

John Smegal: Okay. Hello, everybody. Thanks for joining the webinar today. We're going to give folks a few moments to join in, login. We'll be starting soon, so hang in there.

[Brief pause]

All righty then. So let's get started. Hello, everybody. Welcome to the 2022-23 Better Buildings Webinar Series. We're dedicated to bringing the latest actionable insights from leading industry experts. This is an annual series. It's a chance to explore topics, and technologies, and trends that affect your various organizations, as well as efforts to accelerate decarbonization and energy efficiency adoption. So today's webinar is entitled "Inspiring a Clean Energy Workforce." Before we dive in, I want to cover a few housekeeping items.

Today's webinar, as you heard earlier if you were on when the announcement, the automated announcement came on, will be recorded. It will be archived on the Better Building Solution Center. And if you need to get access to it later, you'll be able to do so. And we will also follow up subsequently and make sure that slides are available for those who request. Attendees, if you're on, you're currently in listen only mode, meaning that your microphones are muted. If you have any audio or visual issues like that, you know, throughout the webinar, just send a message in the QA box to the bottom of the Zoom panel, and hopefully, the tech team can respond to you with respect any questions or concerns that you have.

All righty. So that's me, although it doesn't look like me. It looked like me a while ago. My name is John Smegal. And I am the program manager for the Industrial Assessment Center Program for Department of Energy in what is currently the Advanced Manufacturing Office, although we are undergoing a reorganization, and I won't get into that, but there'll be some new names and new titles. But ultimately, I am still responsible for the Industrial Assessment Center Program, which we're going to talk about a lot today. All right. Can we move forward? Okay.

So, again, my goal here is realistically to introduce things and provide a little bit of context, as one might assume from my opening remarks. The Industrial Assessment Center program is undergoing a rather dramatic set of changes, brought about by the Bipartisan Infrastructure Law, among other things. And so we're going to touch upon some of those, and we're going to talk about some of the specific implications for both what's going on now,

what has been going on, and what looks to be going on in the future with respect to workforce development. Next slide.

Okay. This is where we stand now. I mean, the IAC program has been providing assistance to small medium sized manufacturers for longer than Department of Energy existed. We just celebrated our 45th or 46th anniversary, depending on how you look at it. And we started out actually within the Department of Commerce, and then transitioned over to Department of Energy when the Department of Energy was formed. So we have a long history. And during that period, we've been providing assistance via our students at IAC-accredited engineering institutions across the country to small and medium-sized manufacturers.

We're trying to help to improve their energy efficiency, their competitiveness, their productivity, reduce waste, reduce water usage. And to do so in a way in which that develops what we refer to as the next generation of energy-savvy engineers. Currently, as of 2021, there are 37 Industrial Assessment Centers located across the country. We operate and serve all states. Even though we aren't necessarily located every state, we travel as necessary to help small medium sized manufacturers. Next slide.

This is realistically, you know, we can talk a lot about the benefits we provide to small and medium-sized manufacturers. But given the context of today's session, we'll talk a little bit more about what we're doing in the workforce development arena, which is, you know, the other part of our mission. We have had, over the last several years, an independent third party come in and do an evaluation of our program impacts. And the most recent impact study was completed less than a year ago. And what this study showed is that, realistically speaking, IAC graduates have dramatically enhanced energy efficiency-related skills than students that are operating in the same type of program, the i.e. mechanical, industrial engineering within their schools.

Specifically, you know, the study indicated that 72 percent more energy efficiency-related skills are imparted on IAC students as opposed to their mechanical, industrial, electrical engineering cohorts. The longer I see students participate in the program, the more energy skills they accrue. And we found that even for those students that literally just dip their toe in the IAC water, they generate long-term skills that they take with them out into the world.

And then as we transition from IAC student to IAC alumni, we have characterized through this, you know, this study that we've done now twice, basically by trying to monetize the value of these set of skills through databases are available, Brookings Institution, various other publicly-available databases. And we've determined that IAC alumni have more skills than their comparison groups, the ones that I'm talking about earlier, industrial, electrical, mechanical engineering. And those skills are more valuable, and they translate directly into their salaries.

And if you look out four, five, six, eight, ten years down the line, their total skill set from a value perspective is higher than their cohorts. So the IAC program makes a meaningful difference in terms of not only the path that our students choose, but in terms of their ultimate payoff in terms of, you know, how they perform in the marketplace. And the last little note, I'd say that, I mean, we are getting what we wanted, when we say we're trying to train the next generation of energy-savvy engineers.

Forty-six percent of IAC alumni out after five years have significant responsibilities that have to do with energy, green, renewable energy, etcetera, whatever keywords you're looking for, relative to their cohorts, which are sort of around the 18 percent sort of level. So there is no question that the IAC program has a meaningful impact on their intended pathway forward. All right, next slide. A couple of recent developments. Prior to the previous administration, we've looked at the possibility of expanding the IAC program into commercial building space on a pilot level.

We traditionally have always focused on small and medium-sized manufacturers, but we looked at the possibility of exploring commercial building assessments and partnering as part of that pilot project with other institutions of higher education, i.e. community colleges, specifically, and technical training programs. And as part of that pilot, which began in 2021, we initially, and I say, initially, selected nine centers within our family of 37, to work with a designated proposed partners in the community college workforce.

And we're going to hear from one of our senators, and one of our community college partners that are going to discuss in detail how that's going. It's a pilot project, we're just getting going. But we're looking forward to very, very encouraging results. And that's what we've all ultimately seen, very preliminary results at this point are indicating that we're getting a really positive response. We're getting very positive results from this. And we have no reason to

assume that we're not going to, you know, generate some really, really exciting, and, you know, meaningful impacts in this commercial building space that we're undertaking just as a pilot. All right, next slide.

The bill has had a significant impact on – when I say “bill”, I mean Bipartisan Infrastructure Law has a significant impact on the IAC program. Historically, we are 10, 12, 14 million program per year. Annually appropriated, going on and on, it's less than it used to – or used to be smaller than that, but that's where we are now. The bill appropriated \$550 million dollars of additional responsibility activity on the IAC program. The lion share of that has to do with an implementation grant program, which I'm not going to talk about here today. But it is an intriguing and wide open area where we're going to be looking at doing a whole bunch of activity in terms of working with our small and medium-sized partners to implement the recommendations that we're making.

There's a host of other activities. And one of the most intriguing ones that we're going to touch upon today briefly has to do with workforce development, and how the IACs are expanding to provide additional assessment services through their network of Centers of Excellence, and expanding into trade schools, community colleges, the union training programs that are adopting sort of the lessons learned from the IAC program to really reach a much larger audience of students, and generate the great results that we're seeing just on a different level. Next slide.

And that's all I have. Like I said, I was here just to provide a little context. Now we have – questions and answers are going to be provided throughout. Please provide your, you know, provide your questions through the sort of online version. We'll get to them at the end. But I'm going to turn things over at this point. If anybody wants to, you can reach out to me individually. This is where we have the – okay, rapid transmission here.

Today, we're gonna be using this interactive platform for Q&A. Go to www.slido.com using your mobile device, or you can open up a new window, and you entered #DOE, your event code. And you'll be able to access the slides and functionality for submitting questions, and that sort of stuff throughout. Okay. If you have to ask questions of any of the panelists, as they go forward, please submit them anytime throughout the presentation. We'll be answering questions near the end of the webinar.

You can also provide sort of a thumbs up to sort of move the questions up because we're expecting a number of questions from folks. Then they'll be sort of ranked. And the more thumbs up you give, the higher they'll move up the queue, and the more likely it is that we'll actually respond to them during the webinar as opposed to doing so after the fact. Okay? All right. Now, we have a few poll questions that we pose right now. Just like to learn a little bit more about you. Go ahead and respond.

Specifically, what sector do you characterize yourself as coming from, so we can just get a better understanding as to what your organization is and where you're coming from. We'll take a few moments just to allow these things to sort of filter out. I think obviously let me move my slideshow so I can actually see the result. Okay. We got a pretty good diversity of folks, almost seem to be in that nonprofit and nongovernmental, but working forward. I'll wait another minute or another few seconds. And I think results are stabilizing. Okay.

And if it's okay with you, powers that be, if we can move on to the next slide. The next question, what exactly do you do for this organization that you posited? Are you a professor? Do you have energy management responsibilities? Do you run the organization? Are you a student? Let us know what you do. And we'll wait a few moments here. Okay. Interesting. I would like to know what "other" is. I guess we'll have to see on that. We'll have to ask some questions on that. Okay.

Well, this I kind of what I expected. But I'm guessing that the other folks are, probably they might fall into some of these other categories. But folks are just not comfortable necessarily pigeonholing themselves into some of these other categories. All right. And then let's go to the last one. What do you see as a challenges in workforce development, energy workforce development? And specifically, what sort of hurdles have you experienced? This is more of a short answer type question. I think this will this will sort of manifest in some of the discussions that we might have. Getting different organizations working together.

I'm curious to see what the what the recruiting challenges are. I know that my own experience has been that – okay. Certification requirements. Mm-hmm. Wow, what a – we got lots of different folks. *[Laughter]* Yeah, I think a lot of these answers that I've seen really – okay, seeing really, okay, decarbonization is something. And we're going to be focusing on that. I think a lot of the bill provisions really get at the notion, there's an awareness of a

growing recognition that decarbonization is going to be something whether it's top-down motivated, or whether it's growing directly from facilities themselves that they're going to be focusing on decarbonization.

Specifically within the IAC program, we are taking a hard look at how we modify our assessment protocols to respond to the decarbonization mandate, or decarbonization efforts. Because it's not, you know, energy efficiency is part of decarbonization, but there are decarbonization strategies that don't necessarily result in less energy. So it's a complicated task that we're undertaking specifically within the IAC program to address decarbonization. I also noticed just looking at what I saw, a lot of awareness kind of questions having to do with, you know, folks aren't aware of what the jobs are available, how to get them, what skills are necessary. Yeah. Wow. Okay.

I would like to really spend a whole bunch of time digging into all these, but I don't know if we have time at this point. So I'm going to defer a little bit into looking at how we're going to respond to this towards the end. And I'm going to introduce folks from the rest of our panel who are going to be talking today, today's presenters. Okay. We have folks that I work with on a routine basis. And beginning left to right, Kody Powell is the director of the University of Utah Industrial Assessment Center. Dr. Kristen Cetin at Michigan State University. She's one of our recently selected directors of the IAC. She joined us in 2021. She's off to an auspicious start.

And she has brought one of our partners, Pete Kiser, who works for Henry Ford College. And Michigan State is one of the folks who's participating in the commercial buildings pilot that I referred to. And Pete has a rather significant role in that effort. So Pete's going to talk a little bit about that. Kristen is going to talk about how she's related to her community college partners. We're gonna see about that. And then lastly, Ethan Languri from Tennessee Tech. Ethan was, prior to his assuming the director role, was an assistant director.

Ethan has had a rather prominent role in looking at the R&D side, in particular, of the IAC. He's encouraging student research, as well as just the regular nuts and bolts functioning of an IAC sake. So I'll go ahead, and thanks for everyone for participating. And I'm going to turn it over, I believe to Kody first. Thank you, Kody.

Kody Powell:

Thanks very much, John. Great introduction to the IAC program. So John mentioned the Bipartisan Infrastructure Law and the potential to expand the IAC program, which I think is just tremendous. So my talk today is titled “Transforming industrial energy and inspiring a clean energy workforce”. Again, I’m Kody Powell. I’m the Associate Professor in Chemical Engineering at the University of Utah, and the director of the Intermountain Industrial Assessment Center. So we cover the state of Utah, but we’ve also done assessments in Nevada, Idaho, Wyoming, Colorado, and even in Montana. That was in a previous incarnation of our center.

But I’ve titled my talk this way, because I think the IAC program really truly has the potential right now to be transformational, and not just in helping each individual facility that we assess, improve their own energy performance, but really in fundamentally changing the way that the grid works. Please advance the slide. Okay. So this should come as no surprise to everybody. I’m showing here, this fundamental supply and demand mismatch for solar energy.

So on the left, you see real solar energy data collected from a rooftop in Texas. And then on the right, you see a, this is a little bit of an extreme example, this is what a demand curve could look like. This is also for the state of Texas. You notice the units are very different. But essentially, when we’re trying to completely decarbonize, and we’re relying on intermittent renewable energies, there’s this fundamental supply and demand mismatch. So while we’re doing great as a nation at getting more and more renewable energy on the grid, it’s creating kind of this second level problem of, okay, now, well, how do we get this intermittent supply to line up with this fluctuating demand. Next slide.

So this was dubbed by Vox Media as solar energy’s greatest challenge. I’m sure most of you have heard of the infamous duck curve. We’re seeing this actually come to fruition. This article is a couple of years old, but this is this type of behavior where you’re seeing the net demand curve in that little image on the right. This was forecasted by CAISO in 2012. And we’ve actually seen this come to fruition where the addition of more and more rooftop solar has created this net demand and this new challenge. So when the sun goes down, there’s now this – really a high demand for our of the balance of the system that’s non-solar to ramp up at these incredible rates. Next slide.

Okay. So what I want to show you today is how we can work smarter and not just harder. I have this quote by Albert Einstein, “We can’t solve problems by using the same kind of thinking we used when we created them.” So if we think about how we have been operating the grid ever since electricity became a commercial product, essentially, when we need more demand, what do we do? We build more powerplants. More demand, more powerplants. And as you all know, historically, this has been primarily driven by fossil fuels. We may be making similar choices now, except we’re doing that with different kinds of technologies. We have more demand, more solar. Solar is creating problems. Let’s have batteries.

So I’m not suggesting that these are bad solutions by any means, but I’m saying that there is an opportunity to do things a little bit smarter. And I think that IAC program can really be a way to fundamentally change the way things operate. So we have this big vision. In our IAC, we do a lot of spinoff research projects. It’s really a phenomenal program because we’re out. We’re actually in the plants. We see the real issue that these plants are having. And we’re not, I mean, well, we are making energy efficiency improvement recommendations.

So simple things like upgrading your lights or improve the insulation around piping, or get your boiler tuned, or operate your air compressors more efficiently, or get VFDs on your compressors. We definitely do those things. But we’re also able to see some of these more interesting kind of second level problems that we’re able to spin off into research projects. These research projects are fundamentally driven by students. And I think we’re really starting to drive change for how facilities can operate. So from a research point of view, we have this bigger vision, where we think the grid can fundamentally operate differently, but it would start down at that distributed level, down at the plant level. Next slide.

So we’ve got this video animation. So I talked about this kind of brute force approach, where, yes, we could invest billions or trillions of dollars in batteries, and in large scale hydrogen energy storage. That’s great. And I’m definitely not discounting that. But I think there’s some lower hanging fruit out there where we could encourage our manufacturing and commercial entities operating throughout the country to be smarter and to be more responsive to this fluctuating supply and demand. So if you look at this graph, you’ll see that the bubbles grow and shrink, and that is indicating changing supply and demand on the grid.

But notice this manufacturing facility, the one at the bottom right. So it's got a tank there. So in an industrial facility, what our center has identified is that there are frequently opportunities for these industrial facilities to be very flexible, just like a battery, except they don't have to make this huge investment in something like a battery. So they can run their pumps flexibly. They can fill up storage tanks when demand is a little bit lower. Then they can drain those tanks, and turn down their pumps when demand is higher.

So we essentially want to identify all of these opportunities for manufacturers to operate in a smarter way. They not only can manufacture their product, but they can take in real-time signals from the grid and factor that into their own economic performance decisions so that they could become this major asset to the grid. Next slide. One more. Thank you. Okay. So certainly a big part of this supply and demand mismatch problem is going to be distributed. We're going to need distributed energy resources, distributed energy storage, specifically, to help with this supply and demand balance.

So the Industrial Assessment Centers Program is just that. It's a program that is distributed all across the country. We have these 37 centers, plus our new community college partners that are out there. We have this army of students basically going out and identifying these interesting opportunities. So students are not just making those bread and butter recommendations, but they're seeing on the frontlines, really what facilities can do to operate smarter, to not only improve their bottom line, but to eventually over time become an asset for grid regulation. Next slide.

So since I'm speaking to a lot of energy professionals, this may not be a major surprise to you. In the industrial sector, at least, it's ubiquitous, at least in my area, that a significant part of manufacturer's electric bill is from their peak demand. So this can be somewhere on the order of 50 percent of their energy costs, and it's based on just that. Again, in my area with the regulated utility, whatever 15-minute period during an entire month represents their max demand. That is what sets their peak demand charge. Next.

So just using today's existing rate structures, there are significant opportunities for companies to dramatically reduce their energy bills just by shifting when they're using energy. So they can run more of their equipment, fill up storage tanks, maybe run their production a little bit overclocked, I guess. And then if they can – they can do that during the off peak hours. And then when they are

approaching what would otherwise be their peak, they can turn things down, they can drain their tanks, they can turn their pumps down as an example. And they can dramatically reduce their peak demand, which can have a dramatic impact on their bill.

So our center has found at least a dozen of these really interesting case studies where we think companies could operate just smarter with better automation, but leveraging the existing infrastructure, and make a substantial dent in this supply and demand mismatch problem. Next slide. So I'll give you an example. This is a facility in eastern Nevada that we assess. This is a minerals processing facility. So their process flow diagram, a very basic one is shown in that figure on the top right.

So what they're doing is they're pumping water from these wells. They fill up these 6.2 million gallons of storage, and then they use that water for processing. This facility wanted us to come and analyze doing a large solar farm for them. So this is their real-time demand in blue. And then if they added solar, this is what their net demand would look like. So if you look at that carefully. Next. Next slide, please. Okay. So you notice that solar doesn't decrease their demand at all. So the obvious solution here would be huge battery storage, so they could shift to their peak.

So we did our analysis as IACs do. We worked with vendors, and we priced out a battery system to help them shift a significant amount of their peak. That battery system was \$3.6 million. Next slide. So we came up with this much more creative solution. We did this analysis, we created a simulation of their plant, at least their water storage, and its impact on electricity. We encouraged them, instead of installing a large battery system and making this huge capital investment, to just run their existing system a little bit smarter.

So what they could do is pull water from their wells, fill up these tanks during the off peak hours. Then when they hit peak, they turn their pumping down. They just rely on their stored water to feed their process. So this had a result of about 2.5 megawatts in peak demand savings. As you can see where it says "drain tank" on the figure. So during that period, they'd be draining the tank, turning all their pumps down. And then they make up for that later. As their net demand for electricity goes down, they fill up their tank again. Next slide.

So these are the different scenarios. So you can glance through these. If they just installed the solar farm, this particular facility

had a really punitive peak demand, and we noticed that solar did very little to help with that. So they're relying almost entirely on just this very small per kWh savings. So the solar farm by itself is a 28-year simple payback for this company. The battery system by itself would be about an 11-and-a-half year payback, and that would just be focused on reducing their peak demand.

This smart pumping system that we recommended for them would still save this company nearly \$400,000 a year. And this would just require new sensors and new automation, new algorithms for predicting when that peak is going to come, when you should be filling up your tank, and then when you should be draining the tank. So, effectively, their existing infrastructure becomes a battery system for them. This has a dramatically improved payback of about 0.7 years. Next slide.

So this was just one simple example. But in our IAC, we're able to create these student-driven research projects. And we have a strong focus on this, where we're calling grid responsive, smart manufacturing. So we've got a whole portfolio of a bunch of different case studies of things that we have examined. If you're so inclined, you could look up some of these papers and read more about all these different case studies that we've found. Next slide.

So again, I really think the IAC program can fundamentally change how the grid works. We have this distributed approach. We're actually getting it into these individual facilities, identifying ways that these facilities can operate more energy efficiently, but also smarter. Our students, who are driving all of this, they not only learn the basics of energy efficiency. They're actually the ones who are creating and driving these solutions for the future to change the way things fundamentally operate. So I just want to end by saying that tomorrow's energy workforce is going to be one that works a lot smarter, and not just harder. Thank you very much for your time.

John Smegal:

Okay. Awesome. Thank you, Kody. Another illustration of the wisdom of applied energy efficiency and applied energy engineering as opposed to theoretical, and sometimes conventional knowledge. I think you're basically, folks who are intimately involved in the processes basically found a different solution, which might otherwise appear not so obvious. All right. So next, I want to introduce a Dr. Kristen Cetin and Pete Kiser, who are going to talk a little bit about their experiences.

Dr. Cetin is associate professor at Michigan State. She's also Director of the Michigan State University Industrial Assessment Center. Michigan State University is a collaboration. The IAC is a collaboration between the University and Henry Ford College, and Michigan Tech. And they have a focus on sustainability, and small manufacturing, as well as commercial building. So I'm gonna turn it over to Kristen and Pete. Go ahead.

Kristen Cetin:

All right, thank you. And thanks for the invitation and opportunity to present here today on this topic of the Clean Energy workforce. The presentation we put together, as John mentioned, we were one of the assessment centers that has a collaboration with a community college, as well as the commercial building assessments. So we'll try to speak to those things in the context of workforce development, and what we've seen so far.

The main things that we'll cover, we have some slides that give an overview of our assessment center, program, and training that we've had ongoing. And then the last few slides talk about challenges and opportunities we've seen related to workforce development. So where have we seen issues or things that we've tried to address through the IAC program? What have we done so far? What still needs to be worked on? So next slide.

So just a little bit about our Industrial Assessment Center. We're based at Michigan State University. We generally support the state of Michigan in terms of conducting assessments. But this is a collaboration across Michigan State, Michigan Tech, and Henry Ford College. So Pete here is on as well. And we look forward to sharing some of the insights from that initial collaboration, both on the industrial and commercial side. So we conduct about 20 assessments per year for industrial facilities, and about ten for commercial. And try to support all of Michigan and part of Northern Indiana.

And as John said, we're a new center. So we started in 2001. So provide some insights there and in starting a new program within this long standing program. Next slide. This is our team. We won't spend much time here, but just so you know kind of where we stand in terms of collaboration. So I'm the director, and then Pete is one of our main contact points within Henry Ford College. Next slide. All right.

So a little bit of background about our students because those are the people that we're ultimately trying to train with these skills and hands-on experiences that we hope to go into the energy or

manufacturing space once they graduate. Or if not, at least take those skills and expertise into whatever they ultimately go into. So the students that we work with, for the most part, since we're based within the Civil and Environmental Engineering Department at MSU, a lot of the students that we ultimately see applying for these positions are within civil and environmental engineering. So it's a bit different from other IAC programs. But if there's anything I can say, according to that, right.

There's a lot of interest in sustainability within these programs. And so, you know, the expansion of including students that are maybe in a little bit less traditional types of engineering programs within the IAC program, I think has been a beneficial experience so far. We also have students from mechanical biosystems and chemical engineering at MSU right now, and generally see kind of range of different engineering students apply. We have students in undergraduate program, sophomore to seniors. BSMS students that are sticking around for a master's, as well as graduate students.

At Michigan Tech, our collaboration is within the chemical engineering department. So we see students from there for the most part. And then at Henry Ford College, Pete here can speak to this more, but they have both an energy technology program, as well as an architecture and construction technology program. We try to recruit students from. So next slide. So the next few slides just give you some overview of what we tried to accomplish within the first year. And then, hopefully, that can help lead to the last few slides, which is what our challenges and opportunities have been related to workforce development.

So the first year, we've trained about 16 students in both conducting assessments, as well as just overall training within the university, at MSU, two students at Henry Ford, and two at Michigan Tech. And we hope to maintain something similar to that moving forward. We've also tried to expose students to opportunities on campus through joint positions. The first ones we've done have been with the IPF for Industrial Planning Facilities, so they can apply to things that are within our assessment center program to support buildings on campus.

In terms of training development, I know every IAC program is different. The way that we've tried to do it, or started to do it, and continue to adapt and make things better. We ran a training pilot, one-credit course for all IAC students in 2022. That worked out fairly well, except for some challenges with scheduling. But we've gotten the approval based on that success to do a three credit

course and open that up to students outside of the IAC program to hopefully give more students the opportunity to learn these kinds of things both within and outside of the IAC.

We also have asynchronous training development. So all of the faculty and staff got together and each picked a few topics that they could develop some training on. We have that as a database of training materials for students to learn outside of our main training program. Next slide. Two other things we tried to do, maybe on the peripheries of what the typical scope of the IAC program is, but it's something that we heard from various stakeholders when we were establishing or writing the proposal, and then also, you know, initiating conversations and collaborations as we got started. And that was, you know, how are we trying to encourage the K through 12 population to go into these kinds of fields and increase awareness of that.

So we've tried to, we started, this year, we did a few summer camps with STEM programs at MSU related to IAC type work to give students some exposure to energy-type topics. And then as a part of the commercial building pilot program, we've done a number of schools for assessments. And so we've tried to integrate some presentations as a part of that into the assessment process, so that students that are there in the building understand what we're doing and get some exposure and understanding of where they can go with that kind of a career. Next slide.

The other thing we tried to do is work on supporting training. So one thing that's a challenge is, especially when you're starting a program like this is, you know, students haven't been on assessment yet. They maybe don't have the mindset of what that looks like and what to do. And so one of the research topics that we've been working on as a part of this is trying to improve training for those initial students to engage them in understanding what the assessment process looks like, even if they don't have a building or industrial facility to look in.

So this is a really basic example. But the idea is that, you know, maybe there's a better way to train students beyond the classroom environment before they can go on an assessment. So this is in addition to the things that the IAC program does. Next slide. Okay. So challenges and opportunities. So what's unique about the Michigan based IAC program, and what kind of things can we speak to here, at least based on what we've learned this first year. And again, we're still learning.

So we're a new center, so there's been some challenges there in trying to establish a program. We're collaboration so that means we're doing remote work and hybrid work, and trying to engage people across geographically, much different areas, different spaces. At MSU, we don't really have an energy focus program, though we're trying to start one. And so that presents some challenges in terms of awareness, as some of you have mentioned.

And then in terms of opportunities, right, those are the challenges, the opportunities, and the good thing is maybe Michigan is full of manufacturing, and opportunities, and needs for an energy workforce. And so seeing the enthusiasm for these kinds of things is really encouraging. There's also many manufacturers within the state of Michigan that have sustainability goals, and are driven by, say, you know, they're suppliers of larger companies that require sustainability goals in the future. So there's some challenges and then also opportunities to, to work into and in our efforts. So next few slides are challenges and opportunities. So next slide.

So what have we seen so far? And I think some of you mentioned this in the initial question. So we don't have an established energy program, at least at Michigan State or Michigan Tech. And so what we struggle with is students not really understanding what the IAC program is, or what energy careers look like, or almost anything. There's just not a lot of background in the students at MSU. So that's a struggle. And then in addition to that, there's a whole bunch of competition. So students have lots of opportunities. Right now, students are getting many, many different offers for internships and full-time positions. So that's a challenge.

The opportunity is, you know, students are interested in this. They tell us that during classes or when we bring people in. And the students that do participate in the IAC program, that's one of the main things they mentioned as an interest area. Next slide. Other challenges we see is that students are just very busy. There's a whole lot of competing priorities and things that they need to figure out and do as undergraduate students especially. And in addition to that, many of them need to work either for financial reasons or otherwise. But there's not really a lot of opportunities to work on campus in things that have something related to their career goals.

And so something that I think the IAC program has helped provide, or at least to the students that have participated so far, is the opportunity to do meaningful work related to what they're interested in, while on campus taking classes. So I think that's

been a kind of exciting thing to see. Next slide. Other things that we've seen that's been really interesting. I know students struggle with this in the classes that we teach on campus is more of the soft skills and communication, just the challenge. Students don't have a lot of opportunities except for maybe their work experiences or internships, to practice communication and soft skills, and figuring out how to set up meeting calendar invites, these kinds of things.

And so part of what we've seen in participating in all aspects of assessment processes has been that students have gotten much better at learning these things. And it's great to see through the mentorship of other students, as well as their participation. Next slide. And this is the last one, and then I'll pass it to Pete to talk about the last slide. So just the other thing, I think the main point wanted to say here is we're a new program, but the really nice or exciting thing is, you know, when you're starting a new program, it's very challenging. We need a whole lot of things to establish, right.

But coming into a program that's been around for so long gives the opportunity for mentorship and people that we can ask questions to much more quickly than if we were just trying to figure things out on our own. So the reason I mentioned this is if there's ever the opportunity to expand this program, like maybe what John mentioned, building on what's already there, and the support structure that's already in place is a great opportunity. So I'm gonna pass it to Pete now, and he'll finish up.

Pete Kiser:

Hello, everybody. My name is Pete Kiser, and I'm with Henry Ford College in Dearborn, Michigan. Kristin and the MSU team are very, very great partners. They're very professional in what they bring to the table in these assessments. Very thorough. They're very knowledgeable. I have 50 years of heating and cooling experience, as well as unlimited mechanical contractor, and a Michigan mechanical inspector.

And I've been very, very impressed with how they go about the assessments there. It's a great team to work when they're investigating. They work well together. They know what their assignments are before they get to the job site. And before they leave, I think one of the most impressive thing is a review of what they've found on the assessments while they're out there, and updating the customers on what they have found out there. So it's been a great partnership. I am very proud to be a part of their group. I learn every time I go out on one of these with their team. And I just like to thank Kristen and team for all their hard work.

A little bit about Henry Ford College. Our students include high school students. We have new college students, and also we have students from the skilled trades from Detroit Diesel, Ford, Chrysler General Motors, as well as Chad is not on the call with us today. But he has a great construction program, as well as an architectural program that is a good feeder program. And that's what we hope to do is send some students to Michigan State for Kristen and her group down the road. And I'd just like to tell you, thank you very much on behalf of Henry Ford College and myself for the opportunity to present.

Kristen Cetin:

So just to finish up main thing I'll say is this, it's been a good opportunity to collaborate. And, you know, we continue to work on figuring out the best ways to support the collaboration across the community college and university. Go ahead, John.

John Smegal:

All right. Great. Thanks, Kristen. Thanks, Pete. Yeah, my only one observation would be, we started the pilot. And it is meant to be just that. It's a learning experience. We did not dictate how everyone should run their pilot. The goal was to allow a bunch of different schools to try different approaches. And then ultimately, after a year, or two, or three, hit upon a set or an individual – an approach that works best. And I think it's going to be a set of approaches because this is a diverse circumstance, we do not start and say, "Thou shalt do this." We're going to evolve into this.

And by the end of this four or five-year pilot, we're going to have a really rip-roaring program that's demonstrating really good results across the universe of commercial, as well as industrial facilities. So that's my one caveat. Okay. I'm going to quick jump to Ethan. Thank you, everyone. A quick reminder to everybody on the audience to send in your questions you have at www.slido.com. The event code is #DOE. We look forward to answering your questions at the end of the session.

And we're going to hear from our final speaker now, Ethan Languri. He's, as I said, director of Tennessee Tech, former assistant director. A long history of experience, and in particular, a great deal of focus on encouraging his students to really actively engage in the nitty-gritty details of research as well as applied energy efficiency. So Ethan, I'll turn it over to you.

Ethan Languri:

Hey, thanks, John. Hello, everyone. As John mentioned, I'm Ethan Languri. I'm a director of Tennessee Tech Industrial Assessment Center. I'm an associate director in the mechanical engineering department. I have been assistant director, or associate director, we

call it a Tennessee Tech, for seven years. And past one and a half years, I've been the director. And Tennessee Tech has been having the host of IAC for last 16 years, that I was part of it for last eight years. Next slide.

Well, let's just start by asking this question why we should care about workforce development in this really particular case. Mostly, we're going to focus on the student training in IAC. Well, just by looking at this manufacturing USA publication and study they did, that by 2028, there'll be 4.6 million jobs in manufacturing. Because of retirements, 2.7 millions of it, as you can see on the kind of graphic on the right. And also because of national growth, we expect to get another two million.

So over half of it, 53 percent will be vacant because of the lack of skilled workers or a skill shortage in the US manufacturing industry. And that's why I just want to kind of use that to emphasize the importance of having a skilled worker, especially in the field of energy efficiency, that are familiar with manufacturing facilities, kind of the importance of it. Next slide. So, overall, as John mentioned, and other speakers mentioned, the IAC trying to go after two main goals, one saving costs for manufacturers. So our goal is to go there, find energy saving opportunities, making ten recommendations or so in a typical assessment.

And we follow up, and typically they implement a little bit over 50 percent of those. And that's where they see an actual cost saving. And the other one is workforce development, which is preparing our students future workforce, as well as training the current workforce. I'm going to talk about those. But on the righthand side, I'm showing a graphic, we develop ourself that shows how IAC, Tennessee Tech, handles those goals. And as I mentioned earlier, each IAC operates differently than another IAC. So there is a really a lot of freedom, how to operate with IAC.

And of course, we are trying to kind of answer those two goals, reach to the goals. But in our IAC at Tennessee Tech, we focus a lot on decarbonization, cyber security. We're working on a cybersecurity team funded by NSF. They're helping us with like a specialized cyber security review for some manufacturers. We do a lot of water and wastewater especially recently, in recent assessments. And some others as well as inside the circle, you see other layers that shows our partners.

We work with CHP TAP, Combined Heat and Power also through DOE. We work with our Tennessee Energy Office, Tennessee

Valley Authority, TVA, and any partners you see here, Better Building Better Plants, that we can tap into to help our manufacturers. So I just want to kind of emphasize that what I'm going to list here are how we have been doing over the past 16 years, especially the past eight years, I've been involved. Next slide.

So this is a list of what I'm going to cover today, how we handle new students. Onboarding new students is a challenge. Imagine we have a student that just had been in school for maybe two years, and they've never seen the same system. And we are going to start them to start a process in terms of training and have them ready for a real assessment, and ask them to do recommendations, do the calculations, present the reports. Then I'm going to focus on how we handle our experience with the student. We're talking about the students that have been doing this for years.

We have a lot of students that have over 30+, over 30 assessments and report on. So how we can truly do the experience, and experience the students, then you're going to talk about how research has been helping us to even understand deeper, keeping up with technology. Technology is changing all the time. So how we can kind of make sure we understand the latest and the greatest. And more as we'll see in our last slide. Next. So onboarding new students is very fun, is a big part of what we do.

Typically, every year, we have around six to ten new students into the program. And we lose some of them maybe, but we usually have a good retention rate in terms of keeping them in the program. We do a lot of in-house training, which is nothing but getting together over usually 5:00 p.m. dinner. And then we do a training either on a PowerPoint, a slide, or we do it in the lab, doing actual kind of power measurement, or just using some equipment. So we try to do as much as we can in terms of in-house training to make sure our students are kind of prepared before we head into the, we go into the manufacturing facilities, especially for the new students.

We do a lot of hands-on. And by these hands-on, I mean, we do training while you're doing assessments. So we talked about it in the office, but when we are an assessment, that's another level of training that we can actually do it and see it. That's usually learned way better. And I remember when I was new into this program, we had others, my former director, Dr. Cunningham showing me how to do it in a real facility. And, of course, it's easy to remember

those because they stick in mind. Last two bullets, our support system. And then another one, I'm going to explain later. Support system. I mean to being available as a director or associate director for the suit. So if new students have any questions, they know where to go. There are not layers between us. Let's call it a busy faculty that I have a teaching loads, and I have other projects, perhaps, IAC, and our newest students. So usually I'm gonna make sure my students know that they can always e-mail me, text me, call me. So we have our phone number exchange. So it's easy to get to me with questions. So especially help the new students.

And last bullet is being fun, flexible, and friendly. What I learned over the years is if the environment is not fun, students find another way to make hourly money, or learn another topic. So in order for us to keep them in Industrial Assessment Center, in our center, I'm going to usually make sure is a fun environment. They are respected. They have a good relationship with our leader students, graduate students, and there is a friendly environment. Next.

In terms of experiences with students, that's another level. So we've talked about new students, but imagine those students that have been doing this for, as I said, three years, four years. A lot of our students are started as a second year undergrad, and now they're doing their Ph.D. And they have been in this program. So we were talking about students that are very comfortable doing complex calculation in terms of energy saving. When we have 13 air compressors communicating together, and how we can optimize those, or a steam systems, or HVAC system.

So in order to keep them involved and excited at the same time, kind of we try to have a specialized training for them so we can go deep on certain topics. Last year, I taught a course for the first time in terms of advanced energy conservation and conversion, that we had a group of students, a three-credit course through mechanical engineering department, just focusing deep on certain things such as nitrogen generation onsite, or details of process that we typically don't share those with newer students or with average students.

Also, through the IAC funding, we make them available to go to certain training outside, and get a specialized and certified as well. And also, we can talk about what else they can do based on their knowledge and experience. On the lefthand side, you see a model developed on cooling tower assessment, existing cooling tower assessment, how they can save energy based on TMY3 for any location that has been developed with four or five students over the

years, that has been doing a lot of cooling tower, HVAC energy assessment. And they find a need, a gap, to be filled. And here we go, we have a model.

On the righthand side, a group of our team has been helping Tennessee Value Authority Combined Cycle Powerplant in Mississippi to become the first 50,001 Ready Energy Management Standard Certified in the US. So we kind of utilize those expertise, and doing certain things that keep them happy, involved, and excited. Next slide. We learned doing research regarding IAC in terms of understanding the topic would help a lot. Of course, as a faculty, we are involved with research, but finding the challenges that manufacturing facilities, experienced in real life.

And we see them firsthand in having a conversation with the plant manager that, yes, this is a challenge like from Kody's talk, first speaker that he talked about a technical challenge. You can take those concepts, bring it in, and call it a dissertation, a research topic, or for an undergraduate case. It's paid research experience that will take you to the lab. We do a lot of wellness study published, and we compete in terms of awards as well. And righthand side, Devia is one of our students doing a test under a solar simulator using a porous layer to capture more energy and store the heat in the thin layer for faster evaporation and condensation. And on two left side, we see Patrick and Spencer are presenting their papers and winning an award as part of the research. Next.

And we have to make sure we can keep up with the technology. So technology is changing. There are usually solutions new into the market that has been tested, passed through R&D. Now a lot of facilities, companies, are offering those solutions. And there are seeing results. So we have to make sure we are going through those trainings to make sure we're not missing from anything up-to-date. So here is a list of training you see on the right black box that we have gained over the past few years to be certified in energy, compressed air, and some other things.

On the left, I'm gonna talk about there are two platforms that are free. The training offered by Energy dot-gov at DOE, as well as the Better Plants Program that has a virtual in-plant trainings that I have the address on top of this as well. There are a lot of detailed technical resources available on these free websites that just a matter of how much time I would like to put to learn. Otherwise, recording videos for a seven-day course with a lot of details. All

the resources are there. I just, I myself use a lot of those in the past. And I would like to just bring that up. And next.

And this is my last slide. Mentorship. IAC offers women for energy efficiency, group mentorship, that we make sure our female students use. The host, we sponsor senior design projects at Tennessee Tech is starting doing it past the past year. And right now, we are hosting three senior design teams in terms of idea, helping with research, sometimes with funding, and making sure we're engaging other parties in the community who are not heavily involved in IAC, such as TVA and Energy Office customers. I believe that's my last slide. Thank you so much.

John Smegal:

Thanks, everybody. Thanks, Ethan for the presentation. Thanks to all the panelists. I think given the timeframe, we're gonna realistically hold questions and answer them subsequently. I want to encourage everybody to download the additional resources handout in the Zoom chat box. It contains a bunch of useful links and resources for Better Buildings. And to all our speakers on today's topic, we hope you find this useful. I think we're not going to deal with questions directly if I'm not mistaken. We have an upcoming webinar series.

Thanks to everyone for all of your questions. This webinar that we're holding today is part of a much broader series of Better Buildings Webinar Series. You can see there's a big lineup of activities that are to be held and the subsequent weeks. The next webinar is going to be on that measuring up. November 15. Leveraging the capabilities of the measure tool suite. The IAC has actually contributed to development of some of those tools on there. Please join the webinar to get a demonstration of this free and powerful open source set of software tools that can help folks that are interested in manufacturing or other contexts to optimize their performance of their own systems.

I think we've got a Better Building Summit coming up April 2023. And I'm looking at this here, and we haven't, it's in Washington, D.C. Registration is coming soon. Visit the Better Building Solution Center to learn more about how to attend this. There will be significant presence of IACs at the Better Buildings Summit. And I think with that, I want to close by thanking all our panelists for taking the time to be with us today. Feel free, anyone who's participating or listening in, contact with this contact information here. All of our individual panelists will get back to you on responding.

I know that there was some stuff on 50,001, I have to get to. We'll make sure that respond to all of your questions that were submitted online via the chat function. And please, you know, follow the Better Buildings Initiative on LinkedIn and Twitter for all the latest news. And you'll get an e-mail notice when today's recording of slides are available on the Better Buildings Solution Center.

So thank you to everyone who attended. I had to wrap things up there real quickly. I hope I did that effectively for everybody. Any additional thoughts? Okay. So I guess with that, we will conclude. Thanks again for everybody for attending and for participating. Bye, everybody.

[End of audio]

Additional Speaker Q&A:

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Additional Questions

Audience member: The lack of diversity from the IAC Training cohorts is very evident. I didn't notice any HBCU's on the map graphic. What are your plans to include unrepresented, unserved, uninvested student groups to include high school students?

Kristen Cetin: This does not directly answer the question but is related. I wanted to add to this that I agree that more can be done here and we, as IACs, have been asked to work on this from the student perspective. Each IAC has a DEI plan that we had to write up for this cycle of submissions, regarding such goals. We must report on the progress towards this each year. In summary, from what I know, this is something the program is working on. However, others beyond myself I'm sure have a better understanding of what is going on at high levels.

John Smegal: The IACs currently include 10 universities designated as minority-serving institutions (MSIs), as well as an eleventh MSI serving as the IAC Program Field Manager at Rutgers University. In addition, there are currently five universities serving as satellite IACs that are also MSIs. These satellite centers work with their primary centers to extend the geographical reach of the program. Four of these satellites are HBCUs – Grambling, Jackson State, Clark Atlanta, and Florida A&M.

Audience member: How can elementary schools and CBOs develop conversations in the general population so that building and transportation and economic sustainability become 'a thing' for them to explore?

Kristen Cetin: Great question. And a challenging one, and one at least that our team (our IAC) does not have a great answer to. Perhaps a success story from the “people engagement” perspective of sustainability is recycling in that its integrated into much of our daily lives and is generally ubiquitous. Perhaps we can look to how and why this was successful to determine how to better instill similar values about buildings/transportation/economic sustainability.

Somewhat unrelated to this, but still relevant, we've seen substantial success at the college level within the departments that at least I have worked in that programmatically have integrated common themes (e.g. programming skills, group work, etc...) into all classes such that

students see this common theme and have touch points on it all years and all semesters. It becomes something students know is coming and build on throughout the years there are in a (college) program. Perhaps something similar for, for example, elementary schools - common sustainability themes and activities that are integrated into all grades and classroom experiences. Just some initial thoughts/ideas.

K-12 students also absorb everything and can bring it back to their homes in the form of actions and conversations. I am sure there is research that has studied this and how effective it is to help bring such ideas and actions into the home/family through teaching children these ideas, but I'm sure more needs to be done. Here is one I can find quickly that is publicly available.

<https://www.nature.com/articles/nenergy201691>

John Smegal:

As part of their workforce development efforts, a number of IACs have established outreach efforts or public forums with K-12 schools. If individual schools have specific questions or would like to showcase the activities of the IACs for their students, school administrators are encouraged to reach out to the IAC Directors in their area to obtain more information.

Audience member:

What would IACs need from State government/utilities to advance their mission?

Kody Powell:

There are so many different ways that government entities and utilities can be engaged. We work very closely with our utilities and even have them accompany us on assessments frequently. This is mutually beneficial as it gives us another set of eyes on the assessment, but also helps the client develop good relationships with their utility representatives.

Government entities can help with outreach by doing social media posts, involving the IACs in networking, accompanying them on assessments occasionally, and really just helping the IAC be regularly involved in the local energy community. Where possible, government entities can also help the IACs expand their services and scope of work by providing funding. We have a small contract with the State of Utah that gives us more bandwidth to do deeper analysis for our clients. Sometimes, analyzing a recommendation idea requires more detailed design and simulation work, so this partnership helps us immensely with this type of work.

John Smegal:

The IACs welcome collaboration and even formal partnerships with their state energy office and/or utility colleagues. Many IACs routinely receive client referrals from these entities. In other instances, IACs invite utility partners to accompany them on

assessments – assuming the client and all relevant parties are willing to do so. In general, reaching out to the IAC Directors and discussing potential opportunities for collaboration is always appreciated

Kristen Cetin:

Although we (our IAC, not the IAC program overall) are in the early stages of figuring this out, I can say what we've seen so far. First is on-going and open dialogue. What is going on in this space within the state, what does the state care about, want to prioritize, what are the ongoing programs that will support dovetail nicely into the IAC programmatic efforts? Are there programs we can point the companies we work with to for further funding or otherwise helpful resources to implement recommendations? How can they know about future opportunities as programs and priorities change? We have been trying to have an ongoing discussion on this with our state on these items. For students, perhaps supporting internships, being speakers, coming to talk to students about state efforts. For the IACs overall, some IACs have additional funding through state programs to expand their scope and abilities to support the companies they work with. For buildings, sometimes the most challenging part with companies is starting the conversation on energy efficiency and decarbonization and making it a priority, but once a company is open to this, why not take advantage of that open door to not only do an assessment, but other things as well. This IACs try to do as much as they can but additional resources, as Kody said, always help to make a bigger impact.

Audience member:

How can we get cities and towns to incorporate all this knowledge production and translate knowledge for policies?

John Smegal:

Cities and towns are best equipped to determine how they can incorporate industrial energy efficiency and productivity improvement strategies into their policies and programs; however, to the extent consultation with IACs can help inform the policy-making process, reaching out to the IAC Directors and discussing potential opportunities for collaboration is always appreciated.

Audience member:

How can industrial companies better engage the IACs to ensure that IAC participants are suitable candidates for careers at these companies?

Kody Powell:

Honestly, I think this comes down to companies forging a good relationship with their IAC. It can start with engaging them in doing an assessment at your facility. At the Utah IAC, we frequently have companies give seminars/lessons in our ongoing training course. Our students love to hear from professionals directly and it helps to build so many great connections.

Kristen Cetin:

Agree with the above. We have worked with a few local manufacturers that have offered to make their facilities available for

tours for students, for student projects, etc... I think this is a good idea. As Kody said, students love “real world” examples. Perhaps internship opportunities, case study information that can be used for class projects and examples, being guest speakers, etc... anything to help connect students and make students aware of what’s out there in terms of opportunities, so the right students can find these jobs and vice versa

John Smegal: Industrial companies and other clients routinely recruit IAC students/graduates as potential employees. The IAC Field Manager maintains a job/internship board at <https://iac.university/jobs>. In addition, prospective employers are encouraged to reach out directly to their closest IAC to determine the availability/interest of both current students and pending graduates.

Audience member: Will there be a "call for proposal" regarding Workforce Development opportunity?

John Smegal: Requests for proposal (RFPs), funding opportunity announcements (FOAs), prize competitions, or other funding vehicles relating to the IACs specifically, or to workforce development more broadly, will likely be posted on the EERE-Exchange website (<https://eere-exchange.energy.gov/>).

Audience member: Is there funding/grants for workforce development? I'm at a community college that needs funding for equipment and scholarships. How do we join the list of community colleges shown on your slide for centers?

Kody Powell: My recommendation would be to make connections to your local IAC program. I'm sure they would love to build new partnerships and consult with you on how you can be more involved.

The existing community college / university partnerships are the results of a competitive grant process where each of those partnerships teamed up to write a proposal together. I believe more opportunities will be on the way, but your local IAC would be a great avenue to start building these relationships.

Kristen Cetin: Agree with the above. My understanding (John can add to this) is that there will be more funding coming from the BIL/IRA related to community college training development.

John Smegal: The current cadre of IACs and their associated partner organizations were selected in 2021 as part of a competitive funding opportunity announcement that is now closed. The next scheduled re-compete for this specific opportunity will be in 2026. However, opportunities for community colleges, technical schools, and union training programs

to participate in the expansion of the IAC program envisioned as part of the Bipartisan Infrastructure Law (BIL) will be posted on the EERE-Exchange website (<https://eere-exchange.energy.gov/>).

Audience member: Where do we see is the best place to get new people into the clean energy workforce? Is it starting in K-12 schools, focusing more on trade schools and/or community colleges, or elsewhere?

Kody Powell: I think there are jobs available at all kinds of skill levels, so I would say “all of the above”. The IAC program has historically done a great job of training students at the university (BS/MS) level. It also creates opportunities to do research at the PhD level, where these professionals can go on to do more technology development or policy work throughout their careers. The IAC program is expanded into the community college level, which is looking really promising. I believe there is, collectively, a lot of effort to do outreach and education at the high school level. However, I’m not aware of any coordinated federal effort, although I’m sure there is one.

Kristen Cetin: To add to the above, what we’ve heard from various people we have talked to is similar. Many people have asked us if we can help support reaching out at the K-12 level to help encourage them to be interested in STEM and energy careers. We are trying to do this but there can be barriers to including minors in participating in college level efforts so at this point we are more doing STEM activities and presentations rather than involving K-12 in our typical IAC activities. Engineering students are a great resource at universities, but so are (in my opinion) non-engineering students. Engineering students are highly skilled and qualified to go into clean energy careers, as I said in the presentation, there is a lot of “competition” in terms of options of career paths. We have several majors here at MSU, for example, who have similar background educational requirements to that of engineering students, and demonstrated interest in sustainability, but not as many job opportunities. There is potential to take advantage of such opportunities to connect these (engineering and non-engineering) students to jobs in the clean energy workforce, or potentially partner with such programs to have courses that will help train the students in the skills that are needed for such jobs while finishing up their studies, or to complete internships in these areas. Weatherization programs, for example, need substantial workforce and require training, but many people I talk to in this space do not come from energy, sustainability or engineering backgrounds originally but have or develop an interest in it.

We’ve also heard from talking to some people that work at the federal level that work on energy workforce development that there is a need in the workforce development space, for better coordinated efforts to

make sure that state/local programs know what resources are out there, and vice versa so that resources can be more centrally shared.

John Smegal: Improving access to the clean energy workforce will require a coordinated effort at all levels – from K-12 to trade schools/community college and onwards to four-year university and graduate school programs. The IACs will continue to do their part at the university (and now the community college level), but we look forward to serving as a platform for expanded engagement as part of the soon to be announced provisions associated with the BIL.

Audience member: Most projects requiring capital need to fall into a business cycle, which can take up to 2 years. How can IACs and industrial companies work together so that the IACs can be involved in the implementation as well as identification?

Kody Powell: This is a great question and one that my IAC (University of Utah) doesn't have completely figured out. We do a couple dozen assessments per year, so it is really difficult to stay engaged with that many facilities over time. However, if companies reach out to us needing additional analysis or help connecting with vendors, we are always happy to stay engaged.

I do believe the forthcoming implementation grants program

Kristen Cetin: We hear this from companies, particularly in the commercial building space and with schools, for example. The IACs follow up with companies about a year +/- after the assessment is complete to see what has been implemented. Statistics for this are in the IAC database if interested. I believe last I looked it was around 40-60% depending on what the recommendation was, with some being more and some being less commonly implemented. However, generally the IAC programs are not involved in the implementation themselves. One thing that I believe our state program has done previously is to fund students to be interns within manufacturers to help support implementation of recommendations from their and IAC program recommendations. I was not involved in this or know much details, but I believe this was a successful effort. My understanding is they are considering doing this again but this is still being discussed post COVID.

Audience member: What type and scale of incentives are needed to move the industrial sector to greater efficiency? Or would allowing a partial deduction for energy costs help move owners to decarbonize and less energy demand/waste?

Kody Powell: There are quite a number of incentives to do this already. I would recommend contacting your local utilities to find out about specific incentives in your area. I also recommend being on the lookout for the upcoming IAC implementation grants that will be available. Finally, if you have a no-cost IAC assessment done, your local IAC can factor incentives into their analysis. They can dig into some of the programs available in your area.

To more specifically answer your question, I think the issue is awareness as much as anything. So many companies we visit are so focused on production and keeping everything running. It's not uncommon to find facilities where no one is paying much attention to their utility bills. We totally get it and this is where we want to help. Bringing in some outside consultants (even free ones from the IAC program) is a resource that companies can take advantage of. All of our analysis is coupled with cost-savings calculations. Typically, the incentives are there just by making the changes we recommend.

Audience member: Do we (who have rooftop solar) need to continue using a 'green energy' supplier (if we produce WAY MORE electricity (in any period) than we could possibly use (and the 'grid' is storing our surplus)?

Kody Powell: Great question! It's hard to answer without knowing the specifics of your facility. My recommendation is actually to contact your local IAC. They can look into your existing rate structure and potential opportunities to optimize your billing and/or find other suppliers. While IACs can do renewable energy and/or decarbonization analysis, we really focus on energy- and cost-saving measures that will improve your bottom line.

Audience member: Isn't real issue 90% of digitized building interconnecting to analog distribution circuit below substation owned by distribution utility? Can't push mutually beneficial optimization to utility because they don't know what going on?

Kody Powell: Great points! All of our analysis in the IAC case studies we've done have been within the context of each facility's existing rate structure. If they have time-of-use pricing and/or peak demand pricing, there exist significant benefits already for companies to do load shifting or peak shaving. We see the idea of "mutually beneficial optimization" to be a really important research topic. We're trying to shed much more light on this issue and highlight all of the technology/policy changes that need to occur to make this real-time, two-way coordination between utilities and industrial facilities a reality. We've highlighted many of the barriers and potential solutions in a very recent publication. This one is hot off the press and we're very excited about it (<https://doi.org/10.1002/aic.17920>). If it's not

accessible, please feel free to email me (kody.powell@utah.edu) and I can maybe send you a pre-print.

Audience member: I see a 28.5 year payback for solar, and our affordable solar PPA is 30 years. Is that really the payback period (P2)?

Kody Powell: This was the simple payback we calculated for this assessment. This was due to the fact that this facility's energy rate was only about \$0.023/kWh. Their demand charges, on the other hand, were extremely high (about \$21/kW). The fact that solar did little to reduce their peak demand meant that most of the payback was based only on the \$/kWh charges. This highlights the importance of paying attention to the real-time power usage and doing what you can to ensure that you're making investments and operating the facility in a way that provides maximum financial benefit.

Audience member: Could you speak to or point me to where on the IAC website where I can find more information about the IAC students? What is the application process? Are they paid a stipend?

Kristen Cetin: Each IAC has a different process and generally includes only students from that university/college. At MSU all students are paid. Undergraduate students are paid hourly and graduate students are considered RAs and paid for as a stipend and tuition coverage. At MSU we have an application process for each cohort that generally involved submitting an application on Handshake, then an initial screening by a student-faculty team, then an interview on Zoom or in person.

You can go to each IAC's website through the main IAC website to determine what their application and recruiting process looks like <https://iac.university/>

Pete Kiser: You can contact iac.msu.edu for this information, register at iac.msu.edu and the Henry Ford College Students are not paid a stipend.

Audience member: What is the significance of ISO 50001 & SEP certification for the IACs as seen in slide 48 or have there been any IACs which have obtained these certifications?

Ethan Languri: Tennessee Tech IAC Director and other members are formally trained on Energy Management Systems (EnMS) and implementation of ISO 50001 and 50001 Ready. Tennessee Tech IAC helped implementing 50001 Ready for a facility as shown in the slide. ISO 50001/50001 Ready are certifications for plants such as manufacturing facilities. Hence, IACs are not 50001 Ready certified but can help manufacturing facilities to be ISO 50001/50001 Ready certified.

Additional Resources

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

Better Buildings Resources

- Workforce Development [webpage](#)
- Workforce Accelerator [webpage](#)
- Better Plants | Virtual In-Plant [Trainings](#)
- Industrial Assessment Centers (IACs) [webpage](#)

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

Other Resources

- University of Utah IAC [webpage](#)
- Michigan State University IAC [webpage](#)
- Tennessee Technological University IAC [webpage](#)
- Manufacturing USA | Workforce Development [webpage](#)

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