

[Silence from 0:00:00 to 0:00:32]

*Hannah Debelius:* All right, everybody. Welcome to the Waste Reduction Pilot quarterly webinar. Andrea, a question – could you just confirm that you can hear me?

*Female:* Yep.

*Male:* Yep, you're good.

*Hannah Debelius:* Okay, wonderful. Thanks so much. Before we officially get started, I've got a quick little disclaimer to read you all for about the disclaimer. So this WebEx call is being recorded and may be posted on DOE's website or used internally. If you do not wish to have your voice recorded, please do not speak during the call or disconnect now. If you do not wish to have your image recorded, please turn off your camera to participate only by phone, and if you speak during a call or use a video connection, you are presumed to consent to recording and to the use of your voice or image. All right. Now that that's behind us, welcome again to our Waste Reduction Pilot Q3 quarterly call where we're gonna be talking about something that I know is a hot-button issue across sectors for everybody and probably also in our personal lives as well, and that is plastic waste. So we have two great panelists with us today, and I'm really excited. Just a couple of housekeeping things to get started – the first is that you are welcome to use the chat function in the little drop down. If you are having technical difficulties you can reach out to Andrea Doukakis specifically, or if you have a question or comment, you're welcome to reply it out to everybody. As you heard from my monotoned disclaimer, this is gonna be recorded and will be available in the Better Buildings/Better Plants Solution Center, and so if you'd like to share with any of your colleagues after the fact or that sort of thing, you'll have access to that recording. And also, we know this by now, but everybody if you could keep yourselves on mute while you're not speaking that would be wonderful.

All right, next slide please Clifton. For this quarterly call, as I mentioned, we are discussing plastic. However, the point of these quarterly calls is to always spotlight leadership, to highlight resources that we've found valuable, and then also just provide a forum to share these challenges and opportunities. So along those lines, if at any time you have a question or comment, you're welcome to put that in the chat box. I'll do my best to narrate or moderate those in real time, but also there'll be plenty of time at the end for Q&A where we'll open up and be able to have a little

bit more of that discussion and dialogue, and I hope that some of you will also share what you've been doing in this space. And our next quarterly call will be in November, so you can keep an eye peeled for that. Next slide, please.

Great. I will go ahead and introduce myself. My name's Hannah Debelius. I think you all should know me by now in the pilot, and I'm an ORISE fellow in the Building Technologies office at DOE and glad to be moderating with you all today. Next slide, please. Great, as I mentioned we are gonna be doing some program updates and actually engaging you all in a couple ways we're looking for some feedback. Then we have two wonderful panelists – Jack DeBell, who is from the University of Colorado – Boulder, and Amy Costello coming to us from Armstrong Flooring, so a university and an industrial partner and will be, yeah, really wonderful. Next slide, please. You all know who you are, but these are our wonderful pilot partners. I think many of you are on the line. In fact I'm not gonna go through this list as a roll call, but if you are on the line representing a partner, I hope that you'll actually put in the chat box where you're from or who you're representing just so we can get a sense of who's on the line. That would be awesome. And I'm gonna – if you all could go ahead and do that, I'll read some out just so we know. All right, thank you Ryan, Green Circle Certified. Flowers Food, wonderful. Laurie, she was our wonderful speaker last time. Yep, Jamestown, which is commercial real estate. PaperWorks for North Carolina. Martin Guitar, wonderful. The City of Beaverton, Oregon, great. We already have so many sectors represented, so that's wonderful. Great. Well, thank you all for joining us and also of course for being a part of our pilot. We'll move forward. Next slide, please.

Oh, okay. I'll read a couple more, which is TNBJ, which is a multi-family. Bristol Myers Squibb and General Motors. As you all know, I'm also supported by this DOE – the DOE ICF and RE Tech Team. Many of you also speak with Bruce Lung if you're an industrial and manufacturing partner. He and I, our emails will be available at the end of this call, but as always, you can continue to reach out to us or your regular account manager or technical account manager for anything you need for the Waste pilot. And on the next slide, we're gonna talk a little bit about a couple of program updates. We recently published an implementation model from Sprint, a T-Mobile company, and so that along with the blog is a great new resource that you can find with this direct link or also on the Waste Reduction Pilot webpage that's in the Better Buildings Solution Center. Also, thank you so much for the many of you who joined us at the Better Buildings Summit. We had a

great turnout for that and wonderful panelists from Volvo and Shorenstein, and that is now available online, the recording, and there's also a transcription for that as well, so you can check out that if you weren't able to join us live. Yeah, and other resources you can find on our website. Next slide, please.

I'm really excited that we are – here we are on our Q3 call, so we are almost to the end of the first year of this pilot. And so we've been doing a lot of thinking about how we wanna continue this engagement and really continue to get things going and revved up for the next year, which is why we're excited to be launching what we want to be our first of a couple of working groups. This one will be around plastics, so we thought it appropriate to announce on our plastic webinar here, but what it might look like is also gonna depend on who we have involved in that. So if being a part of a plastics working group is of interest to you, I hope – whether you're an industrial or commercial partner, I hope you'll reach out and email my colleague Bruce Lung. His email's right there and also at the end. There's gonna be a kickoff call mid-September where there will be a lot more structure around this, and we'll add in some details about what that commitment might look like or the goals they're looking to achieve, and again, based on the interest and input from the people in the working group.

So with that, we're actually looking to get some more feedback from you all in this vein of working groups and engagement. So Clifton, if you could go to the next slide. In order to do this, we are gonna use a tool called Slido. Many of you might've done this already if you came to any of our Better Buildings Summit session, but if you could go ahead in a separate browser or on your cell phone. You can go to [Slido.com](https://www.slido.com), and then you're gonna enter the event code #Waste. This is gonna be – we're gonna do a quick, three survey questions that we'll show live here, but again if you open up a web browser or your phone and go to [Slido.com](https://www.slido.com) and then enter the event code #Waste that's where you'll be able to participate. So I'm gonna give it just a couple of seconds for you all to do that before we launch our first poll, and yeah, thanks so much. I know it's a little onerous to open a new tab, but we're looking forward to your input. Okay. Great. Hopefully we have enough people in there. So Clifton, please go on to our first poll.

Great, so our question here is, “Do you have any special waste streams or efforts to recycle these special items?” We know this is not exhaustive. These are just some of the ones that are – we've been thinking about or are relevant to today's discussion, so you can go ahead and fill that in. That'd be great. Yes, batteries and e-

waste. We know that's really big, and e-waste was a big focus as well of that solution we published with Sprint that I just mentioned. Other plastic waste. Yep, plastic film. That makes sense. Yeah, a lot of batteries. That makes sense, especially also for our commercial office partners. Interesting. And if anyone has other that are in this, feel free to put them in the chat. All right. Great. Well even though I know a lot of you – it looks like about half of you are looking at plastic film, other plastic, or Styrofoam, I think that's actually great because some of you might be able to contribute to our conversation today but also I think will be able to learn a lot from our panelists about what they're doing in this space. Great. Clifton, could you go to the next poll please?

So this one is open-ended, because we are looking for other working group topics that you'd like to either see or participate in in the second year of the Waste Reduction Pilot. We know a lot of the common challenges at this point, such as data management and accurate data, but we're looking for just any ideas of topics that you think would be valuable to really drill down and work with your peers on this and also in a way that the DOE can help. And it doesn't – just because you put an idea out there, it doesn't mean that you're committing to volunteering. Closed-loop applications. Thank you so much to whoever was our first person. All right. Alignment with EPA and America Recycles. Upstream recycling. How to recycle in the current market. Yeah, waste data. That's definitely something we see a lot and I think will be a part of this. Composting for sure, especially in our commercial side, or we learned a lot from Flower Foods as well. Yeah, waste connection opportunities amongst the group. I think that speaking a little bit more intimately by sector could help with that as well. Hazard waste streams in small quantities. And regional hubs recycling. Those are great ideas. Localized solutions. Yeah, locally and regionally I think that is something we could explore. Other topics? We're also interested in what you'd like to explore at the waste energy nexus, whether that's closed-loop or circular economy or embodied carbon and waste or waste-to-energy. If any of those speak to you, I hope you'll \_\_\_\_\_ there. And I will just also – it sounds like we're getting a little bit of feedback, so if everyone could just remember to mute themselves when not speaking, that would be wonderful. All right. Great. It looks like we've got a pretty strong list here, so if we could go to the next poll, and then that's our last one for today.

So, assuming you all are eager to volunteer for these working groups, how frequently would you like to meet? Think about both of course your time management but also effectiveness of a

working group, since we're all in this for – to get a lot of information out of it. All right. Quarterly's ahead, but monthly's also a strong contender. Bi-weekly's eking in a few votes. Okay, interesting. I am interested – the more frequently, but over a shorter amount of time, so for instance only doing it for a quarter but maybe meeting bi-weekly or something like that is another option. I think that's just about the responses that we got on the last one, so thank you so much for your input. You can expect more information from this directly from Bruce and myself and your account managers, as well as in the next quarterly call. So thank you so much for your feedback. If you have another idea for a really great working group, please send us an email. We'd love to chat more about it. With that Clifton – yep, you can – you're reading my mind. You can switch back to the PowerPoint please.

So based on this exercise you just went through with us, I think that you will know what's kind of on our mind as we look at year two, but just really increasing that engagement, increasing the value of this partnership on both sides, focusing more about the connections between waste and energy, and also really drilling down and publishing solutions that are relevant to you all and are the most helpful. So these are some of our plans, and we're glad you're gonna continue to be on board with us. So without further ado – you can go to the next slide, Clifton – I am really excited to get to our panelists. As a reminder, you can put questions in this chat box at any time for our panelists, and I will do a combination of asking them in real time but also saving them for a Q&A portion at the end. But any time you think of it, you can put it in there. Next slide. So we are gonna start to hear from Jack. Jack DeBell recently retired from the University of Colorado's recycling program after more than 30 years. His accomplishments include cofounding the College and University Recycling Council, leading an internship program for students interested in recycling careers, publishing a decision maker's guide to recycling, and advancing CU's zero-waste plan. And I'll mention that University of Colorado, they are not a partner within the pilot, but they are one of our Better Buildings Alliance partners, so we're excited that Jack wanted to step in and share some of his resources and lengthy experience at University of Colorado. So Jack, go ahead and take it away.

*Jack DeBell:*

Good afternoon, everyone. I'm certainly pleased to join you today from Lyons, Colorado. Like many campuses around the country, we're seeing a real challenge to serving our students and protecting not just their safety but so many of the frontline essential services. I've been spending much of my time since retirement since the

spring helping campuses prepare operationally for reopening and trying to stay safe. So there's a lot of uncertainty. I hope I can address some of that to the best of my ability. Some of what I'm going to speak about today is tempered by the current situation, so you'll see maybe a little more emphasis on some of the social dynamics at work, both on and off campus. Let me make sure that you can see my first – my title slide. Is that correct, Hannah?

*Hannah Debelius:* Yep, you're all set, Jack.

*Jack DeBell:* Great. Okay, Clifton, can you advance to the next one please, which should be Agenda?

*Male:* Done.

*Hannah Debelius:* Yep, you're good to go.

*Jack DeBell:* Great. So let me first – well I'll talk about some of the credits and some of the people and groups that have brought me here today. We'll focus on a couple of examples that Hannah prompted me, although, as you can expect, campuses around the country are challenged with multiple waste streams – residential, commercial, and industrial in cases, so I'll focus in on a couple that \_\_\_\_\_ to what I'm going to help define as a deep reuse and recycling of computers and film plastics. Along the way, I'll try and pepper in those approaches that I think help characterize a deep reuse and recycling program, which prioritizes the best possible use of those products, focusing on a triple bottom line, and then repatriating or developing domestic markets. So those and others that I'll try and address help characterize what I would consider to be a deep reuse and recycling effort, and I'm sure that many of you are working in this capacity. I just wanted to try and differentiate some of what I've done over the last 30 years, frankly, which was get it off the loading dock and be gone with it. Deep reuse and recycling runs counter to that, and in reflection of my career, I hope to share some of that and certainly welcome your discussion in the limited time that I have.

So let's advance to the next slide and to thank the Department of Energy and you all for addressing materials and their waste in what I would consider a perfect trifecta of energy, water, and materials management or waste that results from improper management of those materials. Kudos to you all, and I hope to help you as much as I can. I also wanted to thank the National Recycling Coalition, which I am currently involved with post-retirement on a volunteer basis. I manage their campus council, which does a number of

things – everything from offering scholarships and mentoring young, emerging leaders to opening up a bottleneck between higher education and industry, relative to applied research, technology transfer, entry-level employment, and the like. So the campus council works on better integrating campuses and the industry, you all. And then finally let me thank my alma mater and my former employer, the University of Colorado system. I wanted to highlight the motto of the university, “Let your light shine.” I can’t pronounce it in Greek. I can’t even read Greek. But I’m glad to see it interpreted, because it characterizes my career, going back to my father and grandfather and our family in the scrap industry before recycling even made the dictionary. I was involved in my Eagle Scout capacity bringing revenue into our troupe for summer exploits into the high country of Colorado, so growing up here gave me also a fond appreciation of nature, a connection to natural systems, and frankly some of the changes that I’m beginning to see here on my acreage at 7,000 feet.

So thank you all for joining us, and let’s proceed to the next slide, Clifton, which should be a little more detail on what we’re doing with the National Recycling Coalition and campuses around the country. Hannah, you can include this as a resource for your participants. We’re assembling a resource center library. That includes those categories that you see with an opportunity for you to submit documents, case studies, presentations and the like from your agency or organization. The next slide shows you a little bit about what we’ve been doing at the university in what we call the Zero-Waste Lab or the Applied Learning Lab for Zero Waste. I wish we had more bench space to do waste characterization and some of the other hands-on work that this industry calls for, but our lab focuses on applying academics in some of these current projects that you see, two of which are listed here that I’m gonna talk about in a moment. The next slide digs in to some of the resources that our students have put together, many of which are applicable to off-campus, in terms of best practices around the country, research and development – speaking to what I talked about earlier about connecting higher ed and the industry – speaker and tour directory, and then some of the tools that solid waste managers typically use on and off campus, so I welcome you to check all of that out.

And then the next slide really congratulates, again, the Department of Energy and the EPA for focusing on a hierarchy that prioritizes reduce, reuse, and recycle as keys to sustainable materials management. This is a systemic approach that I think we can all agree on, and it guides many of our policy decisions on and off

campus. The next slide, Clifton, should show, if the animation works right, the lifecycle approach that more and more of us are taking to identify opportunities for source reduction, reuse, and recycling along the value chain or along the production cycle. So when we begin looking at this entire life cycle from extraction to production to distribution and use and disposal, we see a lot of opportunities, and I, again, welcome the EPA – next slide please – for the new view of how greenhouse gases are assigned to, hopefully, climate action planning, where waste generally is characterized now as the provision of goods and materials, varying – I don't know – it says 38 percent from Allaway's report in Oregon, but I've seen it vary a percent or two either way. Regardless, this is a better way of managing our materials when we see it move through extraction and disposal and back again, hopefully.

Next slide should show the wasteberg that many of the campuses show for real visual value, corresponding, probably coincidentally, of the 60 to – well, the Report of Wasting and Recycling in the US by the Institute of Local Self-Reliance estimates that 71 tons of materials are generated for every 1 ton of discarded products, so that roughly corresponds to what you see above water, but the real mass, the real challenge is what we don't see – what's generated from mining, oil, and gas exploration, agricultural coal combustion, and other discards that are produced along that material production.

*Hannah Debelius:* Hey, Jack.

*Jack DeBell:* Yes.

*Hannah Debelius:* Just a quick head's up that you have about five minutes left.

*Jack DeBell:* Okay, I see that. Thank you. The triple bottom line of course is an orientation that more and more are taking. Next slide for that triple bottom line. Prioritizing people first for this discussion on a deep reuse. Next slide should show you a mountain that I'm standing behind of e-scrap, which is the world's fastest-growing trash stream you're probably familiar with. About 50 million tons worldwide now, so something that we are paying more and more attention from. We're quantifying the material or embodied energy that you see listed in the next slide of extracted industries, followed by the next slide of some headlines that incinerators and environmental racism are raising in our culture today. I don't wanna belabor it, but one particular point on this is what we're seeing characterized as advanced recycling or chemical recycling.

This is indeed a way of turning plastic into fuel, which is burned. The reports that we're seeing are showing that half of the plastic that's processed comes out as pollution. In fact, the best report that we're seeing – best practices are showing that over two times the amount of greenhouse gasses are produced from each product that's converted to so-called fuel. So the point is that many of these facilities are sited in places that are least prepared to deal with them, and so when we're looking about e-scrap – next slide – we start looking at solutions. And what I'm showing here is a project that we have that other schools around the country are doing around reusing computers and, in effect, bridging the digital divide that is really only emerging. It's growing more intense, rather than less, by the virus, and students' lack of access to the internet, for instance.

Next slide would show some detail about our Computers to Youth program, where we're collecting serviceable desktops, laptops. We're moving into mobile devices, which we're looking for more assistance and advice on. But in essence, what we're doing is identifying those most-deserving students around our state through the MESA program. Many of your states might have them also. They work with junior and high school students to really incubate and advance math, science, engineering achievement, so working with them we are bringing students to campus for the day, helping them build a computer with college mentors, some of them first generation college students themselves, where they then, after they build the computer, take it home with them, where we track their progress to higher education, hopefully at the University of Colorado. We've great sponsorship for it. It's a very replicable program, and it gets, again, to that deep reuse method of going upstream to identify serviceable equipment, getting it into the hands downstream, where it's the highest and best possible use. It's only several hundred units per year, perhaps, that we're doing, but it's scalable, and reuse will always outpace disposal and recycling as a viable alternative.

The next example that I'd like to highlight is the work that is also available to you and your agencies through our film plastic program with Petoskey Plastics and Grainger Supply. This was featured by the Association of Plastic Recyclers recently as a case study. It helped vault Petoskey Plastics to Processor of the Year, and I'll dig into some of the steps of getting a higher and better, deeper use or recycled use of what we would call closed-loop process. Next slide would show how we began the planning. We began with a waste stream assessment report, as many of you do, to manage what gets measured, and then along the way we

identified over 70 tons a year of film plastics that were being generated. So on the left side we've got common samples. We sent them off to a number of processors. Some of them went to China. We never really heard from them again, but we did get some real uptake from some local markets.

Next slide will show some of the collection of the viable, clean, dry film that we get from stock rooms, housing and dining. It's basically pre-consumer. We collect it in mail carts and frankly big old cardboard boxes from the delivery of mattresses and such and get it back to a small down-stroke bailer that you see here in the slide 18, where we then get it backhauled to Indiana with freight paid by Petoskey Plastics. Depending on market conditions, there is – there could be – hopefully will be again – some value assigned to that. At one point we were getting five cents a pound when it's nice and dense and delivered to them. The next slide shows really some great work going on in Michigan and Indiana, where they're generating a 70-percent post-consumer resin bag that the next slide will show is purchased right back by our university through competitive bid and also through off-campus business-to-business sourcing through Grainger. We buy these 70-percent post-consumer bags less than virgin bags, and we also get them custom made for – what you see there for our tailgate recycle.

Just a couple of more slides left, Hannah. The next one would show some of the detail on the Greencore can liners and some of the contact information, the government and agency account manager that we work with, and some very large array of sizes. Let me just – the last slide would show why I think plastic recycling is really viable. Not only are we getting these bags back lower than virgin and getting a very great value stream met domestically. We're getting reinforced positively with information that's showing to the pound almost what we're shipping, what we're buying back, and then some of the energy and resource savings. So let me just conclude, then, by what might characterize deep reuse and recycling. And again, I know that many of you are doing this going up the value chain and then downstream to get the best opportunities, get the best possible use of that. Secondly, looking at the triple bottom line. In addition to cost savings, looking at and always incorporating social equity first. Putting people first drives, to me, much of the rest of our challenge. And then domestic market development – repatriating the capacity for \_\_\_\_\_ material. There will always be a market for quality material, whether it's film plastics, polystyrene, or high-quality sorted white ledger, for that matter. The bottom line is that recycling success has always been pulled by demand, rather than pushed by supply, so when we

can identify a company onshore, like Petoskey Plastics, it meets that golden rule of recycling. And finally, let me just, again, congratulate you and thank you – the final slide – for considering materials management in your sustainability work. So I conclude with that. I've gone over a little bit, and I apologize.

*Hannah Debelius:* That's okay. Thank you so much, Jack. I really appreciate it. And the story that you all have around the plastic films and being able to buy that product back to your campus is what drew us to reach out to you in the first place, and I think it's such a great story, and the computers as well, since we saw on our poll that e-waste is a big consideration. Next slide, please. So next I am pleased to introduce Amy Costello. She is the Sustainability Manager at Armstrong Flooring, a local floor design and manufacturing corporation based in Lancaster, Pennsylvania. Amy is responsible for developing and managing sustainability strategies and initiatives and chairs the Armstrong Flooring Global Sustainability Steering Committee, which provides governance and sets the business direction regarding materials sustainability issues. So Amy, thank you so much for joining us, and I'm really excited to hear your perspective. Take it away.

*Amy Costello:* Awesome. Thank you. So what I was gonna do today is just kind of give you an overview of what we're doing with Armstrong Flooring from a recycling perspective. Who is Armstrong? We are a – we're a multinational enterprise. Most of our facilities are located in the United States. We're headquartered in Lancaster, Pennsylvania, and we have facilities in China and Australia as well, and we sell flooring to the residential market as well as to the commercial markets. These are some of the products that we sell in both the residential and commercial markets. We sell different types of polymers. Our main polymer that we sell is PVC, so we make a lot of different products out of vinyl, but we have other polymers that we also sell. Our Biobased Tile is based with a PET. We make a TPU, so we make different types of flooring. The flooring that I'm showing you on this slide here are all recyclable through our recycling program, and I wanted to share some details about that program with you guys.

So these are sort of the types of recycled materials that we use in our manufacturing plants, so we recycle our in-plant scrap, and we recycle that material within our own gate. So some of the material that we recycle we can do it at the same plant where it's generated. Other material we send to different plants. We also have a post-consumer stream of our own materials, so we will bring back our own post-consumer flooring products and recycle those as well as

different types of post-industrial materials. So when you make flooring – and this is probably very general – there’s sort of two different types of flooring products. The first type of flooring is made I always say the way you make cookies. It’s made in a great, big, giant mixer, and you put things in, and you mix it up, and then it’s extruded out, and then it’s rolled, and then it’s punched into tile flooring or it’s left in sheet flooring, but that’s one way to make flooring. And when you have that sort of mixing process where you have the big mixer, it allows you to be able to put materials into that process.

The other way we make flooring is more of a continuous process where we build up the product, so we’ll start with a fiberglass or a felt scrim. It will be connected on a frame. It’ll go through the process, and materials are added to the process as it goes through a series of heating and various things, and it’s kind of a continual process. That process does not allow us to add recycled material into the process, but we are able to recycle the materials or scrap that’s generated from that process, and that’s what I’m sharing on the right-hand side of the slide. It’s labeled trim scrap. Those little bitty pieces that you can see that are being collected in this \_\_\_\_\_ is the very last step in our manufacturing of our sheet vinyl flooring, and that step is there’s a little bitty piece on the edge of the sheet flooring that holds it in the track as it goes through the continuous track program, and that little bitty piece gets cut off at the end. It gets chopped, and then we are able to recycle that material, not in the sheet flooring where it came from, but on that same site we have a process to make vinyl tile, and so we’re able to take that material and put it into the mixer and make it part of our tile. The mill plugs on the left-hand side of the screen, that’s sort of what’s left at the end of the door. So when the process is finished, that little bitty bit that’s not quite enough to be extruded to go out on and make into flooring, we have what we call mill plugs. We save that material. That material goes through a hammer mill. It gets ground up, and we are able to use that back in other tile products.

So when we think about post-industrial recycling, these are just some steps – and I put these in here ‘cause I thought well maybe these would be useful to you guys – that we go through in thinking about what materials we will accept to be able to use in our product. The first thing it says on the sign on the bottom right, “Safety first.” Safety is one of our four key values at Armstrong Flooring, so we always ask for an SDS for the material. We also ask about the format of the recycled material. What is – is it ground? Is it in rolls? Is it – how are we going to get the material?

We consider color. With flooring it's really challenging to recycle certain colors back into our product, so it's much easier to recycle a clear material or a white, a light-colored material than it is to recycle blacks or your deep purple colors. We also consider the availability of the recycled stream. How much material does someone have? What is the frequency or the cadence in which we would be able to get that material? We look at the value of the material to us, and what is that worth? And it says "binder versus filler." In our world, the filler is usually limestone, which is kind of a low-cost material. The binder would be that plastic material, which is a higher-value material, so we consider that.

We test it for compliance, so internally at Armstrong Flooring we have our own – we have a chemical management policy, and we have internal directives about chemicals that we will and will not use within our products, and we will not accept any product to use as a recycled stream in our products if they don't meet our own material concern directives. And then we have the plants evaluate the material to make sure the plant is able to use it. We do some formulation at the plant. We do some lab tests at the plant. Especially new materials that we've never used, we have a much more stringent process that we go through, really that bench study to prove out that the materials will work. Then we do change control, and we actually do a specification for every new source of recycle material that we bring in. We establish an SAP. It gets a number, and a specification is developed for each material.

The picture on the top is a material that we use. It's actually a film that's in windshields, so we use that in our products. That material comes to us almost in a flake-type form. It is separated from the glass, but inside of all your windshields or your safety glass there is a vinyl – that's not vinyl. It's a PVV. There is a polymer that's inside of that windshield that we are able to recycle into our flooring products. And then this is just some other things that we can recycle. Credit card scrap – we're able to recycle credit card scrap into our products, ground films into our products, so depending on the material, depending on where we're getting it, it comes in different formats.

And this is our own post-consumer recycling program, our floor recycling program, which our marketing people have named the On & On Recycling Program. I think this is something that's really special about thermoplastics or especially PVC is that you're able to melt those plastics back down and make them into new products. So our On & On Recycling Program is a complete closed-loop program, so we take the flooring after it's no longer

needed on the floors, after the customer no longer wants it, and we recycle it back into new flooring products that we then sell. The picture on the right is taken in – I'm losing my brain. The picture on the right is taken in a Kroger store in North Carolina, and they literally scraped the flooring product up. They put it into this thick, double-walled or six-walled \_\_\_\_\_ box, and they sent it back to our manufacturing facility. And to date we have recycled over 150 million pounds of post-consumer \_\_\_\_\_ recycled back into our products.

And our recycling program – you can get to it at [armstrongflooring.com/reclaim](http://armstrongflooring.com/reclaim) – has four steps. The first step is to register. We have a dedicated customer service number, so you can call the 888-ARMSTRONG number, and there's a dedicated number for recycling. We go through a screening process with our customers to make sure that we can recycle the flooring. Some of the things that we consider in being able to recycle the flooring is the age of the building. We will not recycle materials in buildings older than 1990, and that's for concerns related to asbestos. We're very concerned about introducing any type of contaminate into our products, and that's the reason that we have those concerns or requirements associated with our recycling program. We will take our own product, and we'll also take competitor products. Again, some testing might be required, because we don't want to introduce contaminants into our process or chemicals that are maybe a concern to us. Once you do that you just need to sign some paperwork. We confirm that the job is acceptable. You let us know when you're doing it. We will provide you with the super sacks or \_\_\_\_\_, the appropriate containers to put the material in. Nothing special that you have to do at the job site. You just remove the material. You put it in the containers, which should be on a pallet. The pallets will come – have to be stored inside. We don't want it wet or moldy. We want it as it looks in the picture. And then just call us again, and we will schedule a truck to come out and pick up the material.

And this is – the three slides on the right-hand side are what happens to that material when it comes back. So we actually have part of a closed recycling program, where the material is dumped into a recycling system and it goes through a series of screeners, metal detectors. It goes through sizing. It's a continual process, so it goes from literally what you're seeing in that second picture from the left which is the material that comes back to sort of this really consistent, homogeneous almost powder material that we're able to then use back into our products. And I put this slide in here because if you're thinking about using recycled materials, there's a

couple of questions that you should be asking or thinking about to yourself, and one is how are you gonna get that material back into your product? Some materials we buy come ready to use. They're coming from a place where it's already been ground. It meets our specifications, and we can use it. Other materials like the materials that we're getting back from our post-consumer program or maybe we're getting it back internally from one of our manufacturing plants have to be processed, and depending on the type of equipment – or the type of material, the flooring material that we're using, there's different grinding capabilities that you have to have. So we make tile products. Our tile products are a vinyl-composition tile product. They're very hard. They're 85-percent limestone, 15-percent binder, and so they're a very hard product, and so you have to have a really tough, like a hammer mill to be able to break them up, whereas a luxury vinyl tile has a lot more vinyl, less limestone, and you can break that up in a granulator, so there's different types of grinding equipment, depending on what – how you're gonna process the material.

The picture on the left-hand side is actually from our Southgate facility in California, and that is just a conveyance system. One of the things that we did when I first started working is we invested in the infrastructure to recycle all of our scrap in-house, and that's what is showing on the first picture on the left-hand side. It's just being able to bring that frame scrap, so when we make tile it's literally like punching out cookies or punching out tile. There's a little bit of trim around the edge, and that material is then collected and it goes back to the front of the mixer and it gets reused. So thinking about how you're gonna convey it if it's inside of your plant, and then if it's outside of your plant or coming into your plant, what type of sorting capabilities do you need and what type of grinding equipment you need are some important things to be thinking about.

And then I put this slide in here because I wanted to share with you too one of the things that – one of our big initiatives from a sustainability perspective we committed to this year is we're doing waste audits at all of our plants, and I love this picture, because this is Nadine and Bryce. They're at our \_\_\_\_\_ plant, and they have been sorting waste all day. So you can see all the different trash cans. They literally collected all the waste from our plant floor and the dumpster, and they went through and they sorted all of it to understand what type of waste we're generating and were there additional opportunities for us to be able to recycle material at their plant. And it kind of makes me happy that they're happy about trying to find opportunities for us to further recycle and

reduce waste in our manufacturing facilities. So thank you for your time.

*Hannah Debelius:* Awesome. Thank you so much, Amy. I always love a good photo of someone standing with a pile of trash. I know that Jack had piles of trash in his presentation, and that's just something I'm delighted by in the sustainability field. And also your cookie cutter analogy is wonderful, and now since you've mentioned that to me just last week every time I go across flooring that's what I'm thinking about. I love it. Great, well we already had a couple of questions come in. The first are for Amy, so I'll kick off with that. Amy, the first question is, "Could you expand on the SDS" – which is a safety data sheet – "for the materials accepted? For instance, are you looking for the SDS for what the material was used to hold, or an SDS on the material itself?" Amy, we can't hear you, so you might be on mute.

*Amy Costello:* We're looking for an SDS on the material itself, so we wanna know if there's anything hazardous in that material that would be disclosed on the SDS sheet.

*Hannah Debelius:* Great. Thank you. And we have one other question that came in for you, Amy, which is, "How much money do you all save in this process?" And I wanna expand on that and also just ask the – if you calculate it, what kind of mechanism do you use for those inputs?

*Amy Costello:* I'm sure it's calculated. I wish I could tell you a magical number. I do not have a magical number. I can tell you that with our recycling program, at least our post-consumer where we're bringing it back from the field, that it is cost-neutral or cost-positive to us, so we will recycle materials at no cost to our customer, but there are situations where it's gonna cost money to be able to bring that material back. It's not a cost-neutral situation. And sometimes we have customers that are so committed that they will actually pay for the shipping to ship the material to us so that they can recycle it. We do a lot with really large commercial customers that – where waste reduction is part of their sustainability commitments and they want to be able to recycle that floor at the end of life. We also do work with really large customers that wanna recycle even the scrap that's being generated, so maybe it's a large hospital, a large school project. They wanna be able to recycle the trim scraps, so they're maybe putting in sheet flooring and there's a foot extra that's cut off. They will work with us on that as well.

*Hannah Debelius:* That's great, thank you. And Jack, I'm also gonna turn that question actually over to you, because it does remind me of a couple of things you brought up – 1) your plastic film example and selling it for five cents a pound, but also your assertion about recycling being driven by demand since it is a money thing. So do you all also quantify whether you save money or spend money there? How do you all quantify that?

*Jack DeBell:* Great question. Through the chain is where we manage it. In fact, in this particular project, on and off campus I would imagine four partners reporting sets of data. So to the first part of getting it collected, I had mentioned a backhaul, which is commonplace in the industry, works very well on campus where the same people delivering material can bring it back – same truck, same loading dock, same time. So they measure savings in not having to go out for special runs compared to a recycling crew, so in the total we see backhauling as a real viable in-house option. The next set of tipping fee – would be tipping fee savings. We \_\_\_\_\_ 40-yard roll-offs a year is what our property services estimates. That's pre-consumer. We don't really talk \_\_\_\_\_ or post-consumer bags, but at the lowest tipping fees in the country, about \$15.00 a ton, compared to a national average of somewhere north of \$60.00 a ton, our property services is still saving \$800.00, \$1000.00 a year. That pays for any preventative maintenance, upgrades to the bailer, and so on. So we do see it as a cost-neutral process in-house, and surely we hear from Petoskey in Hartford City, Indiana, right on the interstate, that it's – they do milk runs similar to a backhaul, where they condense from regional customers particular delivery dates, amounts, bail specs, and so on.

*Hannah Debelius:* All right, thank you. We also have another question here which is, "How energy-intensive is it to use recycled film versus virgin raw material?"

*Jack DeBell:* Definitely a technical question for Petoskey, and Amy you may have a better sense. Mine is that they must be doing something right to put another – for Petoskey to put in another \_\_\_\_\_ there. They are looking at sample campuses or commercial customers to being recycling post-consumer wet bags. Ice bags are something that we cannot get rid of in our industry, so they're looking at capability of taking those along with clean but wet bags that we collect from the tailgate parties that we hand out to tailgaters as they enter campus. There's got – so here's the other thing. I don't know if it's competing right now. In fact, they would report – and I'm trying to stay tuned to what happens when oil goes under \$40.00 a barrel. If you look into the documentation that was aired

recently on documentaries like *Plastic Wars*, you'll see that the industry is dumping petrol chemicals into the plastic markets. I don't have the numbers in front of me, but it's astronomical what the plastic industry is expected to produce. So we have major plastics industry competing within their divisions. Exxon-Mobil and their chemical division have been long, strong supporters of recycling, but now they're getting out-competed by \_\_\_\_\_, because oil \_\_\_\_\_. You know how that works.

*Hannah Debelius:* I do want-

*Amy Costello:* For Armstrong, we do \_\_\_\_\_, so we have the capability of modeling all of the environmental impacts associated with our products, so it is significantly less for us to be able to regrind the PVC and put it back into our process than it is to make virgin PVC. I know that's not the same for nylon 6 where you have to do really intense deep \_\_\_\_\_ processes with materials, but because all you have to do with PVC is literally grind it back up and we've put it back in the process, it is significantly less than what we \_\_\_\_\_.

*Jack DeBell:* Amy, do you mind me sharing something with you? I have to express the challenge that your industry faces. In Denver for many years-

*Hannah Debelius:* I'm so sorry, Jack. We're actually – we're at time here. I'm so sorry. I know. But both of your emails are here, and actually Clifton I think if you go one more slide down it'll be – yep. Here are all the emails for us. I'm so sorry to cut you off on that, Jack. I can tell that you're ready to go on that. But thank you all so much. I really appreciate you having this conversation. I hope you'll reach out to Bruce if you are interested in continuing this plastics conversation. This will be available online, and yeah, please reach out to our panelists if you have follow-up questions, or as well for our panelists if you'd like for us to disseminate more information we're happy to do that as well. Thank you again so much for your time, Amy and Jack. I really appreciated both of your perspective from these different sectors, and yeah, that's it. Everyone have a wonderful day, and thank you so much.

*Jack DeBell:* Yes, congratulations.

*[End of Audio]*