Kiran Thirumaran: Hello, and thank you everyone for joining the webinar today. We're going to give folks another moment to log in. We'll be starting soon

[Brief pause]

All right. Let's get started. Hello, everyone, and welcome to the 2023-2024 Better Buildings Webinar Series dedicated to bringing you the latest actionable insights from leading industry experts. This annual series is a chance to explore topics, technologies and trends that affect your organization, as well as efforts to accelerate decarbonization and energy efficiency adoption. Today's webinar is called "*The (Not So) Shocking Shift Towards Industrial Electrification*". Before we dive in, there are a few housekeeping points I would like to cover.

Please note, today's webinar is recorded and archived on the Better Buildings Solution Center. We will follow up when today's recordings and slides are made available. Next. Attendees are in listen-only mode, meaning your microphones are muted. If you experience any audio or visual issues throughout the webinar, please send us a message in the Q&A box located on the Zoom panel. Next slide.

My name is Kiran Thirumaran, and I'm your moderator. I'm a research staff at Oak Ridge National Lab. I've been here for around eight years now. And I help support DOE in the Better Buildings and Better Plants program. My background is in engineering, and I work on things related to industrial electrification, water and energy efficiency. Next. So today's agenda – next slide please. Yeah. So today's agenda, we'll start with an overview for industrial electrification. We have a few welcome polls, that we would like to go through to get to know our participants better. And then we will be having our speakers.

We have three speakers today from industries who are going to be giving really good insights on some of the technologies that they are looking at, at their facilities. And then we'll have a Q&A session followed by some concluding slides. Next slide please. So industrial electrification, electrification is essentially the shift from any non-electric source of energy to electric source at the point of final consumption. The graph, I'm showing here to the right of your screen is the total energy used in the manufacturing space in the US. Right? So this is the data from MECS, Manufacturing Energy Consumption Survey, collected by the EIA.

And what we're seeing here is kind of like a breakdown of how bad energy is used in the industrial sector. Right? So, out of the total of like 14 quads of energy, which is around like 14,000 trillion BTU's of energy, a significant portion of that is used in – for process heating. Right? So that is like your drying equipment, your furnaces, used in the manufacturing sector to manufacture the product. Around like almost nine trillion, 9,000 trillion BTU's of energy is used for that. So more than like 50 percent of the manufacturing energy used, is used in for process heating.

An interesting thing to note there is again what we see is more than – less than five percent of that energy used for process heating is currently being served by electricity, meaning like almost like 95 percent is fuel-fired, right, so which is like natural gas, coal, coke. So those are the energy sources that are used for process heating in industries. So this speaks to kind of like – this speaks to the potential for electrification in the manufacturing sector.

And similarly, even if you look at the facility HVAC, which is shown on the right, right end of your screen, we have our own much less energy use around like a thousand trillion BTU's of energy used, and a significant portion of that is still like fuel-fired. Right? So both in the process heating space, and in the building HVAC side, heating, ventilation, air conditioning, there is scope for electrification within the manufacturing sector in the US.

So this is what we're going to be looking at. So our speakers are going to be talking a bit more about these things, where are they finding opportunities on the HVAC side? Where are they finding opportunities on the processing side to electrify these processes? Next slide. So whenever we speak about electrification, we also need to consider the grid as well, because anything – any process that we do electrify needs to be served by the grid, and having a renewable source of energy powering that grid is important.

But fortunately, our grid is getting greener by the day. And any forecasts that you take, this one is a very conservative forecast given to us from the EIA, it projects almost like 55 percent of the energy by 2050 is going to be coming just from solar and wind. Right? So a lot of integration of renewable is going on. And in parallel, if we electrify we can get much of the decarbonization benefits that comes with electrification. Next slide.

And of course, decarbonization is one of the big drivers for electrification, but it is not the only reason that we would electrify our processes. Right? That is productivity benefits that comes with electrification, product quality benefits, and also benefits associated with operating cost, as well. And these are things that we'll be hearing more from, from our speakers today. Next slide. So before we get to our speakers, a few, few items. So today, we will be using an interactive platform, the Slido platform for question and answer, and also, also for polling. You could go to Slido dot-com on your mobile device, or on a new window on your browser, and put in the event code DOE to get into the platform.

If you'd like to ask our panelists questions, please submit it anytime during the presentation, and we'll be getting to those towards the end of the presentations. And also, if you find a question that you like, you can, you can like hold it up, so that it kind of like rises to the top of the queue. Next slide. So we would like to know more about you. So let's start off with a few polls. Please join us over at Slido to respond to the following questions. If you have any issues please message our tech support on the Zoom Q&A.

So the first question we have is: "What sector best describes your organization?" You could go ahead and hit your – whichever is relevant to you, and hit "submit". Wonderful. So we have a lot of participation from industries. And quite a few of us joining from the consulting world, and also from the utilities and the state governments. Fantastic. Thank you so much. So next question. Yes. So the second question we have is: "What are the electrification opportunities most relevant to your facilities?" Right?

And of course, if you're if you're not from a specific facility, what are the opportunities that you're seeing in this space with respect to electrification. All right. We see the options jumping around a little bit. Starting to settle. So implementation of heat pumps. Forty percent of you are seeing a lot of opportunities there. And of course within DOE spending a lot of resources on the heat pump side of things, developing new technologies, pushing the, pushing the envelope, and also in implementing them.

We also see quite a bit of people choose electrification of process heating system. So that is your gas-fired furnaces, dryers, and also implementing other electric HVAC systems, right, outside of heat pumps, resistive air and water heating. So we do have a couple of, a couple of projects that our speakers have, we're going to be targeting, talking about some of those opportunities. Fantastic. Thank you so much.

All right, so we will get into the core of the presentation webinar today. So we have a great lineup of presenters today. So we have the Dee Spolarics from Volvo Group Trucks; Rollis Reisner from McWane, and Edwin Willhite from Schneider Electric. Thank you all for being with us today. So our first presenter is Dee Spolarics from Volvo Group Trucks. Dee is an environmental energy and sustainability engineer who has been with Volvo Group Trucks for eight years. She holds a BS in integrated science and technologies, and a master's in energy systems engineering.

Dee's expertise lies in navigating environmental regulations, as well as supporting energy reduction and decarbonization projects. Additionally, Dee is an active board member of her local AEE and CWEEL chapters, showcasing leadership and passion for energy and sustainability. And with that, I will hand it off to Dee to kick us off.

Dee Spolarics: Thank you so much, Kiran. All right. Welcome, everybody. I'm really happy to be here to talk to you about electrification opportunities at Volvo Powertrain in Hagerstown, Maryland. So I'm the environmental energy and sustainability engineer here. And we manufacture the powertrain, which is the engine axles and transmissions for Mac and Volvo class eight trucks. Next slide.

So just a quick breakdown of what we're going to be looking at here and what our scope is. At our site, we have all renewable energy certificates that cover anything that isn't renewable for our electricity. So when it comes to our CO2 reduction goals, we're going to specifically be looking at natural gas, which is the biggest piece of the pie, and diesel. So for natural gas, that's really going to be our hot water boilers and our heat treating. So I'll be focusing on those two things today. Next slide.

So before we get into that, I did want to touch on the fact that we have two solar systems on our site. One is a north parking solar canopy, which is a 1.32 megawatt system. And another is a ground mount system, that's about 2.2 megawatts. So combined, this does provide about 14 percent of our onsite electricity usage from renewables. But more importantly, it also reduces our peak demand by almost 50 percent. And that's really important when it comes for electrification to ensure that we have enough capacity on the grid. Next slide.

We also have a number of regenerated dynamometers on our research and development side. So our facility is split between operations and GTT, which is Group Trucks Technology. And on the technology side, we do have engines that are running constantly for testing, right, but they're not actually powering anything. So as we've been retrofitting these test cells, we have been adding regenerative dynos to them, so that they can produce electricity, and that energy isn't just wasted as heat. So they provide almost – or over 50 percent of the electricity required from our technology side of the campus. Next slide.

So as I mentioned before, 90 percent of our CO2 usage is coming from natural gas from our operation side. And most of that is coming from these four hot water boilers that we have on site. So these boilers are through – they heat the building primarily, mostly through a primary loop that goes to a heat exchanger for secondary loops. And there is – there are a couple processes that are tied to this. But as you can see, these are pretty big. So we have done a case study at a different facility with a much smaller a 2.5 MMBtu boiler to see how that changed. And that allowed us to kind of create a case study of what it would look like for our boilers here.

Now, the problem is that these boilers aren't really at end of life, yet, we still have maybe eight to ten years on them. So it's kind of that balancing act of, you know, do we do that now just to meet our goal, or do we look more at the whole lifecycle of the unit? Next slide. So here was our initial analysis. Not looking at first costs here, just operating costs and how that would change. So if we wanted to reduce our CO2 emissions by 30 percent, we could replace two out of four of those boilers. That would reduce our CO2 emissions by about 3,000 metric tons. But specifically, if we're looking at replacing these with electric boilers, that cost is going to increase quite a bit simply because natural gas is just cheaper than electricity.

So as you can see, on the right, it would increase our operating costs annually by about half a million dollars, just to replace two of those boilers. So again, this is not something we have completely ruled out, but we do want to make sure that the business case is there. Next slide. In addition to operating costs, it's really important to make sure you're seeing the whole picture. And demand costs are something that can really make or break a business case. So it's really important to ensure that you're looking at that as well.

So just as an example, this is how it would look for our peak demand. Every electric utility is different. So you have to look at your bill and see how your demand builds are structured. But for us, our current on peak annual cost for demand is about

$469,000.00. And then if we were to replace two of those boilers and move them to electric, we would be looking at about 780,000.00, four of them, 1.5 million. So again, this is something we've kind of placed on hold and we said, okay, great, we have this information. What can we do beyond this to maybe reduce the load from the boiler so that down the road when they are ready to be replaced, we're only replacing one or two rather than having to replace four, and have these very high costs. Next slide. Next slide. Yeah, there you go. Thank you.

Okay, so for example, you know, our next step was saying, what can we do to reduce that load from the boilers? Most of the consumption is coming from space heating, but we do have a couple processes on it, such as our engine oil heaters, or specific washers we have. So our engine oil heaters use the natural gas boiler loop. And because the oil needs to be heated to 140 degrees Fahrenheit, that means we have to keep the boilers at 183 degrees setpoint, all year round. So if we can just remove this process, that really doesn't take that much energy from the loop, then we could reduce that setpoint.

Reducing the setpoint isn't going to result in a whole lot of savings. There will definitely be some transmission losses that are avoided. But really, the benefit here is that we can now look at other technologies that don't have to go up as high as 180 degrees Fahrenheit. So I know heat pumps are a really hot topic right now, and there's a lot of new technology that's coming out for that. But the struggle is that, is that, that temperature, that high temperature that they need to get to. So I'm seeing some in the range of 140 to 160, not really 180. So doing something like this could help us open up for different types of electrification technology.

So in this process, right now, it's being heated kind of far away. It's staying heated constantly. So we are taking this opportunity to look at a tankless heating system, and heat right at the source. And that would allow us to save energy as well, rather than just shifting to electric. Okay, next slide. The other big process that uses natural gas is our heat-treating furnace. We have one you can see in the bottom right here, that was purchased kind of right before we made these CO_2 reduction targets. So this one is completely natural gas.

Now, this is a carburizing furnace, so it also requires RX gas to be able to create the atmosphere that it needs. But, you know, going forward, we also have been looking at getting a second one of these furnaces, so not even a CO_2 reduction, but just avoidance of CO_2. We need to look at some other alternative, rather than a fully natural gas furnace. So two options we were looking at. One is an all-electric, of course, this would use resistance heating. We would still need to use some natural gas for the RX gas, which is what creates the atmosphere. But there's some opportunity to possibly use hydrogen or a different low-carbon fuel in the future for that.

Another option we looked into is a possible hybrid. And the reason why is because these furnaces have to get up to 1,700 degrees Fahrenheit. But once they're up there, they usually stay there. We're constantly producing. It doesn't make sense to cool it down and bring it back up. It ends up using way more energy that way. So the big concern is how are those demand costs gonna look if we need to ramp it up to temperature quickly, all with electricity. And so that's what that that cost comparison is down there. It's still a lot less than the boilers, but it's, you know, it's a hefty chunk of change.

Now, we did decide to go with an all-electric option. And one of the ways that we're going to try to mitigate that demand cost is to have that ramp up time go over 24 hours, rather than, rather than over two to three hours. So the plan with that means – the plan would be that we wouldn't have to have that spike in demand that would then, you know, possibly determine our demand cost for the whole year. Next slide.

So when it comes to heat treating, there are multiple types of ways that you can heat treat. The one before was a carburizing furnace, but we also have induction hardening onsite for our crank shafts. An induction hardening is all-electric. And it's a really great technology. So it's definitely something before you're considering which one to do, to first look at induction hardening. Because if you can make it work, it's much better in the long run. So the benefits are – is that electricity is being put exactly where the metal needs to be treated. So you don't have to heat a hole, all this air that surrounds the parts themselves. So that really increases the energy efficiency.

Also, because of that, it will improve precision and process control. And you can therefore do even higher production rates. There are some cons to this and considerations. If you have a process that needs multiple parts, all sorts of different parts, it really is only meant for one type of part. So for example, in our heat treat furnace, we did look at induction hardening, but it just wasn't cost effective, because we would need so many different parts and processes to go through. So something to look at, because it can really make a big difference. Next slide.

All right. So a couple final thoughts here. Remember that every application is different. Every facility is going to be different. But the first step, if you haven't yet, is to really understand your facility's heat loads, and when they occur, and see how you can quantify and maybe work together, and reduce things here to be able to reduce it there. For electrification, electrical infrastructure is really important to understand early. Right? There's going to be restraints. You may not have a lot of demand even available. So you got to work with your utility to understand that.

They might even, if you're adding a lot of stuff to the grid, they might want to do some load studies. So that would be a really good time to make sure those are in the pipeline, so that you can be ready when you want to do those electrification projects. Work with your utility, because there's so many rebates and incentives out there. Here in Maryland, there are a lot of – there's a really great program, which we pay into every month for – as part of our electric bill, and then we can get rebates out of that. So if you're not taking advantage of that, I really encourage you to do that. Because otherwise you might be leaving a lot of money on the table to help these business cases.

Also, consider, as I mentioned through this, make sure you're considering not only operating costs, but also demand costs. Really important to have the full picture along with your first costs. And then utilize heat recovery whenever possible. Our furnace that we have, there's a lot of heat that's being wasted from that. So one of the projects we have is to possibly do some heat recovery from the stack where it's being put out, and possibly inject it into boiler loop lines, so that we can have a hotter water going through the facility. So that's where you can kind of start thinking outside the box. And that's all I have for you today. Thank you so much.

Kiran Thirumaran: Yeah, thank you so much, Dee. And just as a quick reminder, we are taking the questions on Slido dot-com. I do see a couple of really good questions come in. We'll be getting to those towards the end of the presentations. So our next speaker is Rollis Reisner. Rollis is the chief information officer at McWane Incorporated, where he currently serves as the assistant vice president overseeing legal, health and safety software platforms. McWane is a leading manufacturer of ductile iron pipes, fire hydrants and fittings, one of the world's leading manufacturer of waterwork infrastructure. McWane is also a top producer of ductile iron poles, steel-fabricated tanks, vessels, fire extinguishers and fire suppression systems. With that, I will pass it on to Rollis.

Rollis Reisner: Thank you, Kiran. Thank you for inviting me and volunteering me to present this morning. I look forward to sharing some of the initiatives we have going on at one of our divisions, Tyler Union at McWane. And you did a good job of telling, next slide please, of introducing our company. I'll just add a few items. We are indeed one of the world's largest manufacturers of waterworks infrastructure. We're located in Birmingham, Alabama, and we have facilities around the globe. We have over $2 billion in annual revenue. Most of our melting and manufacturing facilities utilize natural gas-fired copulas.

An entire union in particular in Aniston, Alabama, they manufacture ductile iron fittings for the waterworks industry, and they have over 500 employees. The facility produces a broad range of ductile iron fittings, which connects ductile iron pipes, and are a critical component to our nation's water infrastructure. Unlike Volvo, we won't be writing on any of our products, or inside of our products, but we bring clean water to your home, and we take water away, and we take care of safety and compliance as well. Currently, our facility utilizes a scrap melting cupola, and requires a significant usage of nonrenewable resources, as you would imagine. They emit a variety of air emissions, including greenhouse gases.

The cupola furnace utilizes significant amounts of coke and natural gases fuels to produce molten iron, while the air emissions are controlled by high efficiency fabric baghouses, which you may have seen significant quantities of GHG's are emitted, and this is what indeed has led us to look at electrification. Next slide. I have very few pictures, but this is a picture of a cupola on the right. That's one of our cupolas at Tyler Union. Very large. You can see lots of systems going to power this engine, or this core in order to melt the iron. On the left, you can see this is one of our smaller melting facilities, where the iron is charged in the cupola. And then comes out and then this iron is then taken in either spun into pipe, or is then made into various different molds.

The process uses scrap metal. Our ductile iron products are over 98% recycled content. So we start with a very high bar from our recycling content. We charge the cupola with coke, raw material and other ingredients, that we do call our secret recipe in order to make ductile iron. Next slide. We know the following. Right? We have two projects currently in Aniston. One is a new product line where we are installing an electric metal oven. In doing so, we decided to evaluate changing the natural gas cupola as well. And as many of you know, making the decision in a boardroom is pretty simple. But in theory, it's very complicated in delivery. It's a bit a bit like remodeling a house, rather than starting from scratch. Next slide.

So what does it mean to go from a cupola to induction melting? We had several opportunities here and I'll explain some of our challenges later. But one was, of course gathering some data. So some facts that helped push our decision to convert. In a particular month in 2022, Tyler Union, again in Anniston, Alabama, melted over 4,000 tons of material with afterburner usage of approximately 2,400 MMBtu's. The proposed project would replace the existing cupola furnace with electric induction furnaces, significantly reducing the amount of GHG emissions by eliminating the use of coke and natural gas at a cost of over $18 million a year.

In an example, for scope one emissions, in 2022, we reported from the current cupola operation, over 27,000 metric tons of greenhouse gases with the use of coke contributing around 22,000, and natural gas contributing nearly 5,000 metric tons. Since electric induction furnaces, as you may be aware, do not use coke or afterburners, there'll be a significant reduction in greenhouse gas emissions by nearly 91 percent. So that's a pretty easy case there to make. Right?

Let's look at this on a per scale basis. We look at per ton, when we look at managing and measuring our production. Our current operation in Tyler Union, and it's about 0.47 metric tons, or 1,000 pounds of greenhouse gas emissions per ton of iron that we melt. Whereas if we transition to electric induction furnace, it's remarkable. Our operations would emit an estimated .043, or only 95 pounds. So that's going from 1,036 pounds to 94.8 pounds of greenhouse gas emissions per ton melted.

Now, in doing this, I know you're asking what about scope two and scope three emissions, because adding scope two, of course, emissions when we start electrifying our plant, we estimated Tyler Union's annual scope two emissions in '22 to be around 19,000 metric tons. Now, power consumption would increase to manage the electric induction furnaces, but by eliminating multiple large motors, and other outdated equipment needed for the cupola furnace, the proposed project could offset the power consumption needs for electric induction furnaces, bringing this potentially to a zero increase in scope two emissions. So that's pretty amazing when you really put pen-to-paper, and start figuring this out.

Now, for scope three emissions, we anticipate a significant reduction in raw materials utilized and waste generated, and in the process of reduction in the storage and transportation of these materials. So by eliminating, and significantly reducing raw materials, like coke, limestone, lime, silicon, and oxygen, and enviroblend, which is part of our recipe, there would be a reduction in greenhouse gas emissions at multiple suppliers facilities. So we believe that we've proven there will be a reduction there as well. A lot of this data we pulled together because we asked for a tax credit to help support this, which I'll tell you about shortly.

So looking at a project timeline and cost, Tyler Union an estimated that the project would take about 23 months, and from design to completion in three phases. Phase one, we were looking at six months for project design and engineering. Phase two, placing purchase orders. There's around a 12-month lead right now that we found for electric conduction furnaces. And then phase three would take around four months in order to place all the equipment and bring it into production. Next slide, please.

So how did we look at managing the project from a cost perspective? Right? We looked at the Advanced Energy 48-C Credit Program. I don't know if many of you are familiar this program. We applied for the credit to us to help us fund this conversion. And it's a federal incentive for investments in advanced energy products that a reduced greenhouse gas emissions be – increase domestic production of clean energy products and materials, and lastly, create high quality jobs. The credit is equal to 30 percent of the qualified investment for eligible projects that meet certain requirements.

The requirements are stringent. The program was established by the American Recovery and Reinvestment Act of 2009, and then was recharged this last year with the 10 billion investment under the Inflation Reduction Act of 2022. The Department of Energy and the IRS are responsible for certifying and allocating the credits to the applicants. And the application deadline, in this process, was last year, December 26, 2023, but we are anticipating applications reopening again this year.

Fortunately, after all that work, we crammed together at the end of the year. We did have a successful concept paper that was submitted, and we were invited to apply. But at this time, since we have these two dual projects going on with the new induction furnace, we decided to stall this project, go ahead and put it in the new induction furnace, and then come back afterward. Next slide.

And that brings me to the challenges that we saw, and part of this challenge, as you just heard in us slow rolling this project a bit. Challenges, first, garnering executive support hurdle for the project. The idea is running the cupola is something we've done for 100 years, and it wasn't "the wolf that was eating us now", if you've ever heard of that analogy. The wolf eating is was issues with, you know, coming back from COVID, with maintaining a proper employee base, and making sure that we're trained. It was scrap, right? The last thing we want to do is produce more scrap. I know that we do recycle scrap. But if we're making scrap, then we're not making good product. So those things were hindering our opportunity to move forward with the project.

Time to install, taking a month or more to install the electric induction furnaces, interfering with production, essentially stopping production when we're running full bore right now. And also the cost and time of our team and distractions. Changing the operation mode, this was significant. And this is where we're going to learn more with our new induction furnace right? Shifting from continuous supply, which you may understand from a cupola, we can continuously pour our scrap and our recipe into the cupola and have a continuous flow. This is not true in an induction furnace. You have batch operation. This requires adjusting production planning, logistics, and of course, quality control.

One of the last items is improving the scrap quality. The induction furnace's operation cannot cope with poor scrap grades. That's because of the – the electromagnetic field creates coupling of the of the recipe. And so you have to make sure that your scrap is a lot cleaner and scrubbed before you introduce into the heating process. And then investing in a new technology, which is going to require new team members or a lot of training as well. And it's more capital-intensive. There's more maintenance involved or maintenance costs. However, in the long run, there is a significant savings, but it does take years to return that investment.

And then lastly, challenges for applying 48-C tax credit. Again, if anyone is interested in our process – our procedures and how we would do this, please reach out to me. I would be glad to share. The competition for the funding is intense. And the timeline for us was tight. We only had a few weeks to pull together a lot of data. We had an immense amount of data. But the IRS requires that you distill this down to a very limited few pages, so that they can get through the process quickly.

The applicants have to meet certain eligibility and technical requirements for qualifying the project, such as commercial viability, timely project lines, specific greenhouse gas emission impacts, supply chain growth and resilience. And then workforce and community engagement was really critical. In fact, that's one of the items where they came back to us and said, look, you know, we like your process, we like your application, but we do think we should see you spend a little more time on how this is going to affect workforce and community engagement. And additionally, the applicants must comply with prevailing wage and apprenticeship rules for construction, alteration or repair of eligible property, which we do. That's all I have.

Kiran Thirumaran: Thank you, Rol. A quick reminder to our audience to send in any questions you have to Slido dot-com. The event code to get in would be "DOE". And we'll be answering those questions right after this presentation. So for our final speaker, we have Edwin Willhite. Edwin is employed by Schneider Electric as a regional facility leader. He manages the facility operations for eight facilities in Tennessee, North Carolina and South Carolina. He is a subject matter and supply chain Edison expert for energy within Schneider Electric North America. These responsibilities include supply and demand side energy management, and energy reporting for the organization. Over to you, Edwin.

Edwin Willhite: Thank you. Thank you. Let's just get right into it. A couple of years ago, next slide please, a couple of years ago, Schneider set a very aggressive goal. And the goal said for Operation Scope One and Two, which is what we'll be talking about today, we're going to be carbon neutral by the year 2030. Net Zero ready means that that we will buy offsets to take care of electricity, and we will be out of the gas business in all of our operation by the year 2030. Quite a big goal, a goal that it took a long time to communicate and get buy-in, and we're still getting the ball rolling. It's in all of our sites in North America, over 50 or 60 sites. And as we roll that forward, it's a big elephant. And today, we're going to talk about just one bite of that elephant. If you go to the next slide, please.

We've got a long history with our energy program, which started in the year 2005. We've worked for an energy, a year-over-year energy reduction goal every year since then. We have been great partners, we've had a great partner in the Better Buildings Program with the Department of Energy. And we appreciate that. We're now on our third iteration of goals pledged for the Better Plants. We're excited for that, and we're looking forward to another 20 percent of energy efficiency in the next few years. Next slide, please.

What are we doing, and how are we doing that? Our energy efficiency program, the first thing that we do, and I guess what we're most comfortable with, is energy efficiency. And we're continuing to invest. The easiest, best way to reduce carbon is not to produce it, to not need it. So we're looking and we're investing heavily and continue our energy efficiency program. Electrification is we're transitioning away from the use of fossil fuels, and we are converting those fossil fuels – we're electrifying those processes. And then last, we are sourcing our electricity from renewables. And I think we have further goals down the road to do – to take that even further. Next slide, please.

So what does that mean? Inside our facilities, it means that we've got to eliminate all of our natural gas that operates the facility, that's from HVAC, boilers, hot water heaters, stovetops in our cafeterias, ovens, everything that would have – today, it's uses electricity, we have to convert. We have an electrification go for our processes, which would include paint lines, preheat ovens, cure ovens, our plating processes. And we have the challenge to convert those from natural gas to electricity as well.

It's kind of funny, up until just a couple of years ago, we were still installing gas. When our company made the commitment. It was it was turning the switch, and then we were all in for electrification. Next slide, please. So the step that we're doing today, in our Columbia, South Carolina site, we had an old, old boiler, and part of the boiler, it operated on a cleaning process for our busbar, large pieces of copper, large pieces of copper to conduct electricity in our switchboards. We got rid of the, we got rid of hot water for comfort – for heating of the building five or six years ago, but we didn't have a clean way to get rid of this process.

You can see from the camera, it's a very – from the FLIR camera, it's a very inefficient process. We were leaking heat into the building, lots of humidity in Columbia, South Carolina to make, you know, a tough situation worse, lots of maintenance on an antiquated boiler. And so we made a decision that we were going to eliminate that process, replace it with a very compact, very efficient electric water heating and cleaning process from gen five.

The cost of this equipment is somewhere between 300 and $500,000.00, depending on how you now taking the equipment out and cleaning up the area and that kind of thing. We're expecting it to use less than half the energy of the old process. We get rid of a boiler that was terribly oversized. We put all that equipment at point of use. We put – we freed floor space so that we can hopefully have manufacturing to shorten lead times of electrical equipment, which ought to hit a note with everybody. And for us, it's a win. Again, it's one bite off a big elephant. And so you say, well, what's next? You know, next year in Colombia, we'll be replacing five and six-year-old rooftops with heat pumps.

Next year in Colombia – next page, please. This is the next step of that process. This is the natural gas oven, where those busbars are plated and then the plating is cured. We'll be working on the technology and the process to change that process to electricity. This is going on, and we, you know, at Schneider we have a lot of relatively small facilities, that together, use a lot of energy. So we do a lot of benchmarking with each other. We find that this process works in Colombia, and then we replicate it at several other processes, several other facilities that use a similar process. So again, one step towards our goal of zero carbon. Next slide. Are there questions?

Kiran Thirumaran: All right. Yeah, thanks a lot, Edwin. I think we would move to the question and answer. So if you haven't already, please join us over at Slido dot-com with the event code "DOE" to submit and upvote your questions. So, yeah, so thanks a lot for your questions. We'll try to go through as much as possible within the time we have. So getting right into it. So the first question we have here is: "How much do you expect electric utility demand charges to change as more facilities electrify and it becomes increasingly difficult for utilities to plan and generate the required power?" So has this been a consideration for any of the organizations, an expected increase in the demand charges that could potentially be coming in the coming years?

Dee Spolarics: Yeah, I mean, I think it's hard to answer this question, because I'm not a utility. And I'm sure there have been studies out there. But this is why I think it's really important to make sure that you are in communication with your utility before you start actually making these changes. Right? Because you could be creating a strain that, well, you know, creates a bigger issue. And then that's where I think the demand charges might increase quite a bit. So yeah, just keep that in mind. And your demand might increase depending on your project.

Kiran Thirumaran: Fantastic. Thank you, Dee.

Edwin Willhite: We have regular communication with our utility, if we were a new facility coming in, you know, green out of the ground, everybody kind of knows everything, when you go for permitting, and that kind of thing. If I decide that I want to change 15 air conditioners on a roof, and change gas to electricity, nobody really knows that. And the only way the utility has a way to know is for you to tell them. And if you bring in, have to bring in a bigger service or something like that, inherently, your demand charges are going to go up through the price of the transformer.

Rollis Reisner: Yeah, we have dedicated power on site, and we're we talked to the power company consistently. So they're aware of what we're trying to do.

Kiran Thirumaran: Thank you, Rol. Thank you, Edwin. On a similar note, I think a second question is about when you go for electrification, how do you deal with the perceived risk, perceived increased risk of disruption, right, and your increased reliance on the grid? How do you how do you think about those challenges?

Dee Spolarics: That's definitely a concern for us. Especially, you know, for our heat-treating furnace. Luckily, we have a backup right now, that might eventually be hydrogen, so we could have some sort of non-electric backup. But you know, for really critical processes, it is important to maybe consider a UPS system, or some other backup battery storage, or things like that. But it is a risk. Absolutely.

Rollis Reisner: We have natural gas generators onsite, because the last thing you want is for that electric oven to go off for any period of time.

Kiran Thirumaran: Yeah, thank you, Rol. I think that was one other question that was on a similar note. Was there like a consideration of energy storage, possibly batteries, one for resiliency and also for helping with the demand charges, right? Because you could, you make use of the cheaper energy available if you do have like extra storage, like an energy storage. So it's like battery storage or thermal energy storage been a consideration along with any of these electrification projects?

Dee Spolarics: We do have a, not our site, but a different site has looked at doing large energy storage for peak load shaving, so not necessarily in tandem, but just in general. And that would also give them some extra capacity as well.

Kiran Thirumaran: Yeah, thank you, Dee. So the next question we have is, "Can the speakers comment on the state of their electrical infrastructure? So transformer substation prior to electrification, if upgrades were required, as they were doing electrification projects." And I know, Dee, this is something that you have touched on. And Rol, you might have had had this consideration as well, given your large induction projects.

Rollis Reisner: We did indeed have to upgrade. I didn't include the costs in this project, because we upgraded for the new facility we're putting in. And we just made sure there was enough capacity for converting eventually, but we didn't, so that would not – that would be a good project to go back and see, you know, to what extent it costs to add the additional capacity. But sorry, I don't have an answer.

Edwin Willhite: And we are doing that we're doing studies and every one of our facilities to try to understand what the real impact will be of, you know, if we change gas packs to heat pumps, that have stripped heat back-up, and paint lines, that currently use gas to electric, it's going to affect our consumption. Our electrical infrastructure at some of our plants is old, and we are considering that a part of the project.

Kiran Thirumaran: Yeah, Dee, do you have any additional thoughts on that?

Dee Spolarics: No, I just thought, you know, most of our projects have, that we're looking at are relatively large, right. So they have almost all had to require some level of infrastructure upgrades. So, you know, we recently got a really great one-line diagram, that shows the whole map of the electrical facility. And that helps us understand exactly where our restraints are, and where we might need upgrades. And yes, if a project comes online that needs that extra substation, or whatever equipment, we do incorporate that cost into part of the project.

Kiran Thirumaran: Fantastic. So the next question we have is: "When developing a case for electrification project, how do you estimate – how do I estimate the amount of fuel purchased, consumed, such as natural gas to its GHG equivalent?" So I can take a first stab at it – stab at that question. So we there are GHG inventories, like specific kind of like factors emission, factors available for each of the fuel sources that is available in the US. Those are available from EIA, and bunch of different organizations that you can refer to.

DOE also has tools that has incorporated some of these emission factors by region so you can make use of those tools to find the emissions reduction that is possible from your electrification projects. I do have some of those tools in my concluding slides that

I could quickly share with the participants. Does anyone else wants to chime in on that on how you are going about calculating these emissions from these projects?

Rollis Reisner: Yeah, we just use online tools, tools from you, and then also contacting our power company.

Kiran Thirumaran: All right. So I think then we'll take one more question, and maybe we could combine those. "Has there been any consideration for gas turbine cogeneration, or gas heat pumps? Has those technologies been considered in any of your facilities?"

Dee Spolarics: For us, you know, our eventual goal is net zero. So if we're going to do an investment, we want to try to eliminate the fuel completely. Well, of course, energy efficiency first, right. But if we're going to implement a new technology, we probably aren't gonna go to like a cogeneration for the investment.

Edwin Willhite: What she said.

Kiran Thirumaran: Fantastic. All right. Thank you, everyone. I think we will transition back to the slides. I know there are a couple of questions we weren't able to get to. But definitely like reach out to us with your questions. You can reach out to our speakers as well, to connect offline with some of those questions. So I want to leave folks with the couple of the tools that DOE Better Plants and the Better Buildings Program is developing, specifically around industrial electrification. Right? Next slide, please.

So there are a couple of tools that we already have. We have the measure, which is the energy modeling tool available for you free of – it's all these tools, again, like developed by DOE. So it is paid for from the taxpayer money for you to take advantage of. So it's free and available for you to use. So the first one we have is measures and energy modeling tool. Again, like we spoke a lot about process heating systems, induction furnaces, dryers, ovens. So this tool will help you model the baseline system, and find the baseline energy use and emissions from these systems.

We also have a cost comparison cap model, and Excel-based tool which you could use to go systematically into the different cost components that are – that would contribute to your non-baseline furnace systems, as well as like your electrified options, right, and do kind of like a holistic cost comparison of not just the energy cost, but all the other cost components, including labor, maintenance, and everything that goes into it. So that's the thermal process cost comparison calculator. And the last one we have is electrification or decarbonization tool. This is an online tool, again, you could check it out in the link available, which does the emission factor conversion, right, that that I just spoke about.

So depending on the location, your facility is located in, it will connect to the relevant grid and the relevant grid factors, and give you a comparison of if you do electrify, what would the impact on your emissions for that specific facility would be. So those are some of the tools that we already have. Next slide. But the Better Climate Challenge Program, we continue to develop new tools. So one of the big things, or one of the reports we are working on is the Electrification Assessment Framework, which is a product of a collaborative working group discussion, we've had with our partners last year.

And we are putting together this framework on how do you go about doing a facility-level electrification assessment, right. So kinda like going through all the different topics that our speakers spoke about, kind of like starting with like evaluating electrification infrastructure, identifying projects, implementing identifying projects, how do you go about combating it, and eventually implementing it, right. So the report will go through, kind of like, give you the steps that you could take in order to implement it. Next step. Next slide.

And we are also developing like complementary, supplementary tools that goes along with the framework. Right? So tools for evaluating specific technologies, like heat pumps, like forklifts, what would be the cost savings and emissions reductions that comes with it. So those are tools that we are – that we continue to develop, and we will be like publishing it, and in the coming months. Next slide. So outside of these tools and resources that that are being developed by the Better Plants and the Better Buildings Program, the broader DOE – broader DOE also has a lot of activities going on in the electrification space, from technology development, we have fundamental research, to piloting projects, and kind of like getting it to a point where it could be commercialized. Right?

So I'm just, I'm not – again, I don't have the time to talk about all the different things that are going on in the electrification space within DOE. But I just wanted to highlight a couple of things, right. Again, a lot of these you could follow up with more information available online. The IEDO office within DOE has been putting a lot of like research funding over the last, over the last couple of years, and continue to do so. Right. So one of the funding announcements that was that came out last year is to develop technologies for decarbonizing industrial heat specifically, and with specific interest areas being industrial heat pumps, electrification of industrial heat, and also innovative low and no heat processes. So DOE continues to put in quite a bit of effort in the space to develop new technologies. Next slide.

DOE has also set up the EPICS Institute, Electrified Process for Industries without Carbon Institute. So this is going to be led by Arizona State University, and they are putting together the pieces to kickstart this institute, which will be a collaborative effort with bad manufacturers, and other stakeholders will be able to, will be able to take part as part of the activities of the institute, again, with the holistic goal of developing and implementing electrification projects and electrification technologies and take it to the next level.

On a similar note, we have the – next slide, the industry heat shot, which is, again, a department-wide effort to bring about decarbonization of industrial heat, right. Of course, this would include not just electrification technologies, but also other technologies, like hydrogen and other fuels. But thermal processes is a big, big consideration within this DOE-wide effort to decarbonize industrial heating processes. Next slide.

So this webinar is part of the 2023-2024 Webinar Series. As you can see, we have a great lineup of presentations through March. And you can look at the other webinars that are coming up at our Better Building Solution Center. So the next webinar is going to be on actions for transforming climate action – climate plans into actions, and you could register for it at the Better Building Solutions Center, and get the information on those. So next slide.

So we are pleased to announce registration for the 2024 Better Buildings Better Plant Summit is open. The summit will be in the heart of Washington D.C. from April 2nd to 4th. And in addition to having engaged interactive and engaging sessions, you will have an opportunity to network with your peers as well. You can explore the session tracks and book your accommodations on the Better Building Solution Center. Next slide.

So the Better Climate Challenge Roadshow, the Cleveland edition is here. You can watch it, watch it on the website. So you can – we have the episodes includes DOE energy experts visit several of our Better Buildings and Better Plants partners to see how these organizations are putting decarbonization strategies into action. So we have Cleveland Cliffs, City of Cleveland and Cleveland Clinic are the, are the participants in this roadshow. And you can watch the full series on the Better Building Solution Center. Next slide.

So with that, I would like to thank our panelists very much for their time. Feel free to contact our presenters directly with additional questions. We have our e-mails here. I also encourage you to follow the Better Buildings Initiative on LinkedIn and X for the latest news. You can find all our handles by their respective icons on the left half of the slide. You will receive an e-mail notice when today's recording slides and transcripts are available on the Better Building Solution Center. Thank you, everyone.

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