DOE Advanced Manufacturing Office EnPI V3.0 Webinar Transcription
December 11, 2012

Lindsay Southerland: Good Afternoon. My name is Lindsay Southerland and I'm with BCS, Incorporated. It is my pleasure to welcome you to this afternoon's webcast, which is sponsored by the U.S. Department of Energy's Advanced Manufacturing Office, or AMO for short. Today's presenters are Andre de Fontaine of AMO and Ashly Spevacek of the Project Performance Corporation. Ashly and Andre will provide an overview and demonstration of the third version of AMO's EnPI tool.

As for a few housekeeping items, please note that this webcast is being recorded and that you are on mute. We will also hold a Q&A session after Ashly and Andre finish their presentation. If you have a question, please utilize the webinar's question box on the right hand side of the screen to post that question. You can do this at any point during the presentation, and our presenters will answer your question at the end. After Q&A, I will end today's session by sharing how to access slides and the recording from today's webcast, as well as provide a reminder for how you can find and download the EnPI tool and user manual. With that, I'd like to hand today's Webcast over to our first presenter, Andre de Fontaine. Andre?

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Andre de Fontaine: Thank you, Lindsay, and thanks to everyone who was able to join us this afternoon. So, as many of you know, EERE released an updated version of its Energy Performance Indicator (EnPI) tool late last month. So the purpose of this webinar is to give an overview and a brief demo of that tool. Ashly and I are going to be sharing the stage today. She is going to do the hard work and actually demo the tool by explaining how it works and what you need to input and what the outputs are. I'm going to be starting by just giving a quick overview and a description of the purpose of the tool and who our intended users are. I'm also going to talk briefly and in general terms about the benefits of using regression analysis from an energy analysis standpoint and why you ought to start thinking about using it if you haven't already done so. Once we get through the actual demo of the tool, I'll close with a few comments on how it aligns with the Better Plants Program and Superior Energy Performance (SEP) and then make sure you know where to go for additional resources to help use the tool. Next slide, please.

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The EnPI tool is a tool that we think is going to help industrial firms get a more complete picture of their energy use within their facilities and get a more accurate read on the effect of their energy efficiency efforts. So at its core, it is an energy performance tracking tool. It does employ regression analysis to help organizations calculate energy performance indicators by normalizing for things like weather, production, and other variables. And, importantly, it does so in a way that we think is user friendly. The steps are all laid out logically, the calculations are performed consistently, things are automated whenever possible, and there's also a corporate rollup function that allows you to aggregate all of the plant-level performance data into a single corporate-wide percentage improvement metric variable which we know is particularly important for the participants in the Better Plants Program.

As I mentioned, we really designed it to accommodate the Partners in both the Better Plants Program and SEP. But really, this tool should be useful for any organization that is looking to track facility and corporate-level energy performance over time, so you don't need to be a Partner in our programs in order to use it, though there are certain features of the tool that make it particularly useful for

companies that participate in our programs that align with our reporting requirements for those programs. Next slide, please.

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I'm not going to belabor the point here. I think everybody is probably familiar with what regression analysis is—it is a statistical technique that estimates a lot of the relationships between variables. For our purposes, what we're interested in looking at is the relationship between energy consumption and one or more independent variables, whether its temperature or production, while controlling for other variables at the same time.

So the implications for this from an industrial energy efficiency standpoint are that, I think everybody on the phone knows, manufacturing is very complex. You are all out there making conscious efforts to save energy, but there are still a number of other factors that might be impacting the energy use within a facility that are not strictly related to the energy efficiency project that you've put in place. So for example, a mild winter at a light assembly plant in Connecticut could reduce your heating load and, as a result, make your energy use performance metrics look a lot better than they otherwise would. Conversely, a production drop at a large, energy-intensive manufacturer may lead your energy efficiency performance metrics to actually look worse than the evidence would otherwise indicate even if you had put in place a lot of energy efficiency projects.

So, using the tool and using regression analysis allows you to control for those types of variables and it gives you a more accurate window into the effects of your actual energy efficiency efforts. I think this tool is going to benefit a lot of folks. I think the corporate energy managers are going to get a lot of value out of this in particular. For corporate energy managers that are evaluating the performance of plants, or several different plants at locations across the country with different climate zones and production cycles, by using regression analysis at these different plants you'll be able to do some more meaningful comparisons looking at the performance of those plants while controlling for these different factors. That takes me to the end of my brief presentation. I guess one other thing that I might add is that we focus on regression analysis—the tool also does allow you to track energy performance improvement on a non-normalized basis so you can use your actual data so the tool will still be useful for companies that choose not to use regression analysis. It will also give you the outputs that you need to complete your Better Plants annual report, for example. So with that, I'm going to turn it over to Ashly.

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{There were technical difficulties during this portion of the webinar. The facilitator and presenters were talking back and forth to alleviate the situation.}

Ashly Spevacek: Well, thank you Andre for the introduction. For those who don't know me, my name is Ashly Spevacek and I was involved with the development of the tool. So, today I'm going to go over some of the similarities and differences between previous versions, and then I'll give a few short demos on how to use the tool.

So like the previous versions of the EnPI tool, the latest version has been developed in Microsoft Excel. The calculations used by the tool are derived from the Superior Energy Performance Measurement and Verification Protocol. Also like the previous versions of the EnPI tool, the tool calculates percent

improvements, Superior Energy Performance indicators (SEnpIs), annual savings for a facility given energy data, and variables that affect the energy use at a facility. And in addition, the tool allows users to select which variables entered into the tool they'd like to include in their model to normalize their energy consumption.

Unlike previous versions of the EnPI tool, this version has been built as an Excel add-in, meaning the tool will appear in the toolbar at the top of any Excel workbook. This allows the tool to be accessed from any existing or new Excel workbook. I'll explain what this means further, later in the demonstration. In addition, this version allows users to calculate performance indicators without normalizing and it allows users to roll facility level data up to the corporate level for multiple plants, which is what Andre mentioned earlier. Facility and corporate-level outputs are formatted for both the SEP and Better Plants Programs, which allow for the data to be easily transferred into annual report forms. Since the tool is built as an Excel add-in, the users can run multiple regressions in one workbook, allowing the user to compare results from a selection of different model years. I'll also show what this means later on in the demonstration.

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I won't go over the install process here to save time, but to download the tool, visit the EnPI landing page on the eCenter. A link to these slides, along with a link to the landing page, will be provided after this webcast. Detailed instructions on how to install and uninstall the tool are also included on the EnPI landing page. The install process for users with Microsoft Office 2007 and Office 2010 varies slightly—users with Office 2007 are required to complete one extra step. After running a Windows installation package labeled "vstor30," double click on the "AMO.EnPI.Setup," which looks like this here, to install the tool. If you have Microsoft Excel open when you install the tool, you'll need to close Excel and reopen the program to make the add-in appear. After installation, the add-in will appear at the top of any Excel workbook.

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Like I said earlier, the tool can be used to calculate energy performance indicators for a facility using actual energy data or energy data that have been normalized for variables such as weather and production. If you'd like to use the energy data to calculate your energy performance indicators, you'll select the "Use Actual" feature of the tool. The data required to calculate performance indicators using actual data, total energy use, or energy use by fuel type in any unit, production or building square footage, in a reporting period or year. I'll give three demonstrations in today's demo: The first will be on how to use the tool to calculate performance indicators using actual data. The second will be on how to use the tool to calculate energy performance indicators while normalizing for weather and production. The third will be on how to roll the facility-level data up to the corporate level. If after the demo you have questions on how to run the tool, I encourage you to look at the user manual posted on the EnPI landing page.

[Screen Shot of EnPI Landing Page]

Here is the EnPI landing page. A link to this will be provided after the demo. The user manual is located down here.

[Screen Shot of User Manual]

The user manual has step-by-step instructions along with screen shots to help you move through the tool.

[Demo of "Use Actual"]

Now I'll start my demo of "Use Actual." To use the tool, start by opening a new or existing Excel workbook. For this demo I will start from an existing workbook. Note that I've changed the sheet name to be my plant name. This will be important later on in the tool when I do my corporate roll up feature. The sheet names carry through the tool to the corporate roll up so you can see from which plant the data came. Use the feature down here for that.

The EnPI add-in will appear as a menu option at the top here. First time users are encouraged to use the EnPI Wizard, which opens a new window on the right of the Excel workbook. The wizard provides step-by-step instructions on how to use the tool. It states that there are more instructions in the user manual. The first question the wizard will ask is whether your data are in the file. In this example, we are starting from an existing file that already contains my data. So, I will select "My Data is in the Sheet."

In order for the tool to detect your energy data, the data need to first be entered into an Excel table. On the next step, select "Format Data as an Excel Table" to put your data into a table. When prompted like this, you'll highlight all of your data and select "My Table has Headers" if the top row contains your column headers. Click "next."

The tool needs three inputs to run the "Use Actual" feature. First is your energy data, second is your production or building square footage, and the third is the period column. The period column tools the tool how to group the data. If you do not have a period column, select the "Label Reporting Period" button. In here, you will need to select the first date of your baseline year. For this example, it's January 1, 2007. You then select your interval, and in my case my data are entered as "monthly." Then select your label. I will go with "calendar" for this one and will show you "fiscal" in the next demo. What this does is it creates a column called "Period," which groups your data based on reporting years.

Prior to running a tool, all of the energy data need to be converted to MMBtu and from site to source. I already have my natural gas in MMBtu and just need to convert my electricity. When selecting "Convert," this box opens up. I select the columns I want to convert, so I've selected "Purchased Electricity." It asks me what type of energy source it is and it is purchased electricity. My current energy unit is kWh. It then shows me the conversion unit which I cannot edit and the site to source factor. The default factors in this tool are based on the SEP Measurement and Verification Protocol. You can edit these if you'd like—I will not for this demo.

When I click "convert," it gives me an extra column with units in MMBtu after it. I can edit this column header if I'd like to. Now I have my electricity data in units of MMBtu and it's been converted from site to source. I could repeat the step for natural gas; however, it's already in units of MMBtu. If I want to check to see if I need to convert it from site to source, select "Natural Gas," purchased fuel, it's currently in MMBtu, and my site to source conversion factor is one. That means that if I did this conversion it would just multiply it by one. I can just leave this column as-is.

In the next step, I can decide whether I want to use my actual data or use regression analysis to calculate my performance indicators. For this demo, I'll use "Use Actual Data." For the next demo I'll use

regression analysis. For “Use Actual,” I have to select my inputs. This is asking you to identify what the columns are. In this box, I’m going to select my energy sources. I’m only going to select those energy sources in units of MMBtu. This stuff can be tricky, so I encourage you to look at the user manual if you have questions on it. It provides instructions on what to select in each box. For production, I’m going to select “Production.” I don’t have my building’s square footage. If I did, it would show me my energy use per building square feet each year. Finally, I select my baseline year. In this case it is 2007—I could select 2008 if I want but will stick with 2007. Then I click “calculate” and it runs three of my equations.

These are my outputs for “Use Actual.” It’s given me a breakdown of energy use by fuel type, total energy use, intensity, and then you can see here the inputs required for the Better Plants annual report form. I have my total improvement, annual improvement, and total savings since baseline year. Down here, I have plotted my total energy use versus time. Over here, I have my production energy intensity, my annual improvement, and total improvement. That is how to use the “Use Actual” feature.

Now I’ll give a demonstration of how to use the “Use Regression” feature.

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For “Use Regression,” I have a fake plant in McLean. In this demonstration I will show how to use the tool to calculate performance indicators while normalizing for variables such as weather and production. I’ll start again by doing the ENPI Wizard after I open up my file.

[Demo of Use Regression]

For this demonstration, again I have my data already in my workbook. I had it already formatted as a table. I’ll still go through the step-by-step wizard; however, as you become more familiar with the tool you can start using the shortcuts that are located at the top. If you want to quickly convert unit, you can jump to here (“Convert Units”). If you want to quickly label your reporting period, you can jump to here. If you want to quickly calculate performance indicators using actual data or regression analysis, you can use these.

Select “My Data is in the Sheet.” It’s already formatted as an Excel table, so I can go to the next step. Now I need to label my reporting periods again and don’t have my reporting period column. So I click on here. So next I need to select the first date of the baseline year. This data set is reporting on a fiscal year. So, the first month of my baseline year in the first row is April 2007. Then I select my interval—I’ll go “monthly.” And then my label—in this case, since I’m reporting on a fiscal year, I will select “Fiscal Year.” I’ll then select “Label Reporting Period.”

What this has done is it’s created the “Period” column. Every 12 data points have been assigned to a fiscal year. So, Fiscal Year 2 starts in April 2008 and Fiscal Year 3 starts in April 2009. If I wanted to, I could change this column so I could use different labels. All I have to do is just edit it like this.

To save time with this data set, I’ve already converted my units. I have my electricity in source and units MMBtu. I have my natural gas in source and units MMBtu. So, I’m going to skip this step. Now, instead of using actual data, I’m going to use regression analysis. This box will look very similar to the one that you will see when you select “Use Actual.” Like in the “Use Actual,” for my energy sources I’ll select electricity and natural gas. If I had converted in my previous energy sources in units of kWh or whatever they were formerly in, they may be listed in this box but I would not select them. I would only select the

columns I want to use on my energy analysis. For my variables, I'm going to select "Production," "heating degree days," and "cooling degree days." For this box, I'm going to select any of the boxes that contain data that might affect your energy use—I could have humidity or employee hours. In this box, I select my production. Production must be selected in both locations. Up here, it is used as a tool to use in regression analysis. Down here, it's telling the tool what to use to calculate my intensity. If I like, I don't have to select this, but for the purposes of this demo I'll select "Production." I don't have building square feet , so I won't select that, but I will select my baseline year. Now it shows me what my model years can be—I could select my baseline year, which would be forecasting; my middle year, which would be chaining; or my final year, which would be backcasting.

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On this slide, I have a table that shows what forecasting, backcasting, and chaining represent. For forecasting, you use the baseline year to develop a linear model, which is used to normalize your current reporting year. If you select "backcast," the current reporting year is used to develop a linear model to normalize your baseline year. If you select "chaining," you would be selecting a middle year which would be used to develop a linear model used to normalize both your baseline and your current year.

[Demo of Use Regression]

For this example, I'm going to do forecasting and have my baseline year be my model year. I click "calculate" and it runs through different regressions, creates a model for each year for each energy stream with each combination of variables. It creates a model data sheet, which shows me my original data, model data, and then an EnPI results sheet which shows me my metrics that are required for the Better Plants Program and an SEnPI sheet which shows me metrics required for the SEP program.

The number of outputs depends on the number of energy streams you have. If I had three energy streams, I would have three sheets plus my model data, EnPI results, and SEP results. In this case, I only have electricity and natural gas, a sheet that shows me the models for each of these energy streams, and model data tab that shows me all of my original data, adjustment method, and modeled data. If you click in here, you can see the equations that were used to develop the model data. What these sheets show are all of the different combinations of variables that can be used to develop a model based on the year that was selected for the model year, if the model is appropriate for SEP, variables included, variable p-values, R^2 values, your model p-value, and the formula. It also shows you plots of the variables versus the energy stream and a comparison of your actual data and model data.

For the model to be appropriate for SEP, the overall p-value needs to be less than 0.1. All p-values need to be less than 0.2, while at least 1 variable p-value must be less than 0.1 and the R^2 has to be at least 0.5. The tool looks at all of the models that fit this and ranks them based on the R^2 value. It also states whether or not the model is appropriate for SEP and has the highest R^2 value. It does all of the calculations based on the default model selected for each energy stream.

I can change the model if I want to try something different by selecting "Change Models." Note that I have to be on this sheet to use this feature—I have to be looking at the model so the tool knows which model I am considering. The dropdown shows me the different models I can select. In this case, I select "Production." I click "Switch Model" and now on "Electricity" I only have production in my equation. My EnPI results have been updated to use this equation. If I scroll down here, I notice that the equations that were used have been updated to only show production. That is true for the SEP sheet as well.

If I'd like, I can restore back to my default or pick a different model. I am going to switch back to the production, heating degree days model –now I have production and heating degree days back on the model data sheet. If I go down here, I also have production and heating degree days.

In this sheet, like the "Use Actual," I have the outputs required for the Better Plants annual report form, a plot of the model values and total actual energy use, production energy intensity, annual improvement, and total improvement. I also have a table that shows me which models and regression statistics were used to calculate these data. For the SEnPI Results, I have the actual data, model totals, SEnPI cumulative, cumulative improvement, annual improvement, and annual savings. The plot on the left is the same, but over here I now have the SEnPI cumulative, annual improvement, and cumulative improvement plotted. I have this table again.

If I ran this and was not satisfied with any of my models, I could try a different model year. Within the same workbook, I can go back to "Use Regression", decide I want to use "Chaining," and click "Calculate." The tool will give me the results with Fiscal Year 2 as my model year. This way, I can compare the results with a different year selected as the model year. Now my model year has changed to Fiscal Year 2 and I have my results and models.

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For my final demonstration, I'll show you how to use the corporate roll-up feature. This feature can be used in an existing or new workbook. For example, in the workbooks I just used to determine my plant-level results, I could use that same workbook to determine my corporate-level results by rolling up the plant-level data from multiple facilities.

[Demo of Corporate Roll-up]

For this example, I will start from a blank workbook to make it simpler. To use this feature, you have to run the tool on each of your facilities. If I had four facilities, I would have to take the data from each facility and run the tool to get each result. The label that I used for my period would have to be the same for each of those plants. If you would like the sheet name to carry through the corporate-level results, rename the sheet that the plant-level results are on with the name of that plant.

Let's start by opening up the "Corporate Roll-up" feature which gives me this window, which is the only window I'll need to run this feature. If I don't already have my plant-level data in the workbook, I need to "import it." For this demo, I've created four sample plants. I've run the tool for each of these plants, which use the same label for each period. I will select all of these and then open them.

Here, it shows me the sheets that were shown in each workbook. If I had run three different regressions for my Hastings plant, I would have three options here for the one workbook. For this example, I've only run one regression for each plant in each of the workbooks that I've selected. Now I select the sheets that I'd like to import—I select all of them and then "import" my data.

This creates a sheet for each of these facilities. They include original and model data. There are a few extra columns that will be used for the calculations for the corporate roll-up. Now I can select which plants I want to include in the roll-up. The names appear in here with the sheets labeled as plant names. Now I will "create my report."

It's brought the results from each facility into this sheet. It has also carried over the sheet name so I can see the Hastings, McLean, Minneapolis, and Rochester results. Down here, I have my corporate totals. You'll notice the labels align with the Better Plants Program—this includes total energy use, my adjustments, annual improvement, total improvement, new energy savings, and total energy savings. That is how the corporate roll-up feature works.

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That is all I have. I apologize for the technical difficulties with my phone at the beginning. I will now pass this over to Andre.

Andre de Fontaine: Thank you, Ashly. That was great. This slide in many ways is a repeat of what Ashly just showed. The important thing to note is that the tool is designed to line up with our program. As Ashly demonstrated, the outputs that you get by running the tool line up with what we ask companies to report through the Better Plants and also SEP. Not only are the outputs what the program calls for, but all of the equations follow the SEP Measurement and Verification Protocol and verifies that the model regression statistics line up with the SEP requirements. One point that I would make is through Better Plants we do not mandate the use of a particular tool—there will not be a requirement for people to use EnPI for the program. We think it is going to be very helpful and would encourage companies to take a hard look at this tool and use it if they think that it makes sense for them. If you have an existing methodology or system that is working for you it is fine to continue to use that, though we do believe the tool is going to provide a lot of value and perhaps lead to more accurate results and simpler reporting process for companies. Next slide, please.

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Lastly, here are some additional resources. We talked about a few of these. When you go to the download page for the tool, there is also a user manual that's available to help walk through the steps in some detail. We do have general background information on the Better Plants Program and SEP—the links are there. The SEP Measurement and Verification Protocol is also available online. We are going to be making a recording of this webinar available on the website. You'll be able to go and watch the demo again if need be. For companies in the Better Plants Program, your Technical Account Managers will also be available to help troubleshoot use of the tool and assist in interpreting results.

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I think that covers it for our presentation today. At this point, we're going to open it up for questions from our participants.

Lindsay Southerland: Thanks, Andre, and thanks also to Ashly for taking time out to go over all of this information. So far, we've received two questions. The first one builds off of what Andre was just saying about how to access specific information. It will be made available on the eCenter as well as an email tomorrow, approximately 24 hours after this, which will provide a link for you to view the webcast in real time. Please be on the lookout for that. If you refer back to the link sent earlier, you'll find the EnPI tool's landing page which has all of the information on installing the tool as well as the user guide.

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Now to get into more specific questions—we've got a couple more that have popped up. The first one is from a participant who has asked whether energy production data are available on the daily level and was wondering whether or not this model has some sort of functionality or automated element that would allow the conversion of daily data to perhaps weekly or monthly. That way, he can avoid doing a manual roll-up.

Ashly Spevacek: The tool doesn't have that feature right now, but I'm sure there's a way to use Microsoft Excel to enter an equation in to roll up every seven rows.

Lindsay Southerland: Is that something that is being considered for a future iteration?

Ashly Spevacek: Certainly. We always welcome feedback and anything we don't have in the tool now, we are still recording and considering for analysis for whenever updates are done. To that level, if they do have daily data they can still do the roll up using those data. It might take a little longer to run it, but you can in the period column, as long as you have the year grouped together, use daily data if you'd like.

Lindsay Southerland: Thank you. How often is this tool updated?

Ashly Spevacek: If we encounter any bugs that prevent the user from moving forward in the tool, we will address those right away. We don't have a maintenance schedule set up yet but will be setting one up to address minor bugs. I'll let Andre take the rest of that question.

Andre de Fontaine: I don't think we know yet. That's probably going to be driven in part by the feedback that we get on the tool and whether we feel that major changes or improvements need to be made. As Ashly mentioned there are certain maintenance activities that will be made as they come up, but in terms of major new features, we're just going to have to look at what our priorities are, budgetary considerations, timing, and how important we think those changes are—we don't have a set schedule for that.

[Flipping through of Slides]

Lindsay Southerland: Thank you. Our next two questions have to do with variables. The first one: Is there a limit to the number of variables that can be evaluated?

Ashly Spevacek: I've done regressions with up to eight, but there is no limit. The more variables entered, the longer it takes to run because it looks at the regression statistics for every combination of variables—the more variables you have the more combinations you have.

Lindsay Southerland: Great! The second question: If you select regression analysis but do not satisfy any of the regression criteria for the variables, does the tool default to actual data?

Ashly Spevacek: It doesn't—not right now. If it goes through and tells you that none of the models fit for SEP, it doesn't default to the "Use Actual" application. You can just return to the entry page and run the "Use Actual" in the same workbook.

Lindsay Southerland: Great; thank you. The next questioner is wondering what the source was for the HDD and CDD data.

Ashly Spevacek: The dataset used for these data here I've been using for about a year now. I'm not quite sure what the source was, but there are multiple sources you can use to get these data. For SEP, it is recommended to use NOAA. On the EnPI landing page there are a few sources that you can go to to get these data. There are other websites sponsored by universities that offer HDD and cooling degree data, and links to those websites are included on the EnPI landing page. If you are interested in participating in the Superior Energy Performance program, you're recommended to use NOAA as your source.

Lindsay Southerland: Great; thank you. We've received a couple of compliments, so I wanted to pass those your way. The last question I've received is how someone would go about getting a tutorial or more information for their company.

Ashly Spevacek: For more information, there is the user manual which is located on the EnPI landing page. That is pretty detailed. If you have any questions after that, I'd encourage you to tell me so I can update the user's manual to be clearer. There is also going to be a recording of this webinar. You can also certainly email me and my email address is shown here. I'd be happy to answer any questions that may come up.

Andre de Fontaine: Ashly, this Andre. I think for companies that participate in DOE's Better Plants Program, this is a role that your Technical Account Manager can play. All of the TAMs are familiar with this tool and have these slides. So they can set up a webinar with the corporate energy manager and whichever plant managers you want to bring in to the call to do a similar type tutorial.

Lindsay Southerland: That appears to be it for the questions that we've received. Once again, I'd like to thank our presenters today, Ashly Spevacek and Andre de Fontaine, for going over this information. You'll be able to find the user manual and the landing page by clicking on the link I sent through the chat function as well as a reminder email that will come out within the next 24 hours. The link to the recording will also be included in the email. Those of you that have access to the eCenter should be able to find the recording there later on today. Thank you all so much for spending time with us today and again if you have any questions, please feel free to contact any of the folks on the screen. I hope you all will have a great rest of your afternoon.