well be curious to dive more into those details at a later date. Appreciate it,

thank you for being here with us. Then finally, last but not least we have Rachel Romero, Rachel is a senior engineer and project leader at the National Renewable Energy Laboratory.

She's an active member of ASHRAE, currently serving on the residential buildings committee and is the project lead on the DOE's Smart Labs program, which seeks to plan and cost effectively achieve safe, efficient and sustainable laboratories through resources on the Smart Labs toolkit. I also want to give a quick reminder too for folks to send in questions on slido.com, with the event code #DOE, we look forward to answering those questions at the end. I will turn it on over to Rachel.

Rachel Romero: Great, thank you so much. I am going to take our direction a little way from K-12 schools and lead us in the direction. What we're typically looking at is more universities, but don't tune me out this is great information for anybody who's looking at ventilation or has lab spaces. That will go to the next slide. Why are we looking at labs? Laboratories typically consumed three to five times more energy than the average office building.

It can be as high as 10 times more, so there's a lot of opportunities found in labs. We've seen studies where you can find opportunities in the 20 to 40% range in case studies, and there's a huge potential for this across the U.S. and not just schools, but many sectors. That's why we're looking at labs today. Next slide. When we're looking at a lab, here's kind of a typical lab layout. The first things we're looking at is really that ventilation, which is why we're here to talk to you today.

Under that, the top energy users with the ventilation, we're including the heating and cooling in that as well, as that's all kind of part of the same system. Then we see plug loads. Everything that's plugged into the lab being used as equipment, things like that, and then lighting in labs. This is why we're going to focus on ventilation because it's a huge portion of what we're looking at in labs. Next slide. Why is energy wasted in lab? Again, back to that ventilation, cooling and heating.

It's an ingrained practice when you increase that ventilation you increase safety, and there's been several studies that showed that's not necessarily the case. Often that ventilation is not needed. Also, you may have a perfect system today or when you built your building a few years ago, but we see that airflow systems lose up to 50% of their control ability within five years, and that's pretty

consistent. We have a lot of energy that's wasted due to too much air, inefficient systems and improper modulation flow.

This could possibly reduce or lower your air quality, it could affect safety in the lab and that's why we're looking at this today. Next slide. If many universities are on campuses, and do have a lot of labs on their campuses, and with this greater energy use there's a greater opportunity. There's more opportunity for savings, more opportunities for resilience, we've seen a lot of universities looking into resilience in their systems.

By reducing their energy consumption in labs, they're really able to do some projects they wouldn't otherwise able be able to do. There's a greater reduction in emissions in helping to achieve decarbonization goals and improvements to indoor air quality. I do want to look specifically on the next slide, and why universities. Universities account for 25 to 29% of the laboratory market, this is really significant. I definitely see a lot of energy consumption per year in universities.

Just to break down quickly on the right-hand side of laboratories in the US by type. We do you see a lot of teaching laboratories, clinical diagnostic laboratories, research institutions, and life science research companies. Next slide. This is where we come to how our universities and education organizations and all these organizations looking at their labs, they're doing it through the lens of Smart Labs. A Smart Labs program really enables top notch science, through design and operation of safe and efficient high-performance labs.

We've put together a process for you to follow, to help implement some of these savings' measures. On the left-hand side, you see plan, we start with planning which is a big part of looking at labs, a lot of people or a lot of organizations look at labs and say they're mission critical. We don't want to even look at this, let's move on to other projects. But as we move towards decarbonization goals, we're going to have to look at these mission critical spaces. Planning looks, we'll get into that.

Then we move into assess, and then optimize and manage, and we put that all together into a Smart Labs program with the appropriate team. Let's look more deeply in the process on the next slide, we start with plan. This is really where you build a team of lab stakeholders, you understand what your building is consuming. What are the metrics, you really understand what your institutions

priorities are, so you know where to prioritize your efforts and really develop a strategic plan here?

Then we move down the slide to assess in orange. This is where you're going to conduct audits of laboratory building systems. This includes a laboratory ventilation risk assessment, which I'll talk about shortly. This will focus on ventilation systems, but we'll cover all of the other systems as well, and you develop a scope of work for system optimization. Then we move on to optimize, this is where you execute projects and understand how you're going to manage your building moving forward.

Then finally, we move into management. This is really implement a lifecycle performance management plan and apply lessons learned, in improving potentially additional facilities on your campus. On the next slide, we'll talk about the key elements of a Smart Lab. This is when we walk into a lab, these are the technologies we think of when we see a Smart Lab. Let's click through. I will start on the right-hand side with this informed selection and placement of diffusers.

We're looking for diffusers to be in a certain location of the room so as to sweep across, you can see the lines on the slide kind of animated there, to sweep across, pull the contaminants from the workspace away from the employees, out through the exhaust system. That goes with the optimized airflow, are you providing the correct amount of air based on the risks that you have in the lab space? This is where laboratory ventilation risk assessment comes in.

Next, we're looking for high performance exposure control through fume hoods and other exposure control devices, typically a fume hood. We're really looking for those to be high efficiency. We move to controls, we want VAV controls to modulate and allow for setback, low pressure drop design in the ducts to reduce that friction to keep the air moving. Then wind-responsive exhaust, and this is exhaust that modulates depending on the direction of wind in your building.

That can be done through a study of the wind conditions in the buildings around your lab space. This is what makes up very high-performance lab, and that's what we're looking for. I'm not going to talk, next slide. Okay, now we're going to have a quick poll. How you do determine the proper air flow rate for your lab? Just click over and look at it with you. We have a couple options here, and

this could be how you determine the proper flow rate for your space? I saw somebody asking Shannon in the Q&A about his.

Laboratory Ventilation Risk Assessment set standard, which we're seeing a lot of local code. Maybe it's an arbitrary number, somebody said once upon a time this is what it's going to be in, and that's what it is. Mission critical space, we don't really touch that, nobody talks about it, it just is what it is. The PI says don't touch it, it's what it is. There has to be somebody who maxed out their space and left it. We know that happened on a lot of spaces, maybe there's another.

All right set standard, yes, doesn't surprise me that is, we see that a lot. Thanks for participating in that, we will move on to the next slides. We're going to talk about the Laboratory Ventilation Risk Assessment. We have provided a tool to help organizations do the Laboratory Ventilation Risk Assessment. Because this can be a very overwhelming process to the team, when you first consider how to implement a Smart Labs program.

The LVRA tool enables users to determine laboratory ventilation requirements based on the laboratories overall risk and the items in the lab. It takes information collected from laboratory surveys, which consider the hazards and exposure control devices in your working environment. The tool then assigns a risk control band for each of these considerations, which has a scale for going from negligible risk to extreme risk. The values are then aggregated to calculate the overall risk level for your laboratory, which is then led to their aggregated for overall.

Then it leads you to determine your ventilation off of the ASHRAE design level recommendations. Then it enables you to really set minimum and maximum room flows to help optimize ventilation strategies. We're just going to give you on the next slide a quick demo. We've taken a short screenshot of what the LVRA tool looks like when you download it from the Smart Labs toolkit, which is where all of this information is collected and freely available.

It comes in Excel file as you can see, and there are multiple columns and rows containing various information that users can calculate to describe their laboratory. The tool assigns a risk control band for each response, which can then be used to determine the air flow rates. It's pretty user friendly, although there's a lot of information that goes into it to help you make good decisions, and accurate decisions for your organization.

Really, if you're looking at labs, this is a great way to look at your flow rates and ventilation that can really affect your overall organization's energy consumption and decarbonization plans. Moving for that, alright. I just want to share really quickly on the next slide, Smart Labs in action. This is one of our partners, University of Minnesota. They started by planning, by working with the Environmental Health and Safety staff. This was the energy and sustainability staff got together with EHS.

Really developed a performance-based alternative design process together. From there they moved on to the assess, and they determine their risk control bands and ventilation safety design. They very well documented all of the activities, including a chemical inventory and a local exhaust ventilation inventory. This could be replicable and continued. In their optimize, they've reset their ventilation rates.

Then they've really worked to bring together similar activities, or hoteling concept to group those similar activity. Then they've implemented more hygiene for chemicals to be stored in ventilated storage cabinets. Finally, in the manage phase, they've really put together a toolkit to document these safety procedures, and they conduct an inspection of labs every six months to ensure that they're continuing to achieve performance in their Smart Labs.

That was a lot of information. On the next slide, we just want to say we're here to help you. My name's Rachel Romero, I'd be happy to answer questions through Slido or through the webinar. Also joined by my colleagues, Otto Van Geet and Amanda Kirkeby, and we are sponsored by FEMP, and I will turn it back over to Bri, thanks.

Bri Colon: Thank you so much Rachel, for all that really rich information. That was great to hear, and thank you to all of our panelists. I know if we had the ability to send up those virtual applause emojis, they would be flooding the screen right now. Thank you all for taking the time to share this information with us. If you haven't already, I believe we have time maybe for one question in the slideshow.

Don't worry, there will be opportunities, we'll share the contact information at the end for you to reach out to these folks as well, if you have any follow up questions. If we could transition to Slido for this Q&A. Again, the event code DOE, we can see maybe which is the most popular question right now and address that. I'm

seeing here one of the most popular is, research is showing that germicidal ultraviolet systems applied within a room is more effective and energy efficient than increasing ventilation to reduce spread of COVID.

Is this measure eligible for grants and part of campaign challenge? I'm curious if any particular panelists has any insights on that question and wants to unmute and share.

Anisa Heming: I'm not going to talk about germicidal UV, but I actually think this is for you guys.

Bri Colon: Yeah, I know with the campaign challenge, I know that component. I believe that could be a part of the bipartisan infrastructure — element, and happy to connect with folks on additional aspects related to that and refer them to our lead on that grant program. Sarah Zaleski is our lead on that one, and happy to connect folks with that contact information. But Anisa if you'd like to share more about germicidal ultraviolet systems, happy to hear your input on that.

Anisa Heming: Yeah, it's a very well respected, well tested technology. It needs to be applied correctly, and especially the ones that are in space in room, DUV systems. Making sure they're installed correctly and high enough in the space, and near ventilation sources is really important. We have a fact sheet about that, and the indirect ones are also great for keeping systems clean.

I know that they've been used in labs for a long time, so Rachel might have more to say about DUV or UBTI is sometimes called. It's a technology that's worth exploring, where you think you need extra ability to keep air clean.

Bri Colon: Thank you so much, Anisa for that backup information, that was really helpful. I believe we'll transition now just to a few closing slides. Again, want to reiterate the ability to connect with our presenters to learn more, and ask follow up questions that you may have. This webinar was part of our 2022webinar series. As you can see, we have many planned throughout the rest of August, and recordings of past are available on our Better Building Solution Center. Go to the next slide.

Great, our upcoming one is listed there taking place on August 2nd, if you're interested, please feel free to register and we will see you there on August 2nd. Next slide. We also have released our annual report, our progress report for Better Buildings with key

findings updates metrics for this initiative, please visit the Better Building Solution Center, so many reasons to visit it and explore more about this progress report with a really rich information shared from partners in the DOE about how we're working towards a more energy efficient future.

Next slide. Finally, if you're interested in learning more about the topics discussed today, I encourage you to download our additional resources PDF from the chat box. This handout contains links that were collected from our panelists as well as Better Buildings resources, so we hope you enjoy and find it useful. Then our contacts are listed here on this final slide. I'd like to thank our panelists again, for taking the time to be here with us today.

Feel free to contact them with any question we didn't get to, or any follow ups. I encourage you all to follow the Better Buildings Initiative on LinkedIn and Twitter. We're hip, we've got social media at the DOE, so our handles are there on the left. Please don't hesitate to engage with us there. Then you'll receive an email with today's recording slides and transcripts are available on the Better Building Solution Center. Thank you all again for attending and have a great rest of your day.

[End of Audio]

Breathe Easy: Indoor Air Quality in Education Spaces

Additional Resources

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

Better Buildings Resources

- Resource Center: Building Operations During COVID-19
- Efficient & Healthy Schools webpage

Explore more resources on the Better Buildings Solution Center

Other Resources

- U.S. EPA Clean Air in Buildings Challenge factsheet
- U.S. EPA Clean Air in Buildings Challenge Guidance
- U.S. EPA Indoor Air and Coronavirus (COVID-19) webpage
- ASHRAE Indoor Air Quality Guide
- CDC Indoor Environmental Quality
- UV Lights and Lamps: Ultraviolet-C Radiation, Disinfection, and Coronavirus
- On-the-ground IAQ: Assessing Air Quality and Planning for Improvements
- Green Schools Conference & Expo
- Preparation in the Pandemic: How Schools Implemented Air Quality Measures, COVID-19 report
- USGBC Sustainability and Green Building Education webpage
- School IAQ Fact Sheets: Entire Series
- Managing Air Quality During the Pandemic: How K-12 Schools Addressed Air Quality in the Second Year of COVID-19 report
- Adams 12 Schools: Energy & Sustainability
- Smart Labs Toolkit

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