

*Sarah Zaleski:* Good morning, and welcome to the Better Buildings webinar series. We're dedicated to bring you the latest and actionable insights from leading industry experts. This is an annual series. It's a chance to explore the topics, technologies, and trends that affect your organization as well as efforts to accelerate energy efficiency adoption.

Before we dive in, I want to share a couple of key housekeeping points. Please note that today's webinar will be recorded and archived on the Better Buildings Solution Center. We will follow up when today's recording and slides are made available. Next, attendees are in listen-only mode, meaning that your microphones are muted. If you experience any audio or visual issues throughout the webinar, please send a message to the chat located at the bottom of your Zoom panel.

My name is Sarah Zaleski, and I'm your moderator today. I'm a senior advisor with the Building Technologies Office, where one of my focus areas is zero and low carbon buildings and working with building designers and district planners on how to realize their low carbon goals. Before we hear from our panelists today, I wanted to share a couple of opportunities with you through the Better Buildings. First, is the Better Climate Challenge.

Through this program, DOE is challenging companies, states, municipalities and other organizations to commit to reducing emissions from portfolio-wide operations by at least 50 percent within 10 years. DOE's Better Buildings will support their efforts with technical assistance and peer exchange to share solutions to reduce emissions and pursue renewable energy. To date, DOE has engaged leaders across 30 economy-leading organizations. If you can go to the next slide you can see the logos of these organizations, across manufacturing and the public sector, and commercial buildings have already joined the Better Climate Challenge.

If you're interested in learning more or joining us in this, please reach out to your Better Buildings contact or visit the Better Buildings Solutions Center. Next slide please. I also wanted to share with you a program called the Design and Construction Allies which was launched last year. This is a program of leading architects, engineering, and contracting firms that are committed to helping enable routine design and delivery of zero energy and zero carbon ready buildings, and to identify and address barriers to delivering these buildings. Next slide.

So we know that architects, engineers, and contractors are crucial and important to buildings because decisions made by these folks impact building's energy use, their carbon emissions, operating cost and comfort. I know it's both carbon emissions for operating emissions as well as embodied carbon that these stakeholders can have a really important impact on. So we see this community is playing a key role in helping building owners, many of which I know are on the phone today, achieve their energy and climate goals. So we'll be hearing from one of the members of this ally working group later in the call today, but I wanted to share this because two of the areas that this working group has chosen to focus on in the next couple years is, one, cultivating client demand, so really being able to share with their clients the strategies and financing strategies and way to be able to make it get penciled to build and retrofit high-performance buildings, and then the other working group is really focused on embodied carbon.

So we'll be hearing a little bit more about that today, and obviously it's the focus of today's webinar. So we know that buildings can be both part of the problem as well as part of the solution in really thinking about our economy-wide carbon emissions and embodied carbon. So if you can go to the next slide, today we'll be using an interactive platform for our Q&A, polling and feedback. So if you can please take a minute, maybe pull out your phone or go to another web browser window to go to Slido.com.

If you open that up in a new window or on your phone, today's event code is #DOE. And we're going to use this to ask our panelists questions. Feel free to submit questions at any time throughout the presentation. We'll be doing Q&A at the end of all three presenters. And you can also select a thumbs up icon on the platform if there's questions that somebody else has asked and we'll see what some of the most popular questions are.

So before we get going, we want to learn a little bit more about you who's on the phone today. So let's start off with a few polls, if you wouldn't mind going to Slido. So the first one is just what best describes your role? So we know that we hear oftentimes on the Better Buildings webinars from building owners, service providers, architects and contractors, utilities, government. So let's see who we have on the call today.

We'll give it just a minute. Okay, coming in. I keep waiting for them to stop moving, but very dynamic. Alright. So it looks like we have about a quarter of folks working for some form of government, maybe state, local or federal. Another maybe quarter

are consultants. We have a fair amount of researchers, also building contractors and designers.

About 10 percent of you are building owners or operators. Alright, great. Thank you for taking the time to do that. So we'll have two more quick polls. One, what is your level of familiarity with embodied carbon? So this is kind of from one, of never really heard of it; two, general awareness of what embodied carbon is; three would be basic understanding of what it is and what low embodied carbon opportunities exist; and then after that really a solid knowledge or really considered an expert in embodied carbon and implementation.

This is very helpful. Thank you all for taking the time to share this with us. Okay. So it looks like about half of you are about in the middle, some basic understanding of the opportunities, and there's about a third of you all that have a general awareness of what embodied carbon is, and then we have it looks like 2 percent of us on the call are experts in this space. So thank you for joining us as well. I know it's a rapidly-evolving space.

I know here at DOE we're thinking more and more about this space, where it's traditionally been more focused on operational carbon, so it's a pretty exciting and evolving area. Okay. And then one last poll before I introduce our speakers. So what are you most interested in learning today? And feel free to choose more than one response here. So everything from what embodied carbon is to why it's important, where to find resources to learn more, and how to make decisions to lower embodied carbon in projects.

Okay. Thank you for this. It looks like the clear winner is how to make decisions to lower embodied carbon. So I'm pleased to say that I know what our presenters are going to be presenting today, and I think – and I know – that we're going to be able to discuss that in some depth. So that is great to hear. Alright. Without further ado, I am excited to present today's great lineup of presenters. So if we can go to the next slide.

The first speaker we'll be hearing from Victoria Herrero-Garcia, and she is a senior sustainability and carbon project manager for Ambient Energy, a Mead & Hunt company. She enjoys initiating embodied carbon conversations with design teams early in design and helps develop sustainability strategies to achieve carbon reductions. So Victoria's going to really be giving us kind of a bird's eye view – she's worked in this space for quite a long time –

of what embodied carbon is, why it's important, some of the tools out there, how to kind of think through some of the methodologies.

After Victoria, we'll be hearing from Ryan Poole who leads sustainability for DPR Construction, which is the technical builder with offices spreading globally. DPR is innovating sustainable practices for how they operate, build, and ultimately help change the world. Through strategic partnerships, Ryan harnesses the power of collaboration and unity to provide influence towards creating a healthier future for all. So Ryan's going to really be giving us some additional tools, and really will look at it from the contractor perspective and what kind of value the contractor can bring to reducing embodied carbon in your projects and some of the tools that they've used at DPR.

And then lastly, we'll be hearing from Ana Duffy. Ana is a sustainability manager at Hudson Pacific Properties with years of experience in commercial real estate ESG programs. In her current role, she manages key sustainability initiatives such as driving progress towards Hudson Pacific Properties' science-based targets and net zero waste by 2025. She also furthers the companies decarbonization strategies, including efforts to reduce embodied carbon in both their developments and redevelopments. And we'll be hearing from Ana really from the building owner and developer perspective of some of the steps that they've taken at Hudson Pacific Properties to reduce their embodied carbon and some resources available to building owners to do the same.

So thank you again all for joining us today. And with that, I will hand it off to Victoria to kick us off. Thanks, Victoria.

*Victoria H.-Garcia:* Thank you, Sarah, and thank you everyone for being here today to learn and discuss a little bit more about embodied carbon. Next slide. As Sarah mentioned, we are here on this panel today to talk about assessing and reducing embodied carbon. Next slide. I work in a firm that we are working toward a resilient and regenerative-built world, and I'm happy to share with you today.

Next slide. My firm has the core services of building performance engineering, so sustainability consultant and commissioning, and today I'm going to discuss two of my favorite topics and what I like to work the most on, whole building lifecycle assessment and net zero carbon consulting and low carbon procurement. Next slide. So to start with, the differentiation of what operational carbon and embodied carbon is. For those not familiar, operational carbon is

the carbon that is submitted once the building is completed and occupied and is related to the operations of the building.

The embodied carbon is all the emissions related to the materials that are being used in the project – transportation, installation, replacement, and end of life. Next slide. So you can see here, that is what I just described, the embodied carbon includes all these stages, including extraction as well. It's also known as global warming potential, GWP. The unit of measurement is kilograms of CO<sub>2</sub> equivalent, and the little E comes because it can include other greenhouse gases, not just CO<sub>2</sub>. Next slide.

Why does embodied carbon matter? When we look at the big picture of global emissions by sector, we can see that the yellow parts of the pie accounts for the 11 percent if we only talk about current shell. Next slide. But we include other building materials, we come to a conclusion that is about 21 percent of the total global emissions. Next slide.

And it's very important to be aware of these because we are projected to add 2.5 trillion square feet of buildings, new construction, within the next 39 years. That means to build an entire New York City every month, and approximates to 468 New York Cities total. That's a lot of new construction. Next slide. But too, operating versus embodied carbon. Today, we have been discussing a lot of energy reductions and operational carbon reductions, and when we do a building as usual, as you can see on the left side of the graph, we have operational carbon being a big chunk of that pie and embodied carbon being very small.

And when we go towards a high-performance building, expecting also the greening of the grid, the operational carbon becomes very small compared to embodied carbon. Next slide. And as you all aware, climate change is the single greatest challenge of our time. So we need to know what we can do today. Next slide. From the last Glasgow COP26 there was a report generated by the Climate Action Tracker.

There's a lot of information, but the key things that I want you to look at is different scenarios using policies and action, 2030 targets, pledge and targets, so different scenarios on the where the global warming will be. So if we go to the next slide, the most optimistic scenario is that if we do everything that has been announced, all the targets and all the policies in place, and we generate long-term strategies, we can get to the 1.8 decreased Celsius, which is a little bit higher than 1.5, but that is where we're trying to get. Next slide.

So where we are today, here in the United States, you can see on this map there is a State Buy Clean legislation that has passed, and this is all in relationship to embodied carbon. There are other states and cities that they have policies, so they are trying to pass the State Buy Clean. Next slide. If you go to the Carbon Leadership Forum's website and you look for the policy, city policy toolkit, there's an interactive map where you can learn more about what is being done and read about the policy.

Next slide. And in addition to what is done at the state and city level, there is also rating systems that reward towards embodied carbon reductions. The first one will be building and material reuse. You're also rewarded by low embodied carbon material procurement and if you do whole building lifecycle assessment. Next slide. So with all that, where we start – so we cannot reduce what we cannot measure. Next slide.

So there's two measurement approaches that I want to discuss with you today. One is the procurement of low carbon materials and the other one is the whole building lifecycle assessment. Next slide. So for the procurement of low carbon materials, we really need to understand what is the impact of the global warming potential of each material or product, and for that – next slide – we need to understand an Environmental Product Declaration, which is a report or document that is kind of like the nutritional label that gives us information about the impacts that these products will have in the environment. Next slide.

The point of discussion today is to discuss embodied carbon and the global warming potential of that product. Next slide. That will be understanding the Environmental Product Declaration systems boundaries. So there's a few terminology that I want you to know today. Cradle-to-gate is mostly the system boundary, most commonly used system boundary for an EPD. Next slide.

Cradle-to-gate includes product stage only, so A1-A3. Next slide. And that means lifecycle stages. So the product is staged. Next slide. It only includes the raw materials supplied, the transport to manufacturing, and the manufacturing. And that's why it's modules A1-A3 only. Next slide.

This is an example of an Environmental Product Declaration, and those are the key things that I want you to look always for. You need to know the product, the declared product or functional unit, and the product category rule or PCR, and also the EPD of scope to

know if it's a cradle-to-gate or cradle-to-grave. This one, for example, is a cradle-to-grave, which makes it a little bit harder for comparability.

And the global warming potential is shown there as well. Next slide. So how do we compare EPDs? So we have the nutritional label with all this information, but we need to make sure that the declared unit is the same, the PCR is the same, and the systems boundary is the same in order to compare them. Next slide.

So there are available tools out there. They're free to any user. And one of them is the EC3 tool, and the other one is the One Click LCA Planetary. They both use system boundary A1-A3 and they have the same functional unit and the same PCR. Next.

The next one is whole building lifecycle assessment. The is the same comparison between a baseline and a proposed case, and the scope can vary depending on the rating system. It can be on the building enclosure and structure, or you can also include interior materials. Next slide. The whole building LCA system boundary is cradle-to-grave.

Next slide. And that means that it includes A1-C4 lifecycle stages. Next slide. These are the lifecycle stages in general for any product. Next slide. Now module A, the product stage includes also transport to the site and construction installation. Next.

The use stage, modules B1-B7. Next slide. End-of-life stage module C1-C4. Next slide. So that will be the whole building lifecycle stages in total. It's a cradle-to-grave and system boundary A1-C4. Next.

Here are the whole building LCA tools available right now. This is to complete a whole building LCA with different scopes. Athena Calculator, One Click LCA, Tally, and eTool. The first three are the primary used in North America. Next slide.

So I have a call to action for you all, to maximize embodied carbon reductions. First, reuse and reduce as much as you can. Secondly, early conversations are key. We have seen and maximized embodied carbon reductions, having discussions with design teams in concept design, and up to 40 percent reductions. Set up targets. What is your scope and how much do you want to reduce?

Low carbon procurement is very important, because at the end of the day, it's very small there, but the blue biggest square is A1-A3

lifecycle stages, so most of the impacts come from the product stage. And then include all disciplines. Include the client. The design team and build estimators are very important in early conversations. Next slide. Thank you very much, and I'm going to pass it to Ryan.

*Ryan Poole:*

Yeah. Thanks so much, Victoria. Hey, everyone. Glad to be here today and talk to you a little bit about the contractor's perspective on embodied carbon. Next. So a little bit more about assessing and reducing embodied carbon from the contractor's perspective. So Victoria did an incredible job of talking really more about the material procurement side, which contractors have a huge handle in, but I also want to dive a little deeper into the actual operations on a construction site, because that's a big piece of our embodied carbon that we don't want to forget.

Next. So what we're going to use today to discuss this is a framework that was built within Building Green Organization from the Sustainable Construction Leaders Group called the Contractors Commitment. So I'm excited to bring this here to you today. An incredible group worked to put this together, and it's got several different categories. So carbon reduction, jobsite wellness, waste management, water management, and materials.

Today we're going to focus on all of the ones that reflect on embodied carbon, so we won't go into jobsite wellness. I'll also show a little bit about how that tier system works. So here you can see an example on the next one where we get into carbon reduction. So you can see it's got a good scaling for you to provide some prioritizations, so good, better, and best, so some benchmarking for us to have across the industry and some format to help prioritize.

And then we broke it down into plan and implementation, tracking and reducing, offsetting as a last resort, and then disclosing that information. So we want to make sure we prioritize reduction over offsetting always. Planning, here you can see things such as Victoria mentioned earlier around EC3 for material selection as well as utilizing certain types of equipment, so driving towards electrification and types of equipment that we use, and even get into scope one, two, and three for our individual organizations. So not just looking at what we're doing on the construction sites, but what we're doing at a corporate level too, how we're actually operating as businesses, as contractors, and things that we can continue to do to improve there.



Next. So what I'm going to do is after showing some of those I'm going to go through some specific examples that we're doing at DPR to help champion some of these things. So one of the things that we want to make sure that's really permanent to everybody is that the most sustainable building is one that already exists. So adaptive reuse can have a huge benefit on lowering embodied carbon because you already have a lot of materials there. As an operational emissions drop with adoption of renewable energy, embodied emissions, those which are attributed to building materials and energy for construction, will likely dominate new building emissions by 2050.

Next. Here I'll show a little bit of a graphic. So as Victoria mentioned on the left-hand side, we've got 11 percent of embodied carbon that comes from building materials in construction, and she even showed an even greater percentage than that. On the left, what we've got is showing you the progression of adaptive reuse, from building nothing at 100 percent reduction of our embodied carbon all the way down to just building efficiently. And so you can see the massive difference in impact from where you use adaptive reuse to new raw materials. Next.

So at DPR we believe it's our responsibility as contractors to help show our clients the way too, and so we've taken it upon ourselves to have six of our own offices at net zero energy. So these are all in different climate zones. And we're continuing to add more to the portfolio. So San Diego here was our first one all the way back in 2010, before we had rating system certifications for net zero energy. We had Phoenix, which was the largest of its kind when it was certified.

And then all the way over to DPR Sacramento here, which is our most recent one, which was mass timber. So we'll do a little deeper dive into the embodied carbon study we did on that specific office. Next. So waste management. Waste is something that gets pushed to the side when we're talking about embodied carbon, but a massive part of it. It can definitely not only clutter the environment that we live and work in, but causes a lot of emission issues on the back end as well.

So we want to make sure that we're addressing that head on in trying to drive zero-waste culture on our jobsites. So here you can see where we've tried to provide contractors guidance on implementing the right plans, selecting the right partners, putting the right cultural pieces in place, and then reporting and disclosing that information as an industry together so we can continue to have

constant improvement. Next. So here are some examples of how we've been striving to drive zero-waste culture on construction sites.

First and foremost is always having a waste management plan. It's important to communicate that, all the way from having the right partners on the front end, your design partners, your consultants, your owner, and the vendor that you're going to use for your waste collection. Those are all key important factors to make sure that you have early collaboration on and set the right expectations. It's going to make sure it's important that that is educated and communicated through all of the folks that are coming on the jobsite and helping build it.

So having the right presentation for orientations as craft come in, the right signage, the right setup, it's got to be multilingual, it's going to be the best impact to make sure that you have all the things that you need for the right recipe for creating a zero-waste culture. So here you can see some examples of signage that we have, logistics plan, and then also addressing the problem. It's important not to just tell people what we're doing, but why we're doing it and why it matters. Next.

Lean construction practices. So this is not just within construction. This really can be a way of life with any role that you currently serve in. So really lean is all about designing waste out of a process. So we're excited to have a lean leadership course at DPR that is a lengthy course that talks to you all about how to design waste out of your processes that you do every day, so the proper planning techniques, the proper things to be conscious of and tools that you need to continue to eliminate waste out of our everyday processes.

Next. Prefabrication. Prefabrication is a key for us to continue to lower waste in the raw industry. So you can see here that some of our prefabrication processes lower our waste from 74 percent to even 87 percent. Not only is it lowering waste because of the precision that you have, it's also improving quality, allowing us to have a lower carbon footprint, because some of these facilities can operate with renewable energy. So it can drastically cut down overall carbon footprint from the materials that we're selecting.

So here I've got an example of our company in Phoenix called Digital Building Components that does fully preassembled wall assemblies with the mechanical, electrical, and plumbing in them and exterior wall and whatnot. So you can stand up an entire 15,000 square foot space within a matter of a couple days with

minimal people. And then on the left is prefabricated restrooms. So these can be plugged and played into all kinds of different scenarios.

But you've got to think like a lot of the work that you have within a space goes into restrooms and kitchens because they take certainly different intricacies within the elements that they have. So prefabrication can definitely have a huge impact on not only speed to market, but really driving down that embodied carbon. Next. Water. Water always gets tossed aside when we're talking about embodied carbon as well, but it's an incredibly important factor not necessarily from an emissions perspective directly but from transporting of the water.

So the more we continue to be conscious of conservation and reduction of our water sources allows us to not only save water, which has its own problems, but also save the energy that it takes to transport that water. So I'm excited that we're addressing that here. Next. One of the innovative solutions I'm really excited to share with you guys today that we've done on one of our jobsites is a concrete truck washout reclamation center. So you have several different activities that use massive amounts of water on a construction site, and more we can find solutions, to use rainwater capture, to eliminate the usage of potable water that has to be transported to the site for these uses can make a massive impact on our environmental assessment for our sites.

So this particular center was able to save 13,500 gallons of recycled water in just one day, which will add up to over 2 million throughout the life of the project. No potable water was used. We used rainwater capture and treatment for these. And massive amounts of energy saved from not having to transport that water to the site, which then in turn reduces our embodied carbon. Next.

So material selection. So this is what Victoria covered so well, and I so won't go too deep here, but definitely important for us to address it as contractors, because we're on the procurement side of it. So it's incredibly important that we have that early engagement with the design team to select the right tools and materials that provide us with a healthy impact on the planet and the environment and the people that live in it. So we're really looking at full circle from a health and wellness perspective, but really also that there's EPDs in how we can continue to drive transparency in the market.

Next. So you can look at here, this is an example showing the total carbon impact. And what I really wanted to illustrate here is how

much of that the structure can be. Right? So you see substructure and superstructure there, and that takes up over 50 percent of the actual embodied carbon within a space. So I want to make sure we put some special attention on the structural components and some of the things that we're doing to be innovative there. Next.

So yeah, Victoria gave a great illustration earlier. This is another example of that, that shows some of the main structural components that we use in buildings, so steel, concrete, and wood. I've got wood highlighted a little bit more there, because it's the only building material that we have that's got carbon sequestration benefits to it, so a renewable resource that actually sequesters carbon throughout its lifecycle. And so it shows the process there of what it takes to extract that raw material, process it, transport it, and get it to the jobsite where we're putting it in place.

Next slide. Yeah, so mass timber on our Sacramento office. Super excited to share the benefits that we were able to receive there. We did a really deep analysis, not only from the embodied carbon aspect but also from the health and wellness, so multiple benefits. But this particular project, the amount of embodied carbon we saved from utilizing this beautiful mass timber saved the equivalent of 33 cars off the road each year or the energy to power 14 homes every year.

Next slide. Incredibly important to leverage data management because we have such vast amounts of information that we're discussing and communicating here as we work through project teams together. So Victoria already hit on a bunch of these incredible solutions here – Tally, EC3, Athena, and Carbon Smart Pallet – and then we also use some other in-house tools here that help us track waste management, the carbon within our materials. And actually here below we have an online database that allows us to access to go and shop for products that have that transparency. They provide the EPD and HPDs that we need, and we know that they're made responsibly and that it's with a company that's pushing healthier products.

Next slide. So at DPR we've created our own in-house practices and really have tried to revamp those and marry them up to this incredible commitment that we have with the contract commitment at Building Green. And so an impactful piece that tells all of our people in house why sustainability matters to us and the planet, how it impacts us and the planet, and consistency and benchmarking and prioritizing to show all of our folks the right way to champion these efforts. Next slide.

And here we provided a deeper insight into how you actually go and accomplish some of these things. So we've got all kinds of incredible links that provide our craft and leaders in the field with direction. Next slide. So how can you participate? So if you're one of those 12 percent of contractors we have on the call today, please go check out the Contractors Commitment, download it, join, sign up. We've also got the Sustainable Construction Leaders Group, and we'd love to have – the more the merrier.

The more we can spread this and get more contractors on board the larger impact we're going to make. You can also send some feedback to us at [candace@buildinggreen.com](mailto:candace@buildinggreen.com) there. Next slide. And if you're not a contractor, so all the owners and everyone else that's out there, how can you help advance this?

Ask your contractors if they've heard of it. Ask them to follow the measures. Ask contractors to consider signing on, including this in your RFPs, and then if you're a designer including it in your division I specs. Next.

And then last but not least, before I hand it off to Ana, talking about early collaboration being key, right? Having folks like Victoria and myself and Ana all in the room together at the same time early in the project to make those decisions is how we're going to actually make the right impact for an economical solution for our clients. So together we can build a healthier environment for both people and the planet. And with that, I'm excited to hand it over to Ana to talk a little bit more about the owner's perspective.

*Sarah Zaleski:*

Thanks so much, Ryan. And Ana, before you get started, just a quick reminder that we have some great questions coming in through Slido, and I encourage you to add yours. Remember the code is #DOE, so we can be all teed up at the conclusion of Ana's slides. And some of those great resources that Ryan mentioned will be available in the resource sheet that's provided after the webinar as well. So with that, Ana take it away. Thanks.

*Ana Duffy:*

Thanks, Sarah. Great. Hi, everyone. I'm Ana Duffy, sustainability manager with Hudson Pacific Properties. I'm excited to be here with you all today talking a little bit about how as an owner we're addressing and reducing embodied carbon across our portfolio.

Next slide. So first, a little bit about Hudson Pacific. We are an owner operator of existing buildings up and down the West Coast, so we operate all the way from Vancouver down to L.A., operator

of Class A office space and some studios as well. So we have 35 soundstages in Hollywood and we are also a developer of new properties, so we have a new studio coming online in London, some new studios on L.A., and I'll be talking a little bit about how we're reducing embodied carbon in those developments today. And then just on the right side here you'll see we serve primarily tech tenants. Yeah.

Next slide please. Cool. So a little bit about where we are today. Hudson Pacific's Better Blueprint ESG platform was developed in kind of recent years actually, and we've been fortunate enough to actually already achieve net zero in our operational carbon. So Victoria and Ryan spoke a little bit about addressing those scope one and two emissions. We chose to address those first, and we achieved net zero carbon across our scope one and two emissions through a four-part strategy that includes energy efficiency, onsite renewables, offsite renewables, and renewable energy certificates, so RECs and carbon offsets.

And we realized that that was really only one small piece of the puzzle of our carbon footprint, and we had this whole embodied carbon supply chain really tied up in the materials that we purchased for our development. So we completed a scope three inventory using the GHG protocol scope three evaluator and validated the idea that the emissions and embodied carbon tied up in those building products for our developments is a huge portion of our carbon footprint. We found that over 80 percent of our total company emissions are tied in our capital goods supply chain. So that's things like concrete and steel and other materials that we are purchasing to build these new studios and new buildings.

So we knew that operational net zero wasn't enough. We needed to start addressing the embodied carbon in our developments. Next slide please. So a little bit about our commitment to embodied carbon. In 2020, we published a sustainable design vision that outlines our ESG expectations and aspirations, so requirements and then kind of like the aspirational goals we try to reach if it's possible.

And this policy includes some minimum requirements like deploying adaptive reuse whenever possible. Ryan spoke to the most sustainable building is the one that already exists. So we've included that in our policy. And then achieving LEED Gold certification or higher on all projects and measuring each project's embodied carbon footprint. And since publishing our initial sustainable design vision, we've built a really solid understanding

of what the embodied carbon in our development pipeline looks like.

And once we kind of had that better understanding of what that footprint looks like, we were able to commit to creating project-specific embodied carbon reduction targets for each development or major repositioning. So what that kind of looks like is creating a baseline, doing a whole building LCA based on the existing design, and then determining how we can reduce embodied carbon as much as possible through that design, whether it's optimizing design or procuring lower embodied carbon materials, and then developing an ambition target to actually reduce embodied carbon as much as possible. So you can go to the next slide.

So we started out with having a decentralized approach to figuring out what our embodied carbon looks like. We use a variety of different tools, like the Climate Positive Design Tool, EC3, Tally, some of these things Ryan and Victoria have already mentioned. And on the right side of the slide here you'll see some of our findings. So we've completed some of these studies and we have a variety in process, and for those ones that we have in process right now we've really gained that better understanding of what the tools that work for us are, what our baselines look like, and what those targets should look like.

So now we've created a more streamlined approach to addressing embodied carbon in our developments. We're going to work with one third party who's going to be kind of integrated into our development team and our ESG team, and we're going to use one tool that we can really create a streamlined and centralized approach and be able to address and optimize reductions across all our projects. Next slide please.

And so I'll speak to a few case studies that we've completed thus far. So one project is an adaptive reuse project in L.A. We redeveloped the former Westside Pavilion Mall into a state-of-the-art tech campus that's already preleased to Google. Rather than tearing down the entire structure and building from the ground up, we were able to reuse much of the structural steel of the original mall, and we found that that resulted in a 33 percent reduction of embodied carbon from a ground-up scenario. So we kind of completed this embodied carbon study retroactively to find what were the actual savings or the avoided emissions that we were able to achieve from this adaptive reuse project, and found that structural steel was a really big piece of that puzzle.

Next slide please. And then while we have many development and repositioning projects going on at any given time, we also are constantly turning over the interiors of our buildings and building new spaces for our tenants, improving our common areas, and we've learned that there are many material alternatives that can reduce embodied carbon in these kinds of smaller-scale projects, and we can do it with low to no cost impact. So one example of Hudson trying to walk the walk is doing an embodied carbon case study in our Vancouver regional office. So we were building out a whole new regional office there and we had a team that was really focused on reducing embodied carbon.

They were passionate about it and they wanted to see how we could procure low embodied carbon materials. So we focused on high impact materials and worked with a third party consultant to do this. We found that some of those high impact materials include wall systems, ceiling tile, carpet tile, gypsum wall board. And so once we kind of focused on those materials we saw, okay, what do we have specked? How can we procure lower embodied carbon materials?

And we were able to reduce our embodied carbon 23 percent in that project from active procurement decisions and a really engaged team that kind of drove the process with our consultants and architects and contractors along the way. And from that study and buildout, our team wanted to publish those findings in a low embodied carbon tenant fit-out guide, and so we're proud to share this with everyone on the call today, and more widely it'll be included in the resources. And it speaks to kind of the process that we went through, some of our case studies, and how teams can reduce embodied carbon in their fit-outs as well. And another really engaged team is our Northern California construction team.

Like I said, they're constantly building out new common areas and vacated spaces, and wanted to figure out how we can reduce embodied carbon in the spec suites that we're building for new tenants. So we took the following staff that worked really closely with our construction managers to collect EPDs for our existing building standards. We worked with architects and product manufacturers like Interface, Armstrong, to collect EPDs for existing building standards. And then we requested, okay, provide us with some alternatives that are a similar design, similar cost, but lower embodied carbon. We really wanted to focus on that piece of not compromising design or cost to make the case for lower embodied carbon.



And then we were able to get our leasing team sign-off and installed. So some of the results of that are that we now have 60,000 square feet of carbon-neutral carpet installed across our North California portfolio as compared to the original building standards. This carpet has 86 percent less embodied carbon, and we've also been able to reduce embodied carbon in our ceiling tile products as well. And then finally, again to kind of the adaptive reuse point, they've also started taking a really active approach at reusing materials wherever possible and engaging with our vendors on takeback recycling programs.

So we found that we're able to recycle a lot of carpet that we're taking out and replacing that can turn into new carpet. Next slide please. So beyond our efforts within Hudson Pacific at our redevelopments and interior fit-outs, we really wanted to engage with the industry to share our learnings, and we're excited to join Building Transparency's ownersCAN group as a founding partner. And ownersCAN is really focused on promoting awareness of embodied carbon, increasing use of the EC3 tool, and creating resources for the industry to more widely adopt embodied carbon studies and address embodied carbon in their own products.

So one of our first work products that we put out recently – you can go to the next slide – is the ownersCAN Embodied Carbon Action Plan. So it is currently in draft form and we are constantly iterating and improving on it, adding resources to build it out. And it really takes owners through the first steps, all the way through to deconstruction, the whole lifecycle of a building on how to address embodied carbon. Next slide please.

And you can find this online. I've provided the link to the Better Buildings team. One of the really cool things about this action plan is that it includes action items for each key stakeholder in the process. So we have the construction manager. Ryan can go in there and figure out what steps does he need to be involved in to address embodied carbon in the project. We have the sustainability consultant. So Victoria can go in there and see where she has to step in.

It's a really great resource to learning how to kind of engage all those key stakeholders in the process to address embodied carbon. Next slide please. And then it also addresses the different stages of embodied carbon. So at what stages of the development project are you focusing on different life cycle emissions? Next slide please.

And then this kind of just a view of what it looks like fully built out. So there's an interactive webpage online where you can take a look at this, and then you can also download a PDF and just pick out the slides that are most relevant to you. Next slide please. So I just wanted to share some key takeaways as we wrap up. I think one of the most important things everyone on this call can do is get educated.

Figure out what kind of stake you have in addressing embodied carbons at your company and use the ownersCAN Embodied Carbon Action Plan or other resources like those Ryan mentioned or Victoria mentioned to understand your role in how you can reduce embodied carbon. Number two, get buy-in. I think we've all spoken to the fact that there are so many stakeholders involved in addressing and reducing embodied carbon, and so it's really important to get that buy-in early on, get everyone on board and understanding of what embodied carbon is and what are the steps to actually reduce it.

Upon realizing new development projects or interior fit-outs, consider how you might be able to reuse structures and optimize design to reduce the amount of materials you even need to procure in the first place. Then understand your baseline and what those high impact materials are. And when you're going through procurement or thinking about procurement, identify what lower embodied carbon options are. And lastly, request EPDs. You can do this easily in interior fit-outs.

The architects and product manufacturers are we found very happy to help, and ask them for lower embodied carbon alternates. Demonstrate that your buying power is really important. That's what we've found to be important at Hudson Pacific. Yeah, we're excited to answer some questions now. So I'll turn it back over to Sarah to run Q&A.

*Sarah Zaleski:*

Awesome. Thank you so much, Ana. And if the panelists can join me back to tackle some of these questions. Excellent presentations. Thank you all so much. So we have a number of great questions coming in through Slido, so we will try to get through as many as we can.

I'll orient some of you guys or direct some of you guys to answer. If you can kind of keep your responses fairly quick, so we'll how many we can get through in this rapid fire. So one of the questions that I think has gotten a lot of attention is sample procurement documents. Ana, you just addressed some of this. So an owner says,

yes, we want to do lower embodied carbon on our next project, where can we go for some sample documents around how to integrate that into procurement? Does anybody want to kick us off on that?

*Ana Duffy:* Well I can share that through the ownersCAN Embodied Carbon Action Plan we're actually developing resources, so how can you include embodied carbon in your RFPs for contractors like Ryan so they understand what requirements – what do I have to be focusing on for embodied carbon? We're developing specs that are focused on low embodied carbon procurement options. So as we continue to build out that resource, there will be resources that owners can use and kind of just ideally drop into their contract templates.

*Sarah Zaleski:* That's great. Thank you so much, Ana.

*Victoria H.-Garcia:* And Sarah, I just want to add too that right now, in the meantime, until Ana and her team develop these specifications, you can always go to the EC3 tool. They do have baselines, so they do have the different sets, like average, conservative, and you can play around with material types, material global warming potential, to see which one will be better fitted to your project. And also the Carbon Leadership Forum, if you look for the owner's toolkit they also have the resources with the Carbon Leadership Forum baseline for materials.

*Sarah Zaleski:* Excellent.

*Victoria H.-Garcia:* And I didn't mention that I also have resources, and Ryan, everybody has resources that will be provided.

*Sarah Zaleski:* Yes, afterward. Thank you so much. So Ryan, a quick question for you. So a number of folks have asked about how do you motivate contractors to reduce and reuse materials when sometimes it's so much easier to just buy new materials and start from scratch?

*Ryan Poole:* Yeah. So we've got a long way to go really on creating some more lifecycle building centers. So there are some in some cities and there are some new platforms that are coming out, and contractors like us are trying to take other means and methods to reutilize materials. But it takes a collective group together.

The reality is contractors are put up against a schedule and a budget and you have to beat that. And so sometimes going and sourcing reusable materials can be a tedious process. And that's why think Ana and Victoria and I are going back to the key and

we're all saying it – early collaboration is incredibly important. Because if you're an owner like Ana that has aggressive sustainability goals, which is incredible, you've got to have the right partners on board and you've got to have them on board early so that you can do the proper research. The reality is, and this is going back to the first question, is that as an industry we still have a long way to go in driving transparency in the products that we have and what's available for reuse.

And so the more we can come together collective to leverage that the better we'll be able to implement those things in the future. Like I said, the first priority should always be look for spaces for adapted reuse. That isn't always available. It's not that you always have a case where you can utilize adaptive reuse, but it should be a priority. And then if you're not, if you have demolition or something on a jobsite, it's always great to approach it as deconstruction and not demolition, disassembling the components of the building so that they can be salvaged and reutilized.

*Sarah Zaleski:* And hopefully there will be more of a market for those products too.

*Ryan Poole:* Yes.

*Sarah Zaleski:* So it looks like we just have time for maybe one more question, maybe two. I will say that I know there was a number of questions asking insight of particular speakers as well, so we are going to try to address this afterwards and include those in the transcript of the call. So if you didn't get your question answered, we will do our best to answer it post webinar. So I guess maybe one more question.

There's a number of questions around budget and financial impacts. I think part of that question is does this impact or how have you seen reducing embodied carbon project budgets and do you have examples of budgets either being improved or saving cost through some of this stuff and/or coming out cost neutral? So I don't know who wants to kick us off with that.

*Ana Duffy:* I can jump in on that one and then Ryan maybe can take over. So we found through some of our earlier studies, like our Bentall Centre regional office and our repositioning project there, that we really haven't much cost impact. But again, we've focused on making sure that the lower embodied carbon alternatives that we're identifying are not more expensive, because we don't want to compromise cost and we don't want to compromise the

construction schedule to address embodied carbon. But to that point, those ones that I mentioned and some other procurement decisions we've made on steel and concert development project in Seattle, we've found that it's really just more about the effort and the exercise of identifying those materials.

And oftentimes it's not that they're more expensive, it's just creating that spec that you want a lower embodied carbon material, identifying it, and procuring it, and we haven't found that it's impacted schedule or cost really.

*Ryan Poole:*

Yeah. And that's due to – Ana's taking the right approach with early collaboration and having the right partners on board. But it's an open question, right? Absolutely adaptive reuse can be less expensive than building new, and so that's one scenario. Even within the realms of concrete, as an example, there are concrete solutions that have low embodied carbon that are now a little bit more expensive, but there are some that are not.

So there's the adoption of CarbonCure. Most of the time when we're utilizing CarbonCure it's not a cost increase at all, but there are other things like Blue Planet or utilizing recycled glass pozzolan is a replacement for cement. And those can be a little more expensive, but the reality of why they are is because of economy of scale. We just haven't pushed those solutions enough.

We don't have enough people requesting them, and so really they're just not economically viable yet. But we're getting there. We're continuing to push as an industry, and some of those items and solutions that are more expensive are continuing to come down in price. PV is a good example. We've had leaps and bounds in the availability and cost of that over the last two decades.

*Sarah Zaleski:*

Great. Thank you so much. Well, we have just less than a minute left, so I'm going to go to the closing slides. But I first just want to give a very hearty thank you to all three of our presenters. That hour flew by.

I took a lot of notes. I learned a lot from all of you, so thank you so much. Feel free to contact our presenters directly with additional questions. I encourage you also to follow the Better Buildings Initiative and to join us December 16<sup>th</sup> for our next webinar titled *Road Map to Carbon Reductions in Multifamily Housing*.

So if you're interested in learning more about the topics discussed today, I encourage you to download our additional resources

handout from the Zoom chat box right now, and that will have many of the links to the great resources that Victoria and Ryan and Ana shared with us today. Like I said, a lot of evolving work in this space. It's very exciting. I know we'll be hearing much more about this in the coming months and years.

So thank you again to all of our panelists and to all of our participants for joining us today. Take care. Bye-bye.

*Victoria H.-Garcia:* Thank you very much.

*[End of Audio]*

## *Additional Speaker Q&A:*

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

### Additional Questions

*Audience member:* Has Ambient ever considered a "Cradle to Cradle" standard, where the building is disassembled, and parts reused or recycled?

*Victoria*

*Herrero-Garcia:* Ambient Energy has done WBLCA for compliance with rating systems. The Systems Boundary is normally cradle to grave because it is very hard to predict what the demolition contractor or owner will do with the demolition waste. To date, there are few states which have regulations for demolition waste and reuse, and not lots of manufacturers that have a recycling/repurpose program available.

Most tools used for WBLCA already have a predetermine assumption for end of life of that material. Some of them allow you to change it, I will only suggest this option if the practitioner knows what is going to happen to that product at the end of life. I will not suggest using a cradle-to-cradle approach for all materials (based on market trends at this moment), unless you are the building owner, contractor, or your project is in a city or state where demolitions regulations are in place.

I am hoping circularity will become a normal practice soon, and we can all assume different end of life scenarios. Please advocate for reuse/recycle demolition regulations within your city and/or state.

*Audience member:* What are RCI partners relating to waste management?

*Ryan Poole:* Residential Community Initiatives (RCI) through the U.S. Army? Not sure I understand the question.

*Audience member:* Could you provide some extra references about the Concrete Truck Washout Reclamation Center? Thanks!

*Ryan Poole:* Confidential client, so we aren't able to share any more info on the specific project. The systems is more typical of what you would use for rain water capture and treatment in an operating facility.

*Audience member:* It sounds like we should support concrete vendors which use recycled water in their mixes. Are there ways to identify these contractors? Is there a list somewhere?

*Ryan Poole:* This really depends on the your local partner and municipality governance of water capture/reuse in the batch plant location. Many

concrete plants are utilizing or researching the implementation of recycling water for concrete processing. At DPR, we were able to create a water reclamation center for concrete washout which is a massive part of the process that is typically wasted.

*Audience member:* Many a times, projects are not interested in pursuing embodied carbon strategies supposedly because of budget constraints. What is your company's approach on converting projects like these to have at least some embodied carbon goals?

*Ryan Poole:* Early collaboration with all partners is crucial to keeping costs down when implementing sustainable building materials into a project. DPR works closely with partners during the early phases of design to understand what building components we can focus on to have the most impact within budget constraints. One important step is taking the time to research what materials we have that can be sourced locally to keep transportation carbon low. The current market reality is that we still have a long way to go as an industry in pushing transparency behind the materials we use to construct the built environment. The more we push and provide demand, the more economical solutions will be supplied.



## Assessing and Reducing Embodied Carbon

### Additional Resources

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

#### Better Buildings Resources

- Decarbonization [Resource Hub](#)
- Design and Construction Allies [webpage](#)

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

#### Other Resources

- Embodied Carbon in [Buildings Materials](#) for Real Estate
- Hudson Pacific Properties (HPP) Better Blueprint [platform](#)
- HPP 2020 Corporate Responsibility [Report](#)
- Building Transparency ownersCAN Embodied Carbon [Action Plan](#) (ECAP)
- HPP Low Embodied Carbon Tenant Fit-Out [Guide](#)
- DPR Net Zero Energy [strategy](#)
- Microsoft White Paper: Reducing Embodied Carbon in Construction [report](#)
- EC3 Tool [registration](#)
- One Click LCA Planetary [tool](#)
- Carbon Leadership Forum (CLF) [Resource Library](#)
- CLF Owners [Toolkit](#)
- CLF Architects [Toolkit](#)
- Building Green [Contractor's Commitment](#) to Sustainable Building Practices

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