

Sachin Nimbalkar: Hello, everyone. Good morning. My name is Sachin Nimbalkar, and welcome to 2020 Better Buildings Better Plants Summit, a virtual leadership symposium. Next slide.

Thank you for joining our session. Our session title is PechaKucha on Industrial Energy Management. PechaKucha means chit chat in Japanese language. And so, we are going to do chit chat on industrial energy management today. We have wonderful speakers from five different organizations today. They are joining us, and they are going to share their stories in a very different way. So each speaker will get roughly 400 seconds, so 20 seconds per slide and roughly 20 slides, and all those 20 slides will have mostly images. Okay? So only pictures or images to tell stories on industrial energy management. Okay, next slide.

So before we dive in, there are a few housekeeping points I would like to cover. I have a few notes given to me. So housekeeping point of view – it is very important we follow specific guidelines. Okay. So please note today's session will be recorded and archived on the Better Buildings Solution Center. We will follow up when today's recording and slides are made available. So recording will be uploaded on Better Buildings Solution Center. Next, I think these are in listen only mode, because we want to keep noise level down. We do not want kids singing in the background. Okay? So what it means is your microphones are muted. If you experience any audio or visual issues, please send a message on your chat window. Look at it on the bottom of your Zoom panel. Okay?

And I would like to also begin by thanking my colleagues here, so Leslie Jones, she's actually supporting this session. Then, we also have Marissa Schatz. She's also supporting this session from the background. Also Clifton, Kendall, Eli Levine, Tom Wenning – I really appreciate all your support, and giving us the support today. Okay? So thank you for that.

So my name is Sachin Nimbalkar. I'm a group leader at Oak Ridge National Lab, energy efficiency research and analysis group, and we have 22 research members, almost 22 researchers and technical account managers very passionate about industrial commercial building energy efficiency. We are operating from – I am operating from Knoxville, Tennessee. I am also technical account manager for DOE's Better Plants program. So work with almost 35 different companies, and I provide them technical assistance, energy efficiency point of view baselining, as well as energy performance analysis support. We organize energy assessments, in-plant training at manufacturing companies, and I also provide software-

related technical assistance. So my background is Ph.D. in mechanical engineering, and before joining Oak Ridge National Lab, I was at Rutgers University. The reason I mention that – because even at Rutgers University, I actually worked for DOE's Industrial Assessment Center, operating from Rutgers University. So DOE, we are actually working with manufacturing companies from all different directions: IACs, Better Plants Program, CHP and lots of support available. Next slide.

So here is today's agenda. So as I mentioned, we have five speakers and we have five different stories. And, we are going to tell these stories using only images. So each speaker will actually present on whatever specific topic, five different topics, so 20 images per story, and then for each image or each slide, our speaker will only get 20 seconds. So total time is roughly 400 seconds per story. Okay? As you are aware, there are multiple components to energy management. Energy management is actually a very complex system. There are multiple components. Today, through this PechaKucha session, we are going to focus on most important components, components of energy management.

So we'll start with, for example, engaging employees using effective communication tools. Communication is a very important pillar of energy management. So we'll start with that, then we'll talk about energy performance tracking, and energy efficiency opportunities in water and wastewater systems. So energy performance tracking – that's again second most important component of energy management system. Then General Motors, from General Motors, we'll hear about energy performance contracting, so alternative ways to implement energy efficiency projects, so project implementation point of view. That's going to be important. Topic number four will focus on smart manufacturing and internet of things strategies for improving energy efficiency in manufacturing plants. So we need to – because of not only COVID-19, but in general, I think we need to start using smarter tools, smart dashboards, and internet of things to improve our energy efficiency in different facilities. So we will cover that, and last topic, it's more like ultimate goal. That's our ultimate goal. Our ultimate goal is mature energy management system in your manufacturing facility, and then ISO 50001 certification. We will hear from our speaker on that topic, last speaker on that topic, and we'll have Q&A session at the end. Okay? Next slide.

Okay, now again, this is very important, and I have proper notes, but I'm definitely not going to read my note because Leslie had

done a wonderful job in summarizing what we would like you to do next few seconds. Go to slido.com, www.slido.com, because we are going to use this tool to basically capture your questions and at the same time, we are going to do live polling. So for that, it is very important for you to go to www.slido.com. You can do that on your mobile device, tablet, or on your computer. Okay? So go to www.slido.com. Next slide.

So next step is enter event code BBSUMMIT. Okay? www.slido.com, and then enter code BBSUMMIT. Okay, I hope you are with me. So, so far we have 290 participants. I would like to see all 290 people on www.slido.com. *[laughter]* Okay, next slide.

And then please select PechaKucha on industrial energy management. You'll see there is a few dropdown menu. It is very important for you to select right session. So go to PechaKucha on industrial energy management. As soon as you are there, you will see nice screen, Q&A and polls and everything. So next slide.

And so, once you are in, as you can see on left-hand side, we have Q&A, and then at the same time, we will have a polls tab using this slido.com tool. This app is actually very – it's going to be very useful, helpful because we are going to collect your questions, questions for speakers using this slido.com tool. Okay? And at the same time, so you will be able to add your questions, then at the same time you will be able to upvote questions you think are more important. So you should be able to select what are most important questions you would like speakers to address. So you will be able to do that, and at the same time, you will be able to participate in our interactive polling. Okay? So I hope all of you are already there, so again www.slido.com, and then enter code BBSUMMIT. Once you are in there, select PechaKucha on industrial energy management session. Once you are in there, you will see Q&A and polls right on your screen. So with that, let's go to next slide.

And by the way, social media is very important, right? So as you are keeping track of all other not so useful things on Twitter, please go to Twitter through BBSummit point of view. So BBSummit2020, so we have Twitter feeds, as well as LinkedIn. On LinkedIn, we have Better Building Better Plants LinkedIn pages, so definitely follow along our Better Buildings Better Plants Better Plants Summit through our social media. Okay, next slide.

Okay, so like most important part now. So we have total five speakers, and we have selected wonderful, wonderful speakers

here. So we have Rishabh Bahel from ArcelorMittal. We have Jason Grant from Miami Dade Water & Sewer. We have Paul Hartmeister from General Motors, and then on next slide, we have John Troyer, Schneider Electric, and Tari Emerson of Charter Steel. So let's actually start with our first speaker, and our first PechaKucha. Again, PechaKucha means chit chat in Japanese. 20 slides, 20 images, 20 seconds per image and so all our speakers are going to tell story, their stories on energy management using images and photographs. Okay?

And our fearless leader, our first speaker is Rishabh Bahel. Okay? So Rishabh Bahel received his bachelor's degree in mechanical engineering from Penn State University in 2012, an MBA from Case Western University. He joined ArcelorMittal Cleveland in 2012 as an associate engineer in the optic and maintenance group. He then became project engineer in 2013 and was promoted to energy engineer in 2015, and now he is the manager utilities and energy conversation. In this role, he leads the plants efforts for energy conversation and management. Rishabh is a certified energy manager from Association of Energy Engineers and was awarded Crain's Cleveland 40 Under 40 in 2015. Okay, Rishabh, the floor is yours.

Rishabh Bahel:

Thank you, Sachin, for the great introduction. Hello, everybody. I'm Rishabh Bahel from ArcelorMittal, and I'm here to talk about how ArcelorMittal is engaging employees using effective communication tools to propel our ongoing energy management efforts. So we began by working with our communications team to get employees engaged on the 10 sustainable development outcomes, developed by our corporate responsibility team, in line with the United Nation's sustainability goals. Outcome 6 states our ambition to be a responsible energy user that helps create a lower carbon future. This infographic serves as a great resource for a continuous engagement. With the target in mind of getting employees engaged, we developed an energy management toolbox which clearly highlights good communication and how it helps develop teamwork while also highlighting a strategic partnership with USEPA Energy Star and USDOE Better Plants Program.

Our communication teams use greatest tools to spread the message, namely with our bimonthly 1 magazine and social media channels. We are able to share and promote stories of successful energy projects, and engage employees and stakeholders through their comments, likes, and shares. We started *[audio goes silent]* on this journey in 2000 – *[audio skips ahead]* leadership in taking off ArcelorMittal's USA partnership with EnergyStar. From the

beginning, we have prioritized communication, and this was one of the first articles published to tell employees why we are partnering and what our goal is. From one of that very first articles to this infographic that highlights our top 10 energy projects for one year, we have come a long way. This infographic helps our employees across the US get a snapshot of what energy projects other plants are implementing and how they can possibly replicate the same.

As we all know, no energy management program works unless you have the upper management support. In this snipping, you can see our CEO at the time, Andy Harshaw talking to employees on the importance of energy management, and what roles everyone can play in this journey. Our current CEO, John Brett, echoes the same message. This first step of getting the message out is important, so that one-way communication can evolve into true engagement with employees wanting to get involved. In this picture, you can see a number of employees who went out and identified some low-cost, no-cost energy-savings opportunities as part of our Power of 1 campaign. This campaign empowers our employees to make a difference. In this picture, you can see Bill on the left, and Toni on the right who have emerged as our poster children for BFDs and lighting, respectively. We appreciated their efforts by actually putting them on posters across our sites. It sends the message to other employees that you can do this too.

Toni wanted to go a step further. She collaborated with our communications team to write an article on why she cares about energy conservation, and how other employees can relate to it. We published this article not only on the internet and the magazine, but also on our USA website. When we see our shop low-level employees get engaged, it helps the energy leaders to come together and share these best practices while also discussing about the ongoing energy efforts that are working and what needs to be further improved. This picture is from our America's Energy roundtable of all our American segment energy leaders. This picture is of all our global energy leaders. You will see in these photos, there is teamwork, best practice sharing, and dialogue at every level of our organization. Our communication teams capture the key messages from these meetings and help us share the ideas with the full workforce.

We believe one of the best ways to motivate engagement is to recognize people for their efforts. Our Weirton plant accomplished a great project, and we submitted their project to AISD for the energy achievement award, which they won, and the plant manager came with the entire team to receive the award. When these

recognitions get published, other plants want to work on identifying their own prize-winning projects. Inspired by what they see going on at other plants, our Warren facility volunteered themselves to conduct a treasure hunt in-plant training. Here, you can see the article featuring the entire team engaged in the treasure hunt. Our communication team always wants to work with us to keep the conversation going.

For the Energy Awareness month, we decided to do an energy fair where communication teams created material to get people to attend while generating an excitement for the same. Once new people come to attend these events, they want to learn more about ongoing energy efforts and energy principles. So in conjunction with communications, we developed an energy learning channel where people can learn at their own pace about the energy-savings principle that applied to their work, or simply gets them curious. While they are learning about energy principles, our communication teams continue to spread the message on how partnership with Energy Star and Better Plants are helping us. We like to highlight important days for our partners and use it as an opportunity for continued education and engagement of our people. While we try to keep people engaged, not everyone views energy efficiency as part of the job, and not everyone will take energy courses, so we work to feature at least one energy story or principle in every issue of our magazine. This one shows how we tried to make the principle of power factor fun, accessible, and understandable to all our employees.

At the end of the day, we want to continue highlighting our collaboration with our partners, and also showcase the plant's effort. Last year at this summit, we received the Better Project award, which we not only shared in our magazine, but also proudly published on our website for our external stakeholders to see. This continuous engagement with effective communication is what will enable our employees to embrace the Power of 1. I've taken some liberties with our brand here, but only because I want to say we have been able to use strategic communications to develop true energy superheroes in our workforce who will take our energy program to the next level. With that, thank you.

Sachin Nimbalkar: Thank you so much, Rishabh. That was great. That was great, and by the way, in the background, Leslie Jones and Marissa Schatz, they are doing wonderful job in terms of addressing our participants question. There are a few technical questions from our participants regarding www.slido.com and BBSUMMIT as code, and at the same time there are questions regarding our Zoom call in

information, so Leslie and Marissa, thank you for taking care of those things in the background. I appreciate it. At the same time, all participants, if you are already in slido.com, please start asking questions for our speakers, and at the same time, you can also rate or maybe like specific questions, so that then will ask, will short list those questions for our speakers, and we'll address all those questions in the end.

So our next speaker is Dr. Jason Grant, from Miami Dade Water & Sewer. So Jason is an energy management analyst at the Miami Dade Water & Sewer department. Currently, he manages energy policy and energy-related sustainability initiatives for the Miami Dade Water & Sewer department. He has conducted 250 ASHRAE level 2, 3 industry energy audits at small and medium-sized manufacturing plants, companies, because before joining Miami Dade, Jason worked for USDOE's Industrial Assessment Center at University of Miami. So he also is like me, my background is Industrial Assessment Center. So great. As an adjunct professor lecturer at University of Miami, Dr. Grant teaches facilities operation and management, applied statistics for scientists, and introduction to industrial engineering. He holds a doctorate in Industrial Engineering, specializing in manufacturing and large system energy management from the University of Miami, and he is AAE certified energy management and distributed generation professional. So Jason, thank you for joining us today. The floor is yours.

Jason Grant:

Thank you, Sachin, for that great introduction, and good morning everyone. My name is Jason Grant, and I am with Miami Dade Water & Sewer. I work out of our resilience division as the department's energy manager. Today I will be presenting on energy efficiency opportunities, and water and wastewater treatment systems.

How much information is there in a single drop of water? There's volume, shape, color, odor, translucence, temperature, acidity, viscosity, density, melting point, boiling point, atoms, molecular weight, specific gravity, molecular bonds, polarity, cohesion, adhesion, surface tension, crystal structure. Oh, wow. If one drop of water contains so much information, imagine how much data there is at a large water or wastewater treatment plant. There are myriad systems and processes, including mechanical, biological, chemical, electrical, organic and atmospheric. And don't forget about federal government, public policy, and regulation.

Miami Dade WASD has 2.5 million citizens, 3,000 personnel, 3 water and wastewater plants with an average 600+ million gallons per day, 1,100 pump stations, 6,300 miles of collection system, 94 production wells, 800 million in revenues, and 30 million a year in energy, one-third of the county government consumption. An 11 billion multi-year capital improvement plan – build a new treatment plant or expand existing plants? Ocean outfall legislation now requires deep well injection, consent decree, and pump station improvement program, new fog facilities, alternative biosolids handling, and additional capacity with population growth.

And here comes the rising ocean. Resilience is now basic hygiene for any utility, climate change impacts including sea level rise, saltwater intrusion into the Biscayne aquifer. Future need for desalination, septic tank failures, 50-year plan horizons, and response to hurricane, windstorms, and catastrophic damage. Who, what, when, where, and why energy? All water and wastewater treatment facilities have their own energy profiles. Subsystem energy consumption tracking and analysis requires advanced technology. Miami Dade struggles with knowing exactly the who, what, when, where, and why especially over time as the system dynamically changes.

How about some standards? ISO 50001 is the international standard for organizations committed to addressing their impact, conserving resources, reducing greenhouse gases, and improving the bottom line through efficient energy management. It requires the demonstration that energy performance has been improved. Miami Dade WASD has officially committed to achieving continual improvement of its energy systems including energy efficacy, energy security, energy use, and consumption by maintaining and improving an energy management system that reduces energy use, cost of energy and greenhouse emissions. Continuous process improvement through Deming's Plan Do Check Act management model. It is imperative to define everyone in the organization as a stakeholder with shared ownership of success. A framework for iterative improvement that feeds on real data using the scientific method to reliably produce system improvement.

Projects which have always been ad hoc must now be incorporated into one comprehensive holistic strategy. These projects must now be integrated into one cohesive strategy in policy including administrative input and procedures like procurement standards and technical specifications, contract language, and rating systems. We will soon have the internet of things and every device will be

connected via the internet or other control systems like SCADA. Which devices do we connect, monitor, record, track, analyze? How do we manage this integration to achieve optimization improvements throughout the system especially in operations and energy efficiency management?

Big data is also overwhelming and can be as useless as no data. Critical data must first be accurately acquired and stored. It must be reliable and secure, and made readily available to all personnel capable of making use of it. Data must be compartmentalized and prioritized for effective and practical modeling and analysis. Dashboards are great for real-time snapshots of current system state. They do not provide historical benchmarking, analysis, forecasting, etcetera. Miami Dade WASD installed 200 smart meters, and so far, we can only monitor them in real time. The analytical data analysis component has yet to be implemented. Advanced distribution distributed generation includes renewable sources of energy and storage, newly advanced control software, hardware, and communication protocols, increased system reliability, avoiding the oversizing assistant components from generation through transmission to distribution and deregulated markets.

There is no silver bullet. Advanced energy efficiency gains will require comprehensive strategies that include the adoption of renewables, water and wastewater treatment, biogas coupled with cogeneration of the renewables play a significant role towards a net zero energy. In South Florida, there is now an opportunity for solar and energy storage. On a macro scale, the integrated water cycle is complex, and includes all aspects of water and water management throughout a municipal ecosphere. While the amount of data at this level is daunting, there are endless opportunities for energy efficiency gain. Better policy at this level leads to efficient water and wastewater treatment.

There exist many impediments to implementing sound energy projects including federal, state, and local regulation, bureaucracy and policy. These challenges must be addressed directly through a methodical and persistent approach to affect good energy policy as part of long-term, organizational strategic planning.

Finally, thank you USDOE Better Buildings. Our current Better Plants partnership as well as our previous accelerator programs have had a meaningful impact on helping Miami Dade WASD drive energy savings initiatives towards improving our overall energy intensity profile. Thank you.

Leslie Jones: Sachin, you're on mute.

Sachin Nimbalkar: That's me, always. So thank you, Leslie. First of all, Jason, thank you so much for telling us that wonderful story, images, photographs. We're right on target. Thank you so much. By the way, please use slido.com for asking specific questions for our speakers. Okay? At the same time, continue liking specific questions in there. If you like specific questions, just hit thumbs up or down, and then what will happen is we will have more and more questions, like more leading questions or good questions, they will actually come up. Right? So we would like to ask a few questions to all our speakers in the end.

So our next speaker is Mr. Paul Hartmeister from General Motors Company. I actually called Paul more like a go-getter, or getting things done Paul. Okay? So a bit of plants point of view, I communicate with Paul on a monthly basis. General Motors, I would like to mention that almost all of their US facilities are 50001 Ready, DOE 50001 Ready recognized. Great work. Okay?

So Paul is an energy sustainment manager for General Motors. He oversees energy management practices at 11 manufacturing sites in North America. He is responsible for energy and water reduction projects, 50001 Ready implementation, and other activities to reduce General Motors carbon footprint and energy consumption. His sites include over 50 million square feet of manufacturing floor space, 50 million square feet. Can you imagine that? 150,000 tons of sheer water capacity, and 310,000 CFM of compressed air capacity. So a lot of responsibility here. He has had oversight on over 33 million dollars of energy-saving projects, saving over 460,000 megawatts of energy in the last five years. We have multiple facilities, almost 30 – 35 facilities in the US, and all of them are part of Better Plants program. And so, Paul is doing a wonderful job in reducing energy use, reducing energy intensity, and then compressed air consumption in all these facilities. Paul, the floor is yours. Go for it.

Paul Hartmeister: Thank you, Sachin. Today, we're going to go through the energy performance contracting process that we started using at General Motors in 2011. We will show the steps that we took to make our process successful, and discuss some specific projects, and show our next steps and beyond.

Previously, energy projects were funded using an internal budget that required projects have a two-year payback minimum

requirement. The work had to be done within the year the project was commissioned, and projects generally had to be less than a million dollars. With the new EPC system, we have the ability to extend paybacks and have more flexibility when choosing projects. When developing an EPC, approvals are required from leadership, finance, and legal teams as a system of checks and balances. When you consider using an EPC in your organization, it is a great idea to involve these groups early on in the discussion. This helps the process move along with less rework at the end.

With the appropriate approvals in place, project managers need to select an energy service company to conduct the project. This takes the form of a bidding process, where General Motors evaluates offers from the ESCOs and then selects a partner to use on a variety of projects across assembly, transmission, engine stamping, and nonmanufacturing sites. GM pursued lighting projects first because they have low payback periods and are easy to install and maintain, and the savings are easily measured. Pictured is a completed lighting project at an engine plant that was observed during a recent energy treasure hunt.

One of the first EPC projects that we took on was a lighting upgrade at our Marion stamping plant in 2013. The project included LEDs in the press area, and T8 fluorescents in the assembly and shipping areas. This project was very successful and is being upgraded to change the T8s to linear LEDs later this year. The project reduced the plant electrical energy demand by 1200 KW. The global tech center and Milford Proving Grounds underwent site-wide retrofits from T8s to LEDs having about 65,000 and 22,000 fixtures retrofitted respectively, providing over 24 million KWH of energy savings at the two sites.

The beginning to many EPC projects starts with the energy treasure hunts and plant sufficiency planning, where opportunities are identified, ideas are developed and pulled together into a completed project that has several energy conservation measures. Once the project is formed, the ESCO bidding process begins. The performance is signed, and the project gets underway. As lighting progressed from HIDs to T8s, projects were completed, and then redone as LEDs became more reliable and cost-effective. With lighting addressed across the company, a move to more complex projects was needed, and the measurement and verification had deeper scrutiny.

One of the first non-lighting projects was a steam elimination project at our Bay City, Michigan plant. Here, old steam boilers

were replaced largely with Cambridge units and unit heaters throughout the plant. Other steam users were replaced or eliminated based on the continued need. The overall project was a success and paved the way for other similarly complex projects to follow. Saginaw performed an EPC in part to install a leased compressed air building. The new building provides over the fence compressed air and was able to eliminate the use of the existing powerhouse. The new compressor plant is more efficient and located closer to the plant.

One of the conservation measures taken for Flint engines EPC was chiller optimization. The system was converted from primary/secondary to variable primary, got updated controls, and got VFDs on its cooling tower fans. To date, over 60 million dollars of work has been completed with 20 million currently in process. Our current plan is to get over 81 million more out of the planning and into construction in the next few months. Working with a trusted team leads to success, increased savings, and reduced carbon footprint.

One of the projects we hope to launch shortly is our Fort Wayne assembly steam elimination project. It would remove all active steam from the site, use waste heat from our on-site generators to provide heat for the plant in the winter, and drive absorption chillers in the summer, and replace all other steam users with direct-fired natural gas units. At our Bowling Green assembly plant, we are pursuing compressed air and chiller plant upgrades to better align our needs, to provide more efficient and properly sized equipment, and to continue to bring the world class Corvette to customers across the globe.

Expansion to Mexico and Canada is the next step that we are working on. We have selected a partner to work with us in Mexico and are currently working to identify a partner to handle the work at our sites in Canada. We should be able to get underway in Mexico shortly and Canada should follow in the second half of 2020. We are currently exploring water performance contracts at several sites that would allow us to take our waste stream and clean it up for reuse back into the process. We are looking at both point of use as well as end of pipe recycling. This will help us reduce cost as well as make fresh city water available for others in the communities in which we operate. Entering into an EPC needs to benefit our partners. These benefits come in the form of a good meaningful work for their employees, keeping their staffs together over the length of the contract, and providing steady income for the term of the contract. At GM, we have partners who excel in a

variety of disciplines, and at times work together to provide a more affordable project for all involved.

The EPC process has benefits for General Motors as well. It allows us to use our cash for further product development, and still get the energy savings associated with the EPC. Since it pays our partners out of the savings, it allows us to get the project done, and stay cash positive throughout the process. The EPC term of five years means that all of the savings revert to us after the contract is paid off, but the savings keep coming. What lies ahead, only time will tell for sure, but expansion of the process to China, Korea, South America are very possible. The continued savings will also help us bring the electrification of the automobile closer to reality for all of us. This electric future will work toward a cleaner, sustainable future for generations to come. Thank you.

Sachin Nimbalkar: Thank you so much, Paul, and it seems we have a number of questions for you. So in fact, for all our speakers so far, Rishabh, Jason, and Paul, we have multiple questions in slido.com. So you may want to start reviewing some of those questions. A lot of our participants are going to – basically, they are challenging you. Okay? They are trying to get you. Definitely, review those questions. Get ready. *[laughter]*

So our next speaker is Mr. John Troyer with Schneider Electric. John began working at Schneider Electric in 1994 and served in various roles in manufacturing plant. He has been in facilities management for over 15 years, including 7 years as a regional facilities manager. John is a certified practitioner in energy management systems, SEP, Superior Energy Performance verified, so SEP Performance verified, certified energy manager, and certified demand side manager. He has been involved in over 30 energy assessments and has served as a subject matter expert for energy on his FM team for 13 years. He has also been involved in ISO 50001 SCP certifications for multiple sites. Over 20 sites are actually ISO 50001 certified, Schneider Electric sites. John is a graduate of Purdue University with bachelor's degree in electrical engineering technology. John, please go ahead. Thank you.

John Troyer: Thanks for the great introduction. Good morning, everyone. I am a part of a great facilities and energy team for Schneider Electric in North America. I would like to discuss smart factories, internet of things, IoT, industrial internet of things, IIoT, and their impact on energy efficiency. The IoT has about 10 to 20 billion connected devices depending on who you listen to. Information is great, but what value comes from driving actionable items? There are four

basic categories in the big data analytics framework: descriptive, diagnostic, predictive, and prescriptive. Recognize you can't manage what you don't measure. Metering is an essential building block as are building management systems. We've been using some form of these for many years, starting with basic inputs and outputs, with each generation getting smarter. My colleague, Ed Willhite, calls these treadmills in the basement. If you don't use them, they don't do any good.

We look at three levels of architecture: connected products, edge control, and apps, analytics, and services. These work together with backward compatible meter interfaces to deliver value. We're using this to identify excess energy consumption issues, and push data to production to show their process, energy performance. We added supply side management in a central repository for all procurement recommendations, activities, market analyses, utility invoice data and invoices. It also includes a performance analytics module which adds more instrumentation to the energy champion's toolkit. We've been a Save Energy Now Better Buildings Better Plants partner for about 11 years, starting about the same time we pursued ISO 50001, then SEP. Today we have 27 50001 sites and 19 SEP sites in North America. The commitments align well with company goals and they help to add structure.

Along our journey, we added more branch meters and increased granularity. We can use advanced metering interfaces on molding and paint processes. We look at energy consumption as a function of hangar, loading density, and metal type. We can also see what portions of the process use the most energy and when they use it. That brings us to smart LED lighting. Notice what's not in the picture – light fixtures. 20 years ago lighting accounted for about 20 percent of our typical site's energy consumption. LEDs opened up new possibilities for dimming. In the installation represented, each fixture has a sensor. They all communicate on a platform and enable over 80 percent savings compared to T8 fixtures. About 1,000 fixtures are depicted here. Their dimming can be customized independently. Notice the heat map drilled down to weeknights from midnight to 6:00 A.M. shows activity levels. I'll talk in a few minutes about how smart manufacturing can help energy managers, but how can the information shown here help manufacturing?

Analytics for buildings are used to identify potential issues. Here, they are broken down into three categories. Energy, maintenance, and comfort. This tool prioritizes them by opportunity and recommends actions to be taken. Actions can be assigned to a

technician and tracked to completion. We've been modeling energy with linear regression for about 15 years. Taking that a step further, a daily model is implemented, utilizing data that can be gathered automatically. This can provide feedback to building operators and energy managers. For those who want to dig deeper, each day shows model versus actual, confidence band manufacturing and weather information. Sensor level monitoring of assets can issue predictive analysis to allow users time to act before a failure occurs. For example, heat sensors feed into the system and are watched for characteristic changes signaling a possible issue to be acted upon before it can impact production.

Augmented interfaces offer advanced troubleshooting for operators and maintenance personnel. The inside of a control cabinet can be viewed without opening the enclosure, facilitating NFPA70E compliance. It guides operators and maintenance workers in real time and minimizes errors. Again, can we predict failures before they happen? Here is more about augmented reality, and it gets better as we go. On the left is an exploded view of an electrical cabinet with an overlaid interactive menu. On the right, notice the animated hand guiding the technician through the steps needed for the task to be completed. More help on the industrial side, IIoT. RFID advanced HMIs and other tools are used on the production floor to make processes more lean. In one plant, 128 miles a day fork truck traffic was eliminated, and capacity was increased, and a million dollars of down time was eliminated.

Here are some examples of visitor experiences. These stops along a guided tour route demonstrate how we utilize connected devices and the tools mentioned previously. Group tours are routinely made to demonstrate live use of these tools at smart factory sites. So how do all these productivity tools and improvement save energy? If equipment downtime and disruptions are minimized, so is what I call bad overtime. This picture is what you don't want to see if you're an energy manager, i.e. five people running a plant on a Sunday. The building's baseload is still on with minimal output.

Looking into demonstrated impacts. Here's some examples across different companies from utilizing just one analytics tool for building's controls. I'll pause for a few seconds and let that soak in. Machine learning, AI, big data, cloud computing, IoT analytics – where could it all lead? Perhaps when an employee leaves a workstation, we could pause process, dim the lights, shut off compressed air, notify a supervisor, and realign resources, or map employees look at weather and production forecast for the day and plan the energy strategy. Finally, don't forget the basics. At the end

of the day, it all stands on the basic building blocks. Here we see a picture taken during one of the in-plant training sessions we hosted. Continue to get in the dirt, as my manager, Dennis, says. Keep digging.

Sachin Nimbalkar: Great. That was great. Thank you so much, John. In fact, I was also there during that in-plant training. You are 100 percent right. The most important part of energy management, of course, identifying projects and savings money.

Okay, so our last but not least, our last speaker is Tari Emerson of Charter Steel. So Tari has more than 30 years of experience in the industrial and retail market sectors on energy management, generation procurement, and efficiency strategies. She has a broad range of experience from working on efficiency and process improvements in coal-fired power plants, managing energy at a steel mill, to managing a 50-megawatt solar program. Tari has managed energy efficiency energy projects and programs at several industrial companies, including an electric utility, printing company, and a fully integrated steel mill. In addition, she worked for a big box retailer managing utilities, sustainability, and energy efficiency for all 1000 buildings located in 49 states. Her achievements include developing an award-winning energy efficiency program with consistent year over year energy savings and leading the first steel mill in the US ISO 50001 certification. Great. Tari, go for it.

Tari Emerson: I would like to wrap up this session with a summary of how Charter Steel has integrated all of the concepts discussed by my fellow presenters into an energy management system to provide a framework for a sustainable program. Almost five years ago, Charter Steel decided to develop an energy management system. The benefit of an energy management system is that anyone can be an energy superhero if you follow a system. My philosophy on energy savings and cost reduction programs is that the cheapest energy is the energy you don't use. So why are we concerned about energy? Energy costs depend on how much energy you use, and your electric rate, or cost per kilowatt hour. There are actions you can take to reduce your cost for both usage and the rate. At Charter Steel, our utility costs represent 16 percent of our variable manufacturing costs.

Unlike scrap and other index commodities, we cover the cost of any variability of utilities, and we don't pass this along. So price and usage certainty are important to reduce this slice of the pie. When we started the energy department, we needed buy-in and

support from the beginning. So we wanted to make sure we had some fast and early wins. I'm here to tell you there's no silver bullet to solving energy efficiency puzzle, but that you can reduce costs utilizing many different tools. For Charter Steel, we had an existing culture of continuous improvement and working in teams. So we continued with what had worked well in the past. One of the first steps in developing an energy management system is the measurement and monitoring of energy use. When we started to evaluate the data, it was clear that many of the natural gas and electric submeters had not been reading accurately for years. Without correct data, it was a challenge to establish a baseline.

One of the best ways to gain support from upper management is to develop allies in finance. They will be able to provide support for your ROI projects and see the value in cost saving efforts. The director of finance is a member of the enterprise energy team at Charter Steel. When we started our system, we didn't want to spend money on consultants, so we took advantage of low-cost or no-cost programs like our state energy program, Focus on Energy, and also Better Plants program through the Department of Energy. The technical account manager provides information about their tools, programs, and opportunities. We have hosted several successful in-plant events in Wisconsin and Ohio with attendees from all different departments. Better Plants brought in experts in heat transfer, fan efficiency, and energy treasure hunts. Through these training events, we learned how to use the Department of Energy's online tools.

In the past four years, we have received over 850,000 dollars in funding from utilities and state agencies for energy efficiency improvement projects and assistance in developing an energy management system. These programs were instrumental in assisting Charter Steel to be the first steel mill in the United States to certify our system to the ISO 50001 standard. We belong to trade associations in Ohio and Wisconsin which are very helpful in navigating the political arena in each specific state. They provide opportunities to make your voice heard in rate cases and legislative changes. When I started the energy department, we put together a five-year road map of where we wanted to be to make sure that management had the same sense of urgency. In the past, Charter Steel had conducted standalone energy audits, but there wasn't any ownership to implementing results.

As we prepared for ISO 50001, we used the Better Plants 50001 Ready tool as a checklist prior to internal audits. It helped to point out weak links and gaps within our system that we were able to

correct before the audits. Charter Steel has been very familiar with developing a system to a standard and auditing to the standard. We have certifications in environmental, quality, and safety standards. For this reason, we decided to develop an energy management system to the ISO 50001 standard with a third-party registrar.

In order to have a successful energy management system, you must involve all employees. There's no way that a small energy department can manage, monitor, and implement energy efficiency without help from the rest of the plant. We needed to check how well employees were understanding and receiving information and energy awareness, so we conducted a survey of employees. It was surprising how well employees connected with what they did every day to saving energy, but most people were not aware of our energy goal. In 2017, Charter Steel received the Better Plants award, and the Industrial Energy Technology Conference award in Energy Efficiency and Environmental Stewardship. We completed our energy management system and ISO 50001 certification in Wisconsin along with the Better Plants 50001 Ready certification. In 2018, we established the first internal energy awards to Charter Steel employees. In addition, Katie Dimmer, our energy engineer, was awarded the Association of Energy Engineers Young Professional of the Year award. We completed ISO 50001 certification at our Fostoria, Ohio plant.

Charter Steel's next steps include ISO 50001 certification at our Cleveland plant, completing energy dashboards at three locations with information on energy use and cost. We are fine tuning energy improvements for new projects that we have, including a scrap preheat at our Saukville facility and new production line in Cleveland. These are the steps that Charter Steel used in developing a successful energy management system: support from upper management, measuring your energy use, utilizing low cost resources, having a direction, and long-term vision, setting goals, engaging your employees in energy efficiency and awareness, and making sure you celebrate your successes.

Sachin Nimbalkar:

Great. Thank you so much, Tari. That was wonderful, and also thank you for all showing that image. I think Rishabh started with Superman and you ended with Captain America. So thank you for that. Leslie and Marissa, thank you so much, in the background, providing all the support. So now I think next step is Q&A. Leslie, are we going for Q&A, or are we going for poll first?

Leslie Jones: Let's do the polls first because then that'll give the speakers just a few seconds to read through all the questions that came in because there are a lot.

Sachin Nimbalkar: Yes, yes, exactly. Thank you. Thank you, Leslie. So all participants, please look at the questions, whatever questions we already have. Start liking some of those questions, whatever questions you like. If you do that, then topmost questions will pop up all the way up. Okay? So definitely help us in prioritizing questions because we don't have a lot of time to cover all the questions. Now, let's go for active poll. So question is what mechanisms is your organization using to communicate energy-related events or achievements to external audiences? So, so far we have 17 responses. Again, go to slido.com, use BBSUMMIT code, and you will be able to then participate in this active poll, and at the same time, you'll be able to rate best questions. That way we'll address topmost questions during Q&A. Right now, active poll, our question is what mechanisms is your organization using to communicate energy-related events or achievements to external audiences? So definitely share your answer. So far 57. Let's give a few more seconds. We have 300 participants. Come on. We have 300 participants. We need at least 100 responses here.

Leslie Jones: It's coming in fast.

Sachin Nimbalkar: Yes, we have 74. Wonderful. 74 so far. Come on, 75. We need 100. *[laughter]* So website, presentations, corporate responsibility, website, press releases, meetings and emails, biweekly newsletters. Wonderful, great. So we have so far 80 responses. Okay, I think that's good. That's good. Continue, maybe next question. Leslie, thank you for keeping us on track.

If you are a manufacturer, are you interested in 50001 certification? Wow, this looks good. It's actually live results. We are seeing live results. It's almost like election day. If you are a manufacturer, are you interested in pursuing 50001 certification? 62 responses so far. 68. Very good. Not applicable. 30 percent are saying not applicable. Come on, manufacturers, we need more responses from you. So if you are a manufacturer, are you interested in pursuing 50001 certification? Absolutely, there are 22 percent people saying absolutely. Then 22 percent saying not at this time. There you go. Absolutely is winning, 24 percent. I like this. Okay, 100. This is good. Okay, maybe let's wait –

Leslie Jones: All right.

Sachin Nimbalkar: Let's actually wait for a few more seconds, because I think this is an important question. 300 participants. Come on. Okay, 5, 4, 3, 2, 1. Next question.

Leslie Jones: All right.

Sachin Nimbalkar: What big data challenges are you currently struggling with, and what approach have you taken, if any? I think this question is probably from Jason, right? So this question is from Jason. What big data challenges are you currently struggling with? And what approach have you taken? So sufficient metering, cybersecurity is a big issue definitely. Only two responses so far. Five responses, okay. Acquiring interval data, cybersecurity is popping up on the top, setting up alarms, connectivity, sufficient submetering, reliability, okay. SCADA, data gathering, data reliability, storage, internal know how, trying to decide on a uniform platform to use, lack of submetering. Okay, what big data challenges are you currently struggling with? What approach have you taken? 66 – 67 responses so far. We'll actually wait until 100 and then we'll go to next question. 71, all right. Updating IT infrastructure, metering accurate data. Okay, I think let's go for next question.

Leslie Jones: Okay.

Sachin Nimbalkar: Okay, this one is easy. Are you implementing smart manufacturing and IoT solutions for improving the energy performance of your facilities? So again, focus is on energy performance here, right? Energy productivity, energy consumption, or productivity improvement, right? So smart manufacturing and IoT solutions for improving energy productivity, energy performance, or productivity of your facilities? 32 percent respondents are saying yes. So far, we have 81. This is really I think favorite question so far. 87 – 88 people responding. They are saying yes. Not at the moment, but we are looking into it. Third is does not apply. So yes, 30 percent, not at the moment, 27 percent. 92 responses so far. Let's hit 100. 94, 96, 99. One more. So 33 –

Leslie Jones: Then deliberately hover there.

Sachin Nimbalkar: There you go. Okay, next question. Okay, what major challenges do you face when using energy performance contracting to fund energy projects? What major challenges do you face when you are using energy performance contracting? Alternative financing mechanism, SCOs, when you're working with SCOs to fund energy projects? Cost benefit analysis, M&V is big problem. Cost benefit analysis, legal issues, internal finance, CFO approval,

payback period, distrust. Interesting. Complicated contracts, M&V, legal issues, third party verification, less transparent, not sure. Okay, complicated contracts, finding good suppliers, finance approvals. Wonderful, these are great answers. Looking into now. Have leadership – don't use EPCs mechanism, okay. Interest rates. Okay, I think that's good. Okay, next one.

Leslie Jones: So that's actually it for the poll questions.

Sachin Nimbalkar: Okay, wonderful. I think then we – now we are – we'll move to Q&A, right, Leslie?

Leslie Jones: Yes.

Sachin Nimbalkar: Yes. All right, so we have top five questions so far. So first question is for Rishabh. How to get support from the upper management for using the communications team, or communications mechanisms for internal and external communications, that buy-in part? Rishabh, go for it.

Rishabh Bahel: Yeah, and I responded online too, but this was one interesting question, because luckily, we never had this issue. We never ran into this problem. Again, the thing is when you're getting communications involved, you cannot pull someone to come work with you. Luckily, we have one of the best communications department available to us who are actually interested in learning more about energy and are passionate about the same topic. So it just makes our job that much easier to get them involved.

Right from the beginning, when we started the energy program, our top management recognized that communications was very, very important to keep this message going. That was one of the easiest things for us to get done was to get communications to work with us. You know how you work with additional departments and how you bring them together, once that number comes around, it shows that – because again, many people showed they write sustainability reports, they have integrated reports. Well, when your communications and corporate responsibility people are writing those reports, they do need those energy stories, right? So when – if your organization is valuing energy stories and the stuff in those reports, they will want to work with the energy team.

So when you guys do your own energy team meetings, do invite those people in your meeting too. Whenever I do an energy team meeting, our communications rep is always there, and she's very interested in learning more about it. So once you get their active

participation, it just makes it that much easier for you to sell that to upper management.

Sachin Nimbalkar: Wonderful. Thank you, Rishabh. Thank you for that answer. Next question is for John Troyer, Schneider Electric. So what kind of software are you using for data collection, analysis, and visualization? I think energy dashboard, point of view energy performance indicators point of view. What software are you using for that, John?

John Troyer: Okay, most of what we use for on the energy side is going to be the Schneider Electric EcoStruxure branded item, so things like Power Monitoring Expert, Asset Advisor, Resource Advisor. We also use Building Advisor. Some other things that maybe on the manufacturing side, AVEVA, and I don't know much about that, but those are some of the things I touched on earlier that the manufacturing folks use, but we get some fringe benefits from on the energy side also. Digital Lumens LightRules for the advanced lighting controls that I showed earlier, and lots of things that I didn't mention too. So Ecostruxure has a whole suite of things involved that I didn't necessarily touch on. So.

Sachin Nimbalkar: Right, right. That's great. Thank you, John. I think let's actually go for a question for Jason. What is keeping you from implementing energy data analysis features of your submetering?

Jason Grant: Yeah, that's a good question. I mentioned that in my presentation. We do a lot of energy analysis using our utility billing management software, EnergyCAP, and our SCADA system. We just recently finished putting in all of our submeters, and have them connected to our network as well, and the question is how do we integrate that data analysis through either the network or through our data, or SCADA system? There's some cybersecurity issues there too that need to be ironed out. Also which vendor are you going to use to do all that kind of stuff? General government bureaucracy, just trying to get through that stuff to figure out the best way to make use of that data. Lastly, it's a lot of data, so you've got to strategically decide how are you going to use that data, what data are you going to use, what are you going to mirror it against, as far as your systems, and then integrating that into whatever you're monitoring through your process, your chemical or your biological process and stuff like that. We're on a track to do that. We're working with the Better Plants partnership and creating structures to be able to – to have that approach, and we should have that within the next 6 to 12 months.

Sachin Nimbalkar: Great, great. I think next question – thank you, Jason. I think next question is for Paul Hartmeister. Have the GM leadership warm up to the relatively longer paybacks that are typical to energy performance contracts?

Paul Hartmeister: Yeah, Sachin. I'd say the answer is in general, yes. We do have a lot of discussion with the financial people in the plants. We work through any issues that they have, but basically, we are limited to a 5-year EPC. So these projects are done with a 5-year complete payback, and bottom line, we've got savings. We've got energy savings to the start of that process to the end of that process and then beyond. That energy savings all comes back to General Motors at the end of the fifth year, but they've warmed up to it, and it is, as I said in the presentation, it is a way for us to conserve cash on the corporate side for product development and that's a big thing in the business. I would say as a general rule, most of the folks in leadership have warmed up to the process, and as we do more and more, we bring more people into the fold to understand that it's a great way to accomplish this stuff going forward.

Sachin Nimbalkar: Thank you, Paul. I think I would like to ask at least one question here for Tari, because there's a lot of questions for Tari, maybe I'm going to select one. So I think there are a couple of questions on employee survey, Tari. So what were your goals with the employee survey? What questions did you ask, and how did you use the results to improve your energy program?

Tari Emerson: So part of ISO 50001 is making sure that your – there is an awareness within your employees of your program, your goals, how their job impacts energy use, making sure that everybody out on the floor has an understanding of what they do every day can have an impact on energy use. So what we did was we put together – I think there were maybe five questions on energy, energy efficiency, Charter Steel's program, and our goal. We implemented this in a couple of different ways. One was we did questions just paper questionnaire in our break rooms, very low tech, but we did promise if they filled one of these out, they were in a drawing for a gift card. So put your name in for a gift card if you filled one of these surveys out. Then we had pretty good participation from that. People are always motivated by a gift card to Cabela's, or wherever. Then we were able to determine how – what people were understanding.

There was a lot of understanding. We were thrilled people were aware we had an energy program, and a system in place. Had a pretty good understanding of how their job impacted energy use,

but then when we asked – what's the energy saving goal for Charter Steel, people really didn't have a clue. So it helped us then target our communication to the plant personnel in areas where we thought they maybe needed a little more information.

Sachin Nimbalkar: Great. Thank you. Thank you, Tari. I think for this specific situation, COVID-19 situation, there is actually one question, I would like to ask that question, and please feel free. Although this question is for Paul, other speakers if you would like to also jump in, please feel free. So this question is for Paul. How is the SCO arrangement, SCO or EPC arrangement influenced with situations like COVID-19, especially in regard to SCO returns? Not only SCO, but even other contractors. If you are working with contractors to implement energy projects, are you finding it now challenging because of COVID-19 situation?

Paul Hartmeister: The answer, I guess, the short answer to that, Sachin, is it presented – the COVID-19 presented challenges for our energy performance contracts as well as the complete industry and across the nation, obviously. We basically shut down the EPCs, the work, the contracting work ceased when we closed our facilities. Our facilities were shut down from I'm going to say – I can't remember the date exactly, but mid-March, and they started coming back in mid-May, and they were staggered as they started back. Some were actually started here in the month of June. While we held all those things back, we just shut everything down. The comeback now is there's new safety requirements. There's new requirements to get into the facilities, for all visitors. That includes contractors.

So yeah, it has had an impact. We have not seen – to date, I have not seen any negative impact other than the delay of the process, and we will – the invoicing is just going to move out a couple – two or three months depending upon when we can get back into the facilities and start to work. Depending upon the location and the area of the country, we have seen more disruption in certain areas, and less disruption in other areas based upon how the governors and the local folks in politics basically turned off states or turned off cities. If we operate in those areas, we were affected by those rules. So that's the answer that I would have. There's always an impact and it impacted each of us personally, but it also just put a delay on all of our work.

Leslie Jones: Sachin, I think we lost you.

Sachin Nimbalkar: Okay, how about now?

Leslie Jones: You're good.

Sachin Nimbalkar: Okay [*laughter*]. Now there are almost three questions right in front of me for Rishabh. Okay, so I'm just going to create one question, and then Rishabh, then you can answer that. So I think the first two questions regarding communications are actually related to budget, your annual budget. Like some dedicated solely to energy awareness, communication point of view, or what's your annual budget for the energy awareness communication program? Of course, you don't need to answer dollar values, specific hours, but in general please address that question. Then there's also one more short question. What is the magazine you do energy articles in, and how often does it circulate?

Rishabh Bahel: I think Summer is helping me with some of these answers. She answered the magazine for the energy articles, that's our employee magazine called 1 Internet. There's a link on this if you go on slide to access that. Thank you, Summer, for doing that. The other questions about a person delegated and the cost and things. We do not really have an annual budget just for energy in any way or form or shape. It's just that we rely on shared resources, and it's all about creating these partnerships. We have a good partnership with our corporate responsibility, our communications, our government relations. So when all three of us, actually four of us come together, we are able to share those resources, and they are willing to give that helping hand to keep this thing propelled.

As you know, the title of my presentation was Using Effective Communication Tools to Propel our Energy Management. So what these guys are helping us with this propelling management effort, and when they are doing that through the communication's side, be it the magazine, be it the social media, this is – just becomes part of what they are doing in terms of communication. It's just another component that they add to the message they are sending on behalf of ArcelorMittal. So when we are talking about all the things ArcelorMittal is doing, energy is one of the most important part as well, that communication highlights in their message they are sending across.

So we don't really say that okay, one person just work on energy. It's just that all of the people in communication do want to work with you, but we have a continuous relationship with communications and corporate responsibility who keeps this message out. As I mentioned in one of my slides too, that in every magazine, we do have one article or story about energy, because we want to keep the conversation active. We want to ensure people

just don't have to wait until October when it's the national energy awareness month to see something about energy. It's every time things are happening, we are sending this out. Every time the energy team is doing something big in terms of energy site, they like to publish that message out on Twitter or any of the social media stuff. As you can see in those articles, when we won the Better Project award and things, we like to showcase the good things we are doing.

Sachin Nimbalkar: Wonderful, Rishabh, thank you. So there is one question for Schneider Electric, John. There's one question for you. How do you get operations leadership to support funding utility meters when they are considered non-cost saving cap expenditures? So metering, submetering point of view, how you get buy-in from operations leadership to get those expensive meters, submeters? Yeah.

John Troyer: So we have a long history. I'll go back. We've had meters that have been networked for close to 25 years now. We have some of those very old meters still in existence. We just keep adding to the network. We have a – it's a little bit easier, I guess, for us, because we have a demonstrated history of using those to drive results. That's the basic building block. If you don't have metering, then it's pretty tough to know what – where you're at, where you're going, and what you've done. So but, that's one thing I would advise is – we talked earlier. I alluded to the phrase the treadmill in the basement. You can't just put these in and expect savings. Someone has to actually be doing something with that data, and it's not that hard.

When you put meters in, you're going to identify opportunities pretty quickly. You're going to find things – inconsistencies on your night and weekend shutdown. If you do it this good in this period, then why can't we do it that good every period like that? You're going to identify demand savings opportunities, spikes, and things like that. You're going to start asking questions and find out there's an opportunity to shift something to a different time period, for example. We've had multiple examples of all this kind of stuff internally, but you know, I guess it just comes down to your ability to commit to using the data, and convincing your folks that you are going to utilize it and not just go buy the meters and then forget about it.

Sachin Nimbalkar: Great answer. Thank you so much, John. Okay, so one question for Jason. What metric do you use to monitor, track, and view relative cost for resiliency?

Jason Grant: Yeah, I saw that question. I tried to respond as best I can. We don't use any one particular metric. I'd probably refer, it looks like Mr. Thomas, to our resilience manager, Debbie Griner, here at Water & Sewer to better answer that, but I do know that we use all sorts of different information to try to get a handle on our cost for resiliency. It's very complex because you're dealing with many different aspects of resiliency with a big utility such as ours. You're dealing with sea level rise, and environmental resource, just overall asset management. Tons of stuff that comes into the fray. I'm not sure if there's a specific metric that I could point to. It's just a very comprehensive, holistic kind of approach to that. I'm sure our director would like to have that number, and it's probably driving us towards that, to get a better handle on cost of resiliency. It's definitely a challenge for us, and I'm sure it is for many people, just given the nature of what it is.

Sachin Nimbalkar: Great. Thank you so much, Jason. Actually, there is one question for Tari. Let me make sure I read correctly. There we go. Where is that question? I saw that and I think it's a very important question. Yes, there you go. If Paul Shine or Pete Longlight were on the phone, they would be very happy with this question, by the way. So do you have the sufficient data to quantify effectiveness of ISO 50001 in optimizing the energy use at your Wisconsin facility?

Tari Emerson: So we don't have anything that separates out to say this savings is particularly due to being a part of a system, but we do measure our energy usage. We use regression analysis. We've got a baseline back to 2016, and Sachin knows this. It is one of our struggles is trying to make sure that we've got accurate data. So we had some submeters, for instance, on natural gas load actually made it look like we were creating natural gas, which is impossible, if you're consuming it in the plant. We also had an electric meter that had one of the three phases not reading for about four years. So we had some bad data. That was definitely one of the challenges of trying to set the baseline, and then compare that to our actions that we've taken since then to see what those savings are.

We have worked on developing these regression analysis models. We had a contractor or a vendor work with us on that. We have been able to develop some models for that. I think we're in pretty good shape right now. We're able to see the savings compared to that baseline, but it has been quite a bit of work to get to that point, to be able to evaluate that data, make sure that our baseline is correct, and then continuing year over year, seeing what that

savings were, taking into account things like weather and production variability.

Sachin Nimbalkar: Wonderful. Wonderful answer, and I completely – I agree with you, Tari, a lot of challenges, but you are actually tackling those challenges on a monthly basis. So that's good. That's great. Yes, Leslie. Yes.

Leslie Jones: I was just going to say, we have about 4 to 5 minutes left, so maybe one or two questions and then we'll have to end the session.

Sachin Nimbalkar: Okay, okay, so Leslie, I think we have at least 5 questions on our screen. I'm really tempted to do that beer question. Okay, I think let's go with that. Please explain that root beer image.

Rishabh Bahel: Plus I need to find the plagiarism thing for _____ stole that thing from us, but again, this root beer image. I know Summer did it. I responded to that on slido as well, and she gave a full article of – here you can read this article at your leisure. Again, with the root beer image, we are – what we are trying to explain is the power factor phenomena over there. And essentially what the foam is is your reactive power, and that's essentially if you're having more foam, you are just paying for stuff that you're not using. So if you have a good power factor, your foam would be less. If you have bad power factor, your foam would be more. That's essentially what we are trying to say with that root beer analogy, because again, when you are paying for root beer or real beer, you wouldn't want to pay more for the foam, but for the actual stuff.

So the KW, which is the real power used is what you want to use efficiently and have a good power factor. In one of our plants, we _____ they did a good job of increasing the power factor from .75 to .92, and again, this was just a fun way to explain the concept. We want to keep that interaction going and again, our communications team worked with us on that part. I think we couldn't get that beer thing passed through it, so we had to settle for the next best thing, the root beer. It's just our progress. It happens.

Sachin Nimbalkar: Wonderful, thank you, Rishabh for that answer. Then Leslie, now what's next?

Leslie Jones: Let's see. Can you see the slides again, or the slido questions?

Sachin Nimbalkar: That's correct. We are seeing slido questions, yes, yes.

Leslie Jones: I don't know. There's a lot of questions left here.

Sachin Nimbalkar: Yes, yes. I think maybe what we'll do is we could get answers. Some of those questions I think I should be able to answer, or my team members should be able to answer. Somehow, I think we should address. Let's actually discuss that offline, yeah.

Leslie Jones: Okay.

Sachin Nimbalkar: Okay. I think there are a few slides on additional resources. There is actually some videos, right? Yeah, let's go for our next slides.

Leslie Jones: Sure, let me go back. Forgive me. I have to scroll through all of these to go back to the end. I went back to show the root beer image. So *[laughter]*.

Sachin Nimbalkar: No problem, yes.

Leslie Jones: Hopefully, no one is getting carsick.

Sachin Nimbalkar: It was worth it. It was worth it, yes, definitely. I think definitely all these slides, as well as the recorded version of this session, it will be uploaded on Better Buildings website. Yes, so this one is – this slide is showing our upcoming webinar series. Better Buildings Better Plants upcoming webinar series. We are going to discuss very important energy management related topics. So please, definitely go to our Better Buildings website, register for these webinars on time, before time, so that you will be able to take advantage of these important topics.

Next one. Yeah, for any additional questions, we have email addresses on our left-hand side. At the same time, we have all our speakers, their email addresses are there. My email address is all the way on the bottom. So definitely, if we are not able to address any of your questions, and if you're really offended – no, I'm kidding, but make sure please send us email to email. We are here to address your questions. Next, Leslie.

Leslie Jones: That should be it. Let's see. I believe we have a video. Let me – just to end the session on.

Sachin Nimbalkar: Yes, that's correct. We have wonderful Better Building Solutions Center video, right? So we should definitely show that. How many? The Better Building Solutions Center has over 2800 solutions to help you find proven cost effective energy and water efficiency solutions. Yeah, go for it, Leslie.

Leslie Jones: Okay. Can you guys see this? Just let me...

Sachin Nimbalkar: Yes, we are seeing –

Leslie Jones: *[laughter]* Good. I had to check something.

[video playing]

All right.

Sachin Nimbalkar: That was a wonderful video. I like that music. Once again, thank you so much for all our speakers: Rishabh, Tari Emerson, John Troyer, Jason, Paul Hartmeister, thank you so much. Again, thank you, Leslie, Marissa Schatz, Clifton, Kendall Sanderson, Eli Levine, Tom Wenning, thank you so much. And of course, all participants, almost 300 participants joined us today. Thank you so much for your time. Have a great day.

[End of Audio]