

Josh Geyer: Hi, everyone. Welcome to the webinar. We will be starting in just a couple of moments.

[Silence from 0:00:07 to 0:00:55]

Josh Geyer: Hello and welcome to the *2021-2022 Better Buildings Webinar Series*. Bringing you the latest actionable insights from leading industry experts, this annual series is a chance to explore the topics, technologies, and trends that affect your organization. My name is Josh Geyer and I'm your moderator. I work at HUD in the Office of Environment and Energy on issues related to energy efficiency, decarbonization, and also resilience, adaptation, and environmental justice. Next slide.

So here's our webinar for today. We're gonna go through a welcome and an overview of the BBC and the Climate Action Plan that HUD just came out with. We'll have speaker presentations and then a Q&A and wrap-up. Next slide.

So today's webinar is being run by the Better Buildings Multifamily Sector. Two separate partner challenges fall under the multifamily sector: the Better Buildings Challenge and the Better Climate Challenge. For the Better Buildings Challenge, our partners commit to improve their energy efficiency for their portfolios by 20 percent over ten years. This program is comprised of over 90 partners with properties across the country, the vast majority of which are affordable housing providers. In November 2021, HUD was excited to join the Department of Energy to launch the Better Climate Challenge. Partners that joined the Better Climate Challenge commit to the ambitious goal of reducing their portfolio-wide greenhouse gas emissions by at least 50 percent within ten years.

Many organizations have set goals. What we need now is to be supporting organizations in finding pathways to meet those goals in setting an example for the rest of the economy. HUD is partnering with DOE to support this transformative market leadership program in the multifamily sector. Together with DOE and its national labs, we'll be providing technical assistance to help partners tackle barriers. We'll be facilitating peer-to-peer exchange, and we'll be providing a national platform that demonstrates partners' leadership in addressing climate change. If your multifamily organization is interested in joining this exciting challenge, please contact me through email. Learn more about the Better Buildings multifamily program by visiting the site below. Next slide.

Before we dive into today's session, there are a few housekeeping points I'd like to cover. Please note today's session will be recorded and archived on the Better Buildings Solution Center. We'll follow up when today's recordings and slides are made available. All attendees are in listen-only mode meaning your microphones are muted. If you experience any audio or visual issues during today's session, please send a message in your chat window located on the bottom of your Zoom panel. We will be using an interactive platform called Slido for Q&A and session feedback. Please go to www.slido.com – that's S-L-I-D-O – using your mobile device or by opening a new window in your internet browser. Today's event code is #DOE. Feel free to send questions or comments for our panelists by typing them into Slido any time during the presentation. You can also upvote other attendees' questions. We'll address your questions at the end of the three presentations. Next slide.

So I wanted to take a moment to talk to everyone about the HUD's Climate Action Plan which I mentioned before. This was the result of Executive Order 14008 which instructed federal agencies to tackle climate change at home and abroad, and it instructed – one of the directions was for federal agencies to come up with a climate adaptation or climate action plan around all of their agency programs and operations. At HUD we put together a Climate Action Plan that is built on three goals that are in many ways overlapping and interlocking. So Goal One is increase climate resilience across our portfolio and all of our programs, Goal Two is reduce greenhouse gas emissions, and Goal Three is to pursue environmental justice.

The Better Buildings Challenge and the New Better Climate Challenge are a huge part of or a big step toward meeting Goal Two of decreasing greenhouse gas emissions across our portfolio. The Better Buildings Challenge has been our flagship program on energy efficiency for a number of years; and we're looking to continue to have our partners in the Better Buildings Challenge, Better Climate Challenge because leaders for the whole multifamily sector and build environment in general and finding pathways to decarbonization over the next ten years. Next slide.

So these are today's presenters. I'm really excited to have everyone here for them. They're excellent. They're experts, and they are going to be leading the way on all of these issues. We'll be hearing from Webly Bowles from New Building Institute, Greg Hale from NYSERDA, Magda Szymanska and Mark Puchalski from

Tenderloin Neighborhood Development Corporation. Next slide.

So again, I'm pleased to introduce Webly Bowles, a project manager at New Buildings Institute. As an architect, she brings her systems thinking approach in researching and promoting net zero buildings. Webly facilitates a collaborative of national nonprofits aligning actions to collectively reduce building emissions. Her current research efforts include embodied carbonated codes and carbon neutral building messaging. Welcome, Webly.

Webly Bowles:

Thanks for the introduction, Josh. I'm honored to be here and excited about the opportunities in front of us. As Josh mentioned, my name is Webly Bowles. I'm a project manager at NBI. New Buildings Institute is a national nonprofit. We work to advance net zero buildings through research, codes and policy, market leadership support as well. I work on the Codes and Policy Team, and I also support our Getting to Zero market leadership work. Today I'm going to talk about what it actually means to have a net zero building at a very high level. So next slide.

At NBI we center our work on what we call the Five Foundations, and together these different components get us to a carbon neutral future. Each foundation has a scope and has a defined goal to help us meet a 1.5 climate solutions and that's energy efficiency, renewable energy, grid integration, building electrification, and life-cycle impacts. Next slide.

The term carbon neutral has picked up steam over the last year or so, and it has a couple of different meanings. And for years we've seen utility programs that have only been focused on energy efficiency, and that has led the market to lower energy buildings which is great, but now the building sector is shifting from decades of regulation and programmatic orientation around energy efficiency from KWH and therms to governmental actions that are centered on carbon and GHG emission reductions. So we need to figure out how we align these two, but how do we do it?

So just as zero energy has had many different definitions, so does carbon neutral. NBI reviewed over 15 different definitions to evaluate the similarities and differences in how they were represented including embodied carbon, onsite combustion, and how renewables were defined and how they were actually counted. And while the details are varied, we noticed that there were actually a lot of commonalities. The divergence was really in the details. So this chart is from WSP. NBI amended it a little bit, and it represents a few of the carbon neutral definitions and programs

that are out there, and it shows the commonalities and variances. Next slide.

And then we throw in corporate terms, and there's a whole different structure about addressing carbon emissions. This is a World Resources Institute's GHG Protocol, Greenhouse Gas Emissions Protocol. And I'm going to present this at a high level. There's a lot more that goes into this. We could do a whole one hour discussion around it. But essentially, Scope 1 emissions are the emissions from your owned, leased, and otherwise controlled gas equipment – gas appliances, fleet vehicles, fossil fuel leaf blowers, and other such things. There are a few other emissions that are accounted in here including fugitive emissions from onsite gas refrigerants, but essentially it's related to gas.

Scope 2 emissions are from the electricity indicated on your electric bill. So electricity emissions vary depending on the energy source. So in the Midwest you might have more coal and gas, so your electricity is going to have a higher amount of carbon in it compared to those that live in the Northwest use the same exact amount of KWH where our electricity is produced with more hydropower.

And then Scope 3 emissions are called indirect emissions, and those are the emissions from day-to-day activities like travel, purchased materials, waste, and outsourced activities. Scope 3 is often calculated based on kind of dollar amount spent, but I do want to note that as embodied carbon is becoming a larger topic in buildings, this is where Scope 3 emissions lands. So if you're familiar with term embodied carbon and building, this is where that is. So this is, again, at a very high level. The Better Climate Challenge is focused on Scope 1 and Scope 2, and so we can kind of set aside Scope 3 for now. Next slide.

So the zero energy building policies are not the same as carbon neutral policies. We've seen zero energy policies kind of spread across the US which is great; but going back to the Five Foundations, we're looking at four that are really around carbon neutral policies. So within renewables at the building level, California Title 24 requires solar-ready and Santa Monica in California requires a 1.5 watt of solar panel installed per square foot on buildings and for multifamily and small commercial that is two watts per square foot. So there are requirements around renewables in some places in the US.

Around building integration, Washington State actually requires

that any water heaters that are sold in the state have a module demand response communication installed on that water heater. It doesn't require them to be controlled by a utility but just to have the option for future demand response. With building electrification, we're seeing a lot more of gas bans across the country. Berkeley was the first in the nation to do that. No new fossil fuel in new construction. And Brookline, Massachusetts has a similar one which is no fossil fuel in residential. And then within embodied carbon, this is where we are seeing a lot of spread around this as well. So in Portland, Oregon, we have a low carbon concrete procurement policy as well as a deconstruction policy. Vancouver, Washington has a whole building LCA for those that are rezoning. And then there's a lot more that is happening around refrigerants. So collectively, these policies are requiring low carbon, embodied carbon and operational emissions. Next slide.

So when trying to describe carbon neutral buildings, we split the actions into two groups. We look at the core components and then the additional components. And the core components of carbon neutral buildings are very similar to zero energy buildings, if you're familiar with that. So we have zero energy efficiency renewables for on and offsite, which is a little bit of a newer concept of site renewables, and then managing and measuring that zero operations which is essential. And then in addition to the core components, we have additional components and these are the components that will lead us towards a carbon neutral future.

So electrification means no gas onsite combustion. Building grid integration strategies allowing the grid to adjust set points the building's mechanical and using the grid during off-peak hours when the grid energy carbon is actually lower. Low global warming potential refrigerants. These are your natural refrigerants and lower global warming potential blends. And then also looking at leak protection. That's a really important thing when it comes to refrigerants because they are very high potent and can destroy the environment. And then the last one here is embodied carbons. So selecting lower carbon materials that reduce carbon emissions before the building is even operated and metals and concretes are kind of the largest potential for those.

So there's entire books that are written about each of these topics. We recently published a high level guide that introduces these topics. It's called *The Insider's Guide to Talking About Carbon Neutral Buildings*. So that provides a little bit more information. Next slide.

So beyond decarbonizing buildings for the good of using less energy and cutting emissions, high performance carbon neutral buildings have additional benefits to them. We can future proof against rising energy rates, which can help reduce our bills. High performance buildings provide an opportunity for designers to market their understanding of these components and helps them so that they can limit their learning curve when new codes and policies come out.

There's also health benefits. Fossil fuel buildings have cleaner air due to no gas so we're not looking at some toxic indoor pollutants. Often high performance buildings have tighter envelopes that have better insulation that we can better control the ventilation within the building, and we can make sure that there's no cracks in the envelope so we're not pulling in air through the envelope which can often lead to water infiltration, mold, and other contaminants. Again, getting back to that healthy buildings idea. That thick sealed thermal envelope is also great for resiliency. It limits the indoor temperature swing if the electricity goes out. There's a great report called *Baby, It's Cold Inside* and it looks at the conditions inside when – based on a different thermal envelope based on when the power goes out. So last winter in Texas there was a lot of stories about neighborhood heroes who were able to charge neighbors' cell phone batteries so that they could communicate with their families, let them know that they're okay because of the solar and battery components. So that's an important consideration as well.

Tighter envelopes often lead to more comfort. We have less drafts, better airflow within the space. And then another great component of this is that we often have smaller mechanical systems. I worked on a passive house project, and one of the senior residents said that they could actually hear their grandchildren because they weren't blasting the heater all the time. So there's a social component to that as well. And then there's also a safety component when you eliminate that flammable fossil fuel within the building. There's that limited fire hazard. Next slide.

So I've listed a couple of resources here, but there's so many more. I have a link there to our gettingtozeroforum.org/resource-hub site where we have over 300 resources there for you to look at if you're looking for anything. The Insider's Guide was developed to kind of look at those core components and the additional components. Our intent is not to define carbon neutral but to help communicate what should be known about the topics at a very high level. Redwood Energy's Multifamily Electric Resource is also a great guide. It

includes benefits, technologies, costs, and some case studies in there as well. AIA, the American Institute of Architects and Carbon Leadership Forum recently put out three real quick overview guides of embodied carbon and implementation letter. Worth checking out if you're new to embodied carbon. NREL's Cost Control Strategies is also another great guide to understand cost-reduction strategies. It often involved integrated design process and kind of planning upfront.

It's hard to just use a couple of resources. So if anyone's looking for anything, NBI is happy to help find specific resources for you or point you in the right direction. There's also a couple of organizations. I mentioned New Buildings Institute of course. Our Committing to Zero resources have – we have 300 resources there. The Building Decarbonization Coalition is another great organization for electrification resources, and then the Carbon Leadership Forum has great embodied carbon resources. Next slide.

So thank you so much to Better Buildings for coordinating this really important webinar and topic. As I mentioned before, NBI is happy to help you find resources or answer questions for you, just so you get started. Feel free to reach out. My email is right there. Thank you.

Josh Geyer:

Thank you so much, Weby. Just a reminder to the audience, please go ahead and type your questions into Slido, which some of you already have been doing. That's great. And we'll address them at the end of the session. Next we have Greg Hale, Senior Advisor for Energy Efficiency Markets and Finance at the New York State Energy Research and Development Authority, known as NYSERDA. Greg has led the development of NYSERDA's roadmap to a statewide carbon neutral building stock for New York by midcentury and previously was responsible for overseeing the establishment of the \$1 billion New York Green Bank and was the lead author of New York's 2015 State Energy Plan. Welcome, Greg.

Greg Hale:

Thanks so much, Josh. And appreciate everybody who has tuned in today. I'm going to dive in here and try to cover a lot in the next 15 minutes so let's get going. Next slide. So just in case anyone's forgotten why we're all doing this, I'd like to start out with this slide. It kind of evokes a *Planet of the Apes* feel to me and that's what we're trying to avoid. And in New York, we're aggressively going after the climate issue. We've passed a very aggressive climate act called the Climate Leadership Community Protection Act – next slide – in 2019.

And we're currently in the process of developing what's called the Scoping Plan which is the plan to take our entire economy to carbon neutrality by 2050, and that's an 85 percent actual reduction at least in greenhouse gas emissions or could be some offsets beyond that or we could get higher with a 40 percent reduction by 2030 as a milestone along the way. I'll just point out important points here as Weby was talking about, the Scope One and Scope Two, this Act requires New York State to get to 100 percent zero emission electric grid by 2040 with a 70 percent renewable milestone by 2030; and there's a lot of work underway that has us confident that we can meet that. We've got a bunch of – we've actually got 50 percent clean energy in the pipeline when these projects have been completed by the late '20s. Then offshore wind is coming on, and we just announced two new transmission lines that will bring clean energy down into the downstate area of New York City. The other very important part of the Climate Act is about disadvantaged communities and the act requires that at least 35 percent of the benefits with a target of 40 percent run to disadvantaged communities, and there's a whole working group defining what that means. So next slide.

The issue in New York State is we have 30 percent of our statewide emissions coming directly from buildings. This would be Scope 1 emissions in that terminology. When you look at what that is in the bar chart, what that comes from in the bar chart to the right there, you'll see, no surprise, mostly space heating and water heating and multifamily space heating is a big piece of it. That's the yellow bar in the middle there. Then multifamily and residential certainly makes up the majority of the water heating use also. So this is where we have to get to. Once we get a clean electric grid, then electrification will essentially will eliminate that Scope Two emissions. Next slide.

So scale is really critical here. We've got 6.2 million buildings in New York State, over 5 million single family houses. We've got to be operating at ten times the level of heat pump installations and electrification projects that are happening today. We've got to be doing 200-250,000 houses a year by 2030 and right now we're doing about 20-25,000. So massive scale, great economic development opportunity, but obviously a big challenge and we came out within the scoping plan under the Climate Act that aggressive regulatory signals are going to be needed. So in particular, for new construction we have to require all electric high performance new construction in the recommendation in the scoping plan. And by the way, the scoping plan will be out for

public comment next year and will be finalized at the end of 2022.

So what I'm talking about here, these are all elements that are in the draft plan and then we think they're required to stay in there and become the final plan. So the first one is all electric new construction, they're actually saying by 2024 for low rise and single family houses and by 2027 code cycle for larger commercial and multifamily buildings. And pretty exciting, yesterday the New York City Council, New York City Council passed a law requiring all electric new construction with phase in dates that are pretty much aligned with what I just said.

Well, we got to get at existing buildings as well. That's where a major regulatory requirement will be that you cannot replace a fossil fuel heating appliance at the end of its useful life with like kind after a certain date, and we put that date far enough in the future for the market to be able to ramp and meet those dates, and we're suggesting 2030 for single family, low rise houses, low rise multifamily and that you cannot replace a fossil fuel appliance in 2035 for larger buildings there. And then there's benchmarking, energy performance, building standards to drive efficiency for larger properties. So with this in the background, I want to talk about some projects that we're working on today because we can't wait for the final scoping plan to be adopted and the regulations to come in place and just sort of twiddle our thumbs between now and then. So next slide.

I want to talk about three or four initiatives that we're working on today through NYSERDA with various partners that we think are really groundbreaking and can drive cost reductions by scale. So the first one is a partnership with our state affordable housing agency, Homes and Community Renewal, HCR. We're doing a very similar project with the New York City agency HCD. And what this is is actually integrating NYSERDA's incentive into the standard process, the standard financing process that HCR runs.

So through the Low Income Housing Tax Credit programs, the NYSERDA incentives are actually integrated into that offering. So to the developers, they don't have to go to two places. It's all integrated, but it also works to increase the building performance standards that the agency requires all of their project developers to meet to get the tax credits. So we have this structure, and if we can just raise the standards for everybody, then, you know what, the developers will follow because that's where the money is and will figure out how to get the project done at the higher performance standards. So we've already integrated this and increased the

performance standards for new construction RFPs this year, and next year we're planning to get to the RFPs for existing building renovation projects. So we think this is a very powerful tool. Next slide.

We also happen to have the largest public housing agency in the country, the New York City Housing Authority or NYCHA, 170,000 units, over 2,000 buildings, over 350,000 residents. So scale is inherent in this entity and we also have about 50 other public housing authorities in New York State. This project, we also think is pretty exciting; and the idea is to use this scale to develop – and these buildings are – very many of them look a lot alike. There's a lot of replicability here, and it's not just within NYCHA. It's within the other public housing authorities and it's also within multifamily buildings for the entire state. So I've got a little core drilling going on behind me. Hopefully, you're not hearing that too much.

So what we're doing here is trying to create a packaged window-mounted heat pump unit. So this format doesn't really exist today, but it's not far off from what does exist in other places and in the world. So what we're going to do is challenge heat pump manufacturers with a particular specification that will work with these buildings for these window-mounted packaged units. We're developing that specification in partnership with industry and engineers and then we're going to put out a challenge shortly in the next month or two to manufacturers to develop this type of a unit with the backend that – next slide – for this particular pilot, we have 4,000 units, 11,000 heat pumps that can be rolled out once this spec is met.

But then NYCHA has committed to roll that out beyond in other parts of its portfolio if the proof of concept works, and we're pretty confident that it will. But it's not just NYCHA buildings, like I said. This could reduce the cost of electrification across these types of multifamily buildings throughout the US Northeast. They'll be cold climate heat pumps. They'll work for this environment. So then we have the New York Power Authority that can undertake bulk procurement for NYCHA. They are the provider of electricity to NYCHA. So we've got that element in play, and we're also collaborating with DOE and HUD. This is really exciting that HUD is getting into the game here with their Climate Action Plan and the Better Climate Challenge. It's truly exciting. So they're going to be working with us to try to basically spread this as far and wide as we can. The other thing about NYCHA is they're also participating in different type of renovation project with our

Retrofit New York Team. Next slide.

So this is a different approach. It's based on a European initiative called Energiesprong, and the idea is that we have a market catalyst where we market makers. So we're working with manufacturers, with the architect, engineer, construction industry, also our affordable housing agencies. We're aggregating demand with building owners, figuring out a financing product and figuring out what regulations might need to change to make all of this work.

And this – next slide – is doing a truly deep energy retrofit starting with low and midrise buildings up to seven stories, but essentially you're doing it from the outside. So you're doing it with minimal resident disruption and you don't empty the building for a year and go at it from the inside. You're essentially wrapping the existing building call it with a high performance sweater, and the panels on the walls incorporate the windows so you actually – it's all prefabricated offsite. Let's go to the next slide.

This is just saying it's spreading across Europe. There's a lot of – they've completed 20,000 completed or in the pipeline in Europe already. So it's achieving scale. But the idea here is that you're taking a lot of the work offsite. So you're reducing the cost of the onsite labor and you're actually addressing the labor shortfall in construction and translating some of those jobs into higher tech jobs which are more attractive to people entering the workforce today. So you make these panels offsite. You've already done an exact measurement of the building through 3-D measurement technology so you know exactly what the building looks like, and you build these panels so they just fit in place on top of the old building. You take out the old windows and you put this new panel in place. You wind up with deeper windowsills that people like.

And then if you look at the left on this – excuse me – that's what we call an integrated mechanical system or energy pod and that's all of your mechanical systems in one unit that's easy to put onto the buildings, sort of plug-and-play. You can get at it to maintain it from the outside. That's going to have your heat pumps, your ventilation, your ERV, your solar inverter, your hot water heater. So all in a single unit, and there are different shapes and sizes of those. Next slide.

So cost compression here, this is one of the reasons we're really addressing, pushing this approach is that in the Netherlands they're able to achieve over 50 percent cost compression in about five years by developing scale and the way this system works. So we

do believe this is a way of getting at the spiraling costs that are happening today. Next slide.

So we've run some design pilots in the first round. These were upstate pilots. The lower is the designs that emerged. I think the middle one will get built. The other two probably not. The middle one has been held up by the USDA which is their overall financing program. Next slide.

We also did pilots in downstate and the middle one is just about complete. RiseBoro is doing Casa Pasiva. Really interesting project. It's not panelized on the outside, but they used EIFS. So it's not quite the solution that we're driving at, but it's a great project. We'll have great energy savings, and they've run all sorts of conduits in that exterior insulation. Next slide.

So I just got another minute or two here. So what we learned is that there are high cost issues with the supply chain. You know, the technology wasn't there. The labor force wasn't there. And if you go to the next slide, what we're doing, what we have done is spent two years developing all of these elements of the market in the background and we now have rolling requests for qualifications where we've qualified the components that will work, buildings that will work, and owners who are interested and what we call solution providers which is the new business model that will be able to provide a turnkey Retrofit New York style project onto a building that specifies it instead of going through all the intermediary steps of standard bid and construct project. So we have just released a new product opportunity notice, a new PON to provide the gap funding required to do the next generation of projects with people who have come through and qualified and understand what we're driving at. So we're very excited, hope to have some projects underway next year. Next slide.

I'm not going to go into this, but people can ask questions and get back with me later. Very interesting data on new construction of high performance buildings, essentially showing that as you do a couple of these, that the costs have really come down very close to parity in new construction for high performance. There's just no reason to build the old way. I've got to stop now. If you just go through the slides till the end, you'll see a few projects that are underway. These are not dull buildings. Those were all high performance, going for passive house certification, being constructed today in New York State. So very encouraging. We're at the beginning of this ramp, and it's going to be exciting to go

forward. Thank you very much and back to you, Josh.

Josh Geyer:

Thanks so much, Greg. I'd like to follow-up on Greg's overview of the New York City's Housing Authority's Heat For All Innovation Challenge with NYPA and NYSERDA. This is an opportunity to help kick start the market for packaged cold climate heat pumps and reduce the cost of electrification while maintaining efficiency of existing cold climate heat pumps. NYCHA is a Better Buildings Challenge partner and is looking for other affordable housing organizations to express interest in this solution to help convey market demand. Following today's webinar, we will be sending out an additional resources handout that will include a letter of interest form that interested organizations can sign. If you're interested in expressing your support for packaged cold climate heat pumps, please consider sending a letter of interest form back to NYCHA. This action in no way commits your organization to purchase or engage in the project in any way; but it sends a signal to potential manufacturers of this technology that if they are able to come up with a solution, there will be people who want to buy it. Next slide.

Last but not least, we have Magda Szymanska and Mark Puchalski from Tenderloin Neighborhood Development Corporation. Magda is TNDC's Sustainability Program Manager. She joined TNDC in April of 2019 following her work with GIS Analysis at APEX and Energy Efficiency at San Francisco Department of the Environment. She currently manages TNDC's sustainability efforts to achieve goals set for energy, water, carbon reduction, and waste diversion. Mark is TNDC's Director of Facilities. He's a certified systems maintenance administrator and has over 33 years of experience in sustainability, facilities' operations, management, and maintenance. He is passionate about curbing the housing crisis plaguing our communities as well as the climate crisis impacting our planet. Welcome, Magda and Mark.

Magda Szymanska:

Morning. Greetings from TNDC. Welcome to our Roadmap to Carbon Reduction. Next slide please. Tenderloin Neighborhood Development Corporation carries Tenderloin in the name, but we are representing eight of San Francisco neighborhoods. We have 43 buildings in full operation right now. Two brand new properties are just about welcome first tenants and an additional 11 are coming up. TNDC is serving population with low and extremely low income, and our goal is to provide not only home but also health and voice. Next slide please.

It all started in 2013 when TNDC joined Better Buildings Challenge for energy and water goal. The sustainability projects

were planned to focus on three main phases. While auditing properties, we collect data, checking usage, looking at available incentives and also property budget because finances and the final cost is always weighing heavily on the decision about projects. As next step we did and still do run the project itself. This includes energy and water efficiency upgrade, investing in renewables like installing solar system, but also switching electricity to super green meaning carbon emission free. For the new development, we have design guidelines to make better choice at the source of building brand new houses. After completion of the projects, we are looking at the data again, monitoring the savings, comparing predicted savings to calculate to actual cost savings and also looking at the return of investment. Following this path, with 2018 data, we reach our ten-year goal within the first five years and we started to look at what is next.

Carbon tracking came as a natural next step. We have already continuous data for like KWH and therms usage. So we see that tracking the progress in energy use reduction should be able – we should be able also to track the carbon reduction. With this we decided to add carbon reduction goal along the waste goal to our Better Buildings Challenge, and 2018 became a baseline for our new goals. What we see here is our first carbon emission inventory was completed in summer of 2018 with help of climate portfolio. We used the 2018 energy data and calculation sheet provided by Environmental Protection Agency and Greenhouse Gases Protocol. The links we can see here. And we set our goal to 50 percent reduction in 20 years. We run the calculation regularly and at the moment we have results for the past three years. What is clearly visible here is that almost all of TNDC current emission came from gas. With green and super green electricity, we were able to significantly reduce emission from Scope 2 and this is why our focus is on electrification. Next slide please.

So how carbon reduction oriented projects look in reality. Let us present you with our case study SOMA. This is the property of two buildings, one studio or one family, over 162 units, five floor; and it was the first property that we installed heat pump replacing the traditional gas boiler heater for domestic hot water. The total cost of the entire package was over \$1 million. We were able to receive over \$900,000.00 incentives which brought down the net cost to us for around 15 percent of the total cost. Next slide please.

Heat pump installation is always supported by other subprojects to make sure that the building will achieve maximum efficiency before sizing the heat pump but also to maximize incentives. It is

usually 6-12 or even 13 subprojects. The expected savings were calculated based on the modeling used by incentive programs, and they were very promising. We were eager to find out how the actual savings will look like. Next slide please. So within the first 12 months after we completed the project, we see great results. Overall this is over 50 percent reduction in electricity, 70 percent reduction in therm usage which gave us over \$50,000.00 savings; and we reduced carbon emission by 165 tons. Next slide please.

We did not stop with SOMA, and we are targeting carbon reduction approach as aggressively as we can. Energy upgrade package we completed at two properties. We have three properties right now under different phases of construction and three more at the different stages of planning. As nonprofit, we won't be able to move with this speed without an external financial support. Incentive programs are key parties in making this all happen, and I cannot stress enough the importance of incentives' role in running carbon reduction oriented projects. Next slide please.

So what we've learned from these several completed and under construction projects, the staff capacity and its turnover is visible especially during last year's across portfolio here at TNDC but also incentive programs and our vendors. This could provide or present a challenge when we need to make new person up to speed where are we now with project, what is needed as in next. And just to mention from the idea of the carbon reduction package to the moment we are ready to start construction, it is usually taking us between 8-12 months. So this is a lengthy project.

And as each package include multiple subprojects, we are dealing with multiple vendors. From my perspective, it is great idea to have a solid scope of work, all the subprojects listed to avoid any surprises as we go along the project. Irregular calls and check-in with vendors is also great idea and is always to better to have one too many and cut it short than not enough and don't talk about issue that already exists. With this we are building a relationship with vendor and also incentive representatives. We can always talk to them and call them out of the regular check-ins if there is anything we need to talk about.

In talking about the incentives, research all available incentives and check if they can be combined. Some programs allow to combine and use different incentives at once, but some programs are not. Secure the incentives as soon as possible. This will help with cash flow. Knowing what financial help we can count on is helpful, but also you have to keep in mind that majority of

incentives are released after project is completed, meaning we have to be ready to pay all upfront costs before we see or before we receive any check with the incentives.

About data, again, to see or to show the project is effective, we have to have data to support it. And it doesn't mean always dollar amount savings. We are focusing on usage. As utility prices are changing, we are showing our savings with usage. This is the most important data to share for us. And sharing data, not only with higher management who is approving or denying the project but also with site staff. The property staff is heavily involved in every aspect of the project and they are who are dealing with unhappy tenants if we shutting off the water for day or there is disruption in electricity. So site staff is our great support always.

And the challenge about carbon. So presenting carbon reduction as savings may be hard. It is hard to see a savings for people not familiar with sustainability and environmental protection. Carbon savings doesn't have assigned monetary value yet. So it could be hard thing to sell to approval partner. And now we are coming to the biggest challenge and most important lesson, the support of immediate and higher level management. I will pass the stage now to Mark Puchalski, Director of Facilities, who will share his perspective about approaching carbon reduction oriented project that are not always focusing on dollar savings. Mark, the stage is yours.

Mark Puchalski:

Thank you so much, Magda. Welcome, everybody. What an amazing group of people we have presenting today, and we've been showered with quite a bit of technical and resource information by very brilliant people that I feel honored to be on the same panel with. But let's talk about leadership. Let's talk about the responsibility of leadership as it pertains to sustainability. So for decades, you know, sustainability efforts have really been run from the ground up, from the bottom up, through environmental activism and the like. And now we're starting to see more and more leadership get involved and understand the importance of this.

One of the things that I speak about when I go to my leadership, to the CEO or to the CFO of the company, I'm looking for money, I'm looking for financing to support these is to redefine the ROI, right? We tend to look at it is it a two year, three year payback, when do I get my money back. And that's a very narrow focus, and we have to expand that and realize that our ROI now really means health of our buildings, of our communities, health of our countries, health of our planet. The ROI is really a longevity of life here on Planet

Earth. The Earth will go spinning merrily along with our without us. It doesn't care. But what everybody here is trying to do at this point is really save the planet, and by saving the planet saving humanity and creating a future for us and for our kids and for our grandkids and so on. And so it's important that as leaders we take the approach that this is a number one priority within our organizations, and we're starting to see that more and more.

And as Greg kind of talked about, costs are coming down. As costs come down, excuses go away. But we need to drive those costs to come down, and we drive the costs down by incorporating this technology into our buildings, by buying, by buying it in bulk, by getting more of that technology involved. Now there's a lot of things on the horizon. I was reading about graphene batteries and graphene power sources that may be coming out in a few years to help power our facilities and power our batteries and all kinds of things. The Earth itself is coming up with solutions. Scientists have discovered biomes that eat plastics, right?

So there are positive outcomes that can happen, but we need to take a much more active role on the leadership side of things to make this happen. We're looking at arctic heatwaves that are unprecedented in human history. We're looking at the Thwaites Glacier in Antarctica which is the largest, widest glacier in the world and they're anticipating a chunk of that the size of Florida is about to fall off into the ocean which could raise sea levels five or six feet this decade. So this is not something we can wait and put off till 2050 and talk about. We need action and leadership makes action happen. So let's be the generation that solves this crisis. Let's be the generation that can save the planet for future generations.

You know, the other day we were interviewing a new sustainability coordinator position; and I asked the potential candidate if he had a magic wand what sustainability function, what magic sustainability action would you take? Planet-wide, if you had a magic wand, what would you do? And we left the question and we came back to him at the end of the interview and he says, "I have an answer for you." And the answer he gave wasn't, well, I solved the methane from the trash or I'd get rid of fossil fuels or all those predictable answers. His answer was unity. "I would create unity in all people to understand how this challenge ahead of us is really something that we all need to attack." And I thought that was a brilliant answer because that's really what webinars like this, the peer exchange, the exchange of information is to build unity; and unity can't just start from the

bottom. It can't just be a discussion for people out in the field working hard to change life. Like we've got this amazing panel of people who are fighting every day to solve these issues. Unity needs to start from the leadership down, from the president down. We need that kind of unity, and that's the job of leadership.

So you know, keep in mind that as we progress, we often focus on time and money and we toss these things, if I had more money, I could spend less time; but really our investment at this point buys us more time on the planet, right? So I think, you know, money is great and we all love money and we all want money, but money's not going to do us a lot of good when our houses are under water if you live on the coast, okay? So we're really looking at what can we do. Next slide please.

We're really looking at electrification, you've heard about, battery storage, PV storage. One thing I want to focus on here is the greening of our cities with plants, incorporating bees and nature. We need to have a symbiotic relationship with nature. That's a key element. So we're looking at how we can bring more green into our urban areas. Next slide please.

So the Earth is what we all have in common. So that unity is what we're talking about. We all live on Planet Earth. Everything that happens to the Earth happens to all of us. We are indeed from the Earth. So it's important that we get over ourselves with the money aspect and the obstacles we place in front of our own initiatives and we do the right thing. We take the leadership approach, and we realize that this is our number one priority in the world right now is our environment. And I want to thank everybody for joining today. I hope you go out there. I hope you're strong. I hope you're dedicated, and by all means be tenacious. Tenacity wins the day, and it's tenacity that's going to save the planet. So thank you all very much and thank you, Magda, for your excellent work bringing TNDC into the forefront of multifamily housing sector and thank you, Greg and Webly, for your amazing work, and thank you for the DOE for putting this on. And with that, I'll sign out.

Magda Szymanska: Thanks for having us.

Josh Geyer: Thanks, everybody. Thanks both of you. So we do have quite a few questions here and a couple of minutes to answer them. So I think what I'm going to do is encourage the panelists to look at the questions that have not been addressed yet, and because we only have a couple of minutes left, I think I'm going to encourage you to look at the questions that haven't yet been addressed and try to

answer them in Slido as you've already started doing. And as you're doing that, I'm going to go through the remaining information that I have to cover here. So can we do next slide? Great.

So this webinar is a part of the *2021-2022 Better Buildings Webinar Series*. As you can see, we have a great lineup of presentations through April. Visit the Better Buildings Solutions Center to learn more and register. Next slide. So we hope you will join us on January 11 for our next webinar titled "Glass Half Full: Save Money by Saving Water." Join this webinar to explore how water management can reduce costs and energy and environmental impact, saving more than ten billion gallons. Next slide. If you're interested in learning more about the topics I discussed today or, excuse me, that our panelists discussed today, I encourage you to download our Additional Resources Handout from the Zoom chat box. The handouts contain resources from the Better Buildings Challenge and our speakers. We hope you enjoy them.

We're going to take another look back at the Slido and see if there's any questions here. So I see one that just came up and this is for Mark. It says, "I appreciate Mark's point about the need to look past the immediate ROI for this critical need. How can we incorporate social and climate needs into cost effectiveness calculations to show the critical nature of these retrofits?" Mark, if you want to take that online?

Mark Puchalski:

Yeah. And that's the question, right? That's the magic question. How do we capture these soft costs that are out there and bring that home and show a cost analysis with reducing carbon? And it was brought up earlier that we don't have that cost analysis for reducing carbon at this point. What we're really looking at is usage, right? So we're doing a lot of different conservation projects, water conservation, trash management and all this kind of things to absolutely reduce costs, to make it more appealing to the folks; but I start looking at it from the health of the community and from the health aspect; and health cost is one aspect that I incorporate into my calculations.

It's a very broad analogy – analysis, I should say. I'm sorry. Analysis of health costs within a community. But as health costs come down, that's also a benefit to the community from the individual to the company-wide level. If they're working and living in a healthier building, a healthier environment, costs are going to come down. So that's one aspect to it, but it's not just focusing on is my power bill lower, is my power bill lower, is my gas bill lower.

It's how is it affecting all of us from a health conscious perspective because that translates all the way up to the health of the planet and that's what this is all about.

Josh Geyer: Thanks, Mark. So another comment here, so someone at James Orenstein says, "Comments on air versus ground source heat pumps, peak demand during extreme cold weather events with air source heat pumps as a barrier to 100 percent electrification of building heating, especially for retrofitting existing buildings." Anyone want to take that on? Maybe Greg?

Greg Hale: Sure. That's definitely a challenge. I think people do not give it enough credit to cold climate heat pumps and how they can heat an entire building, but that does require a very solid envelope and not necessarily huge buildings. So that's definitely an issue. It's also an issue on the scale of grid expansion that we will need to create between now and 2050. The more ground source heat pumps that we bring into that mix because their COP is higher than air source, the less we have to deal with expanding the grid. So we do want to point people toward ground source, but air source works in most applications. And then we need to figure out is there – you know, it's a controversial issue – is there a need for some backup, potentially fossil fuel fired generation for the coldest days? And that's something that we are intensely focusing on. As we go forward, it's one of areas that we point to as we need further study here. But today we recognize the issue. It's an important issue, and we're trying to address it.

Josh Geyer: So Webly already got this one, but I'd just like her to say a little bit more. "In affordable housing and/or public housing, how do you ensure that heat pumps are maintained so they don't lose refrigerant charge? Having even a few systems leaking refrigerant ruins the GHG savings for entire buildings."

Webly Bowles: The answer is generally management which is not something that all public housing owners want to hear, but it is important to check and maintain the equipment to make sure it's not leaking. So a refrigerant management plan is really important as well in larger systems you can have leak detection as well. I think you can on smaller systems, but it's more efficient in a larger system. And also—

Josh Geyer: So this is sensors, right? Like if you put sensors, like sensor technology somehow, you can monitor all of the – so you know it's something starting to leak?

Webly Bowles: Correct. Yeah, so you can catch it early on. And then the other thing is when possible, changing out to lower global warming potential refrigerants.

Mark Puchalski: Yeah, and, Josh, if I could jump in on that conversation as well and add on to the excellent comments from Webly, is to really look at your preventive and predictive maintenance programs within your organizations because, Webly, you're absolutely right. You know, efficiency is key as well. So if we're not maintaining our equipment to the topmost efficient we can, then we're wasting energy and we're creating a potential for leaks, refrigerant leaks, gas leaks, those kind of things that can not only be dangerous, but they can also be harmful to the environment. So just putting the equipment in and putting in new equipment isn't always – just is not where it ends. It's also maintaining that properly. And with new technologies and new equipment, it can be a challenge to maintain that equipment, right? So make that part of your sustainability plan, needs to include how are you going to maintain that equipment.

Josh Geyer: Okay, great. Thank you, both of you for thinking and running with that. I'd like to say thank you to our panelists, Webly, Greg, Magda, and Mark for taking the time to be with us today. If you'd like to learn more about the resources discussed today, please check out the Better Buildings Solutions Center or feel free to contact our presenters directly with additional questions or if we couldn't get to your question during the Q&A period. I encourage you to follow the Better Buildings Initiative on LinkedIn and Twitter for all the latest news. You will receive an email notice when today's recording, slides, and transcripts are available on the Better Buildings Solution Center. Thank you, everyone, have a great day.

[End of Audio]

Roadmap to Carbon Reductions in Multifamily Housing

Additional Resources

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

Better Buildings Resources

- Low Carbon Technology Strategies for Midrise Apartments [Guidance](#)

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Other Resources

- HUD's Climate [Action Plan](#)
- New Buildings Institute's An Insider's [Guide](#) to Talking About Carbon Neutral Buildings
- A Zero Emissions All-Electric Multifamily Construction [Guide](#)
- Getting to Zero [Resource Hub](#)
- NREL: Cost Control Strategies for Zero Energy Buildings [resource](#)
- AIA-CLF Embodied Carbon [Toolkit](#) for Architects
- NYSERDA's Carbon Neutral Buildings [Roadmap Presentations](#)
- Greenhouse Gas Protocol: The GHG Emissions [Calculation Tool](#)
- EPA's eGrid [Power Profiler](#)
- Compare your Footprint [resources](#)
- World Resources Institute: [Greenhouse Gas Protocol](#)
- Building Energy Exchange: Low Carbon Multifamily Retrofit [Playbooks](#)
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