CLEAN ENERGY SOLUTIONS CENTER
ASSISTING COUNTRIES WITH CLEAN ENERGY POLICY

# Portfolio Analysis with RETScreen

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Webinar Panelists


**Dinesh Parakh** RETScreen International
**Kevin Bourque** RETScreen International


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**Katie** — Welcome to today's webinar, which is hosted by the Clean Energy Solutions Center in partnership with Canned Net Energy. Today's webinar is focused on portfolio analysis with [inaudible] screen. Before we begin, I'll quickly go over some of the webinar features. For audio, if you have two options, you may either listen through your computer or go over the telephone. If you choose to listen through your computer, please select the mic and speakers option in the audio page. Doing so will eliminate the possibility of feedback and echo. If you choose to dial in by phone, please select the telephone option, and a box on the right side will display the telephone number and audio PIN you should use to dial in. If anyone is having technical difficulties with the webinar, you may contact the go-to webinar's help desk at 888-259-3826 for assistance.

If you'd like to ask a question, we ask that you use the questions pane where you may type in your question. If you're having difficulty viewing the materials through the webinar portal, you'll find PDF copies of the presentations at cleanenergysolutions.org/training, and you may follow along as our speakers present. Also, the audio recording and the presentations will be posted to the Solutions Center training page within a few days of the broadcast and will be added to the Solutions Center YouTube channel, where you'll find the other informative webinars as well as video interviews with thought leaders on clean energy policy topics. Finally, one important note of mention before we begin our presentation is that the Clean Energy Solutions Center does not endorse or recommend specific products or services.

Information provided in this webinar is featured in the Solutions Center resource library as one of many best practice resources reviewed and selected by technical experts. Today's webinar agenda is centered around the

presentations of our speakers, our guest panelists, Dinesh Parakh and Kevin Bourque who have joined us to discuss the portfolio analysis module of RETScreen Expert. Before we jump into the presentations, I'll provide a quick overview of Clean Energy Solutions Centers. Then following the panelist presentations, we'll have a question and answer session where the panelists will address questions submitted by the audience. At the end of the webinar, you'll be automatically prompted to fill out a brief survey as well. So thank you in advance for taking a moment to respond.

The Solutions Center was launched in 2011 under the Clean Energy Ministerial. The Clean Energy Ministerial is a high-level global forum to promote policies and programs that advance clean energy technology, share lessons learned, and best practices, and to encourage the transition to a global clean energy economy. Twenty-four countries in the European commission are members, covering 90 percent of clean energy investment in 75 percent of global greenhouse gas emissions. This webinar is provided by the Clean Energy Solutions Center, which focuses on helping government policymakers design and adapt policies and programs that support the deployment of clean energy technologies. This is accomplished through the support and crafting and implementing policies related to energy access, no cost expert policy assistance, and peer to peer learning and training tools, such as this webinar.

The Clean Energy Solutions Center is cosponsored by the governments of Australian, Sweden, and the United States with in kind support of the government of Mexico. The Solutions Center provides several clean energy policy programs and services including a team of over 60 global experts that can provide remote and in person technical assistance to governments and government supported institutions, no cost virtual webinar trainings on a variety of clean energy topics, partnership building with development agencies, and regional and global organizations to deliver support in an online library containing over 5,500 clean energy policy related publications, tools, and videos and other resources.

Our primary audience is made up of energy policymakers and analysts from governments and technical organizations in all countries. What we strive to engage in with private sectors, NGOs, and civil society. The Solutions Center is an international initiative that works with more than 35 international partners across its suite of different programs. Several of the partners are listed above and include research organizations like Irina and the IEA and programs like See For All and regional focused entities such as Equal Watt Center for Renewable Energy and Energy Efficiency. A marquee feature of the Solutions Center provides is the no-cost expert policy assistance known as Ask an Expert. The Ask an Expert service matches policymakers with one of more than 50 global experts selected as authoritative leaders on specific clean energy finance and policy topics.

For example, in the area of renewable energy policy, we're pleased to have Toby Couture from E3 Analytics serving as one of our experts. If you have a need for policy assistance in renewable energy policy or any other clean energy sector, we encourage you to use this valuable service. Again, this

assistance is provided free of charge. If you have a question for our experts, please submit it through our simple online form at cleanenergysolutions.org/expert. We invite you to spread the word about the service to those in your networks and organizations. Now I'd like to provide a brief introduction for today's panelists. First up today is Dinesh Parakh who manages strategic partnership, communications, business development, and training in capacity, building for RETScreen International at Natural Resources Can Met Energy.

And for our second speaker today is Kevin Bourque, who is part of the development team of RETScreen Clean Energy Management Software, and with those brief introductions, I'd like to welcome Dinesh to the webinar.

**Dinesh S. Parakh** Thank you very much, Katie. Let me just get my screen here. Can everybody see that slide? Katie, can you see that okay?

**Katie** Yes, I can. It looks great.

**Dinesh S. Parakh** All right, so good morning and good afternoon and good evening to all of you. Welcome to everyone from around the world, and thank you for making the effort to attend this webinar today. So this is the latest in a series of webinars on the RETScreen Clean Energy Management Software provided as part of Canada's contribution to Solutions Center's Ask an Expert service. I am first going to provide a very brief overview of RETScreen International and the portfolio analysis capabilities of RETScreen Expert. Following this, Kevin Bourque who is a project engineer for RETScreen International will do a live software demonstration of the portfolio analysis module of RETScreen Expert. Before we get into portfolio analysis, however, I'd like to provide a quick introduction to the RETScreen software for those of you who may not be familiar with it. RETScreen is the world's leading clean energy decision support tool. It handles energy efficiency, renewable energy, and cogeneration, and is available in 36 languages covering two-thirds of the world's population. RETScreen's mission is to empower cleaner energy decisions worldwide. We have 525,000 users in every country and territory in the world growing at a rate of about 50,000 new users every year.

At least 900 universities and colleges are using RETScreen for teaching and research, and RETScreen has been responsible for well over $8 billion in direct user savings since 1998.RETScreen is developed by the government of Canada with the contribution of numerous partners, including Ontario's independent electricity system operator, the renewable energy and energy efficiency partnership based in Vienna, NASA, the United Nations Environment Program, and the global environment facility. Now the next generation of the software, RETScreen Expert, was released in 2016. And here is the homepage of the new software. So, RETScreen Expert is a clean energy management software system for clean energy project feasibility analysis and ongoing energy performance analysis.

So this homepage summarizes the different types of analysis that can be done in the software, including benchmark pre-feasibility. So here is the benchmark here, feasibility and pre-feasibility and performance analysis.

These other types of analysis have been covered in previous webinars, which can be accessed on Solutions Center's YouTube page. Today, we're going to look at the portfolio analysis module in detail. So the portfolio analysis module allows the users to manage a number of facilities at a glance. This can be anywhere from two facilities to tens of facilities or hundreds. Even thousands of facilities can be included in one portfolio in RETScreen Expert.

The portfolio analysis module includes a number of features that allow a user to compare and rank buildings, quickly obtain and share statistics, create sub-portfolios, manage multiple facility types, and manage multiple project categories. Rather than continue to describe the module, I'll now turn it over to Kevin for the life software demonstration. And just a reminder before I turn it over to Kevin that the software can be downloaded at our website for free, www.RedScreen.net, and there will be time for questions and answers at the end of Kevin's presentation, so please go ahead and submit your questions as they come in in the question pane. With that, I'll turn it over to Kevin. Kevin?

**Kevin Bourque** Can I be heard? Does anyone hear me?

**Dinesh S. Parakh** I can hear you.

**Katie** Yes, Kevin.

**Kevin Bourque** Sorry. Thank you very much, Dinesh. So we're going to jump right into the software with RETScreen. So I have the software open up here on my screen in front of you. So up until now, you may have used RETScreen for individual project analysis, but today, we're going to walk through the RETScreen portfolio analysis module together, and I hope to show you how it can enable you and us energy professionals to manage many facilities. We can use it to look at multiple energy efficiency measures in a single residential building all the way to a portfolio comprising of thousands of buildings and factories and power plants all around the world.

I hope to show you how you can use RETScreen as a comprehensive tool to help you and your organization achieve energy related investment goals. So today, we're going to be hands on in a portfolio analysis with RETScreen Expert, and together we'll be able to get an idea with the first types of information we can analyze when we look at a group of clean energy projects as opposed to a single energy project. We're going to create a portfolio and then look at how we can dive into the data. So here on the homepage, this workflow diagram in the middle, this circle, shows how you can move from one phase of an energy analysis to another within any given particular project. This project lifecycle flow chart shows different types of projects you can do with RETScreen, and each project you can do will fall into one or more of these areas on the graph. As an aside as Dinesh mentioned, each of these parts of the circle, such as the feasibility study and performance, et cetera, are covered in other videos, which are on the Solutions Center YouTube channel and also linked to directly from within the RETScreen software on the help page.

So in RETScreen's portfolio analysis, it's as if we're stacking this—these circles one on top of each other. We're going to be looking at multiple projects. We're going to look at how you can take several of these projects and analyze them as a group. So for example, you may have several buildings, say schools as part of a school board or maybe manufacturing facilities for an industrial company where you're going to be doing monitoring and verification and performance analysis, for example, and you can aggregate all of these performance analysis including the energy consumption prediction, the regressions, and look at them through the lens of a portfolio for a group to compare and contrast them, one against the other.

You could also, for example, have several power projects as part of the power generating portfolio, or maybe you have several energy efficiency projects either planned or in progress on multiple buildings, and you could analyze all of these together to tease out which projects are the most promising or conversely, which are the most at risk. So, on the right hand side of this circle, we have the different facility types. So not only can you do individual projects here, but we can also have portfolios of these types of projects. So we can have portfolios of power generating plants. We can have portfolios of industrial factories and manufacturing, of commercial institutional building. So schools or hotels or shopping centers.

Portfolio of residential buildings, agricultural facilities, or even user defiance. A street lighting project. You can also have a portfolio with individual measures, so here is a picture of a solar water heating system. If you work with or subsidize or sell solar water heating systems, you can have a portfolio of all the projects you have a stake in and compare them to one another either from the performance standpoint or from their financial viability on a feasibility standpoint. On the left hand column as Dinesh said, we have the different types of analysis you can do for an individual project. So we have benchmark projects, feasibility projects, performance projects—and of course you can have all of them. And the last item here in my portfolio is where we're going to be spending our time today. This is where we aggregate everything above and have a portfolio of multiple projects. So when I click on this, I get to the open portfolio screen here, and this is where I can create a new portfolio, I can open an existing portfolio or access some of the examples we have.

This is—I have already loaded something up, and I'm going to go right now to the portfolio page. You'll see the tabs on the top of this software are different, and so if I click on portfolio, this is where you can add and group your projects into logical categories. You need to have previously done RETScreen projects and saved the file and added them to here, or had someone who has done a project send you the RETScreen file. You can think of this My Portfolio section as a database. It's made up of individual facilities which are analyzed in RETScreen. Additional facilities can be added to the portfolio database by clicking on the button import at the top, and we'll get to that in a moment. You also see that on the left menu, which is called Group, I've created different sub-portfolios or sub-groups, allowing me to group and

compare across different facility types or geographic regions or divisions, et cetera.

The main view on this screen here shows the currently selected group of RETScreen files. So I've selected All here, and there's 17 facilities, and so this is a portfolio of 17 different facilities. You'll see that we have a lot of descriptive data for each of these files. And remember, each of these lines, each of these files is a separate RETScreen analysis, a separate facility. The columns at the top show the different descriptive data for each of these projects. So the facility name and type, the description, facility size, and some information about where it is. There's also other columns that you can have. For example, you could have it by division or the status or the date that this file was last modified, and so on. The right most column allows you to see an image of the project currently selected.

And so you see here is a hospital and here is a wind farm. So I'm showing here that you can have multiple facilities and multiple different types of facilities all within the same portfolio. If ever you need to remove a project, you can click on this garbage can icon here to remove it. Lastly, these files are located in a physical place, and this file icon can open up where they are on your computer. So just as an example, you'll see that here are the original dot red files, the RETScreen files where this portfolio- that make up this portfolio. If you double click on any of these projects, you'll open that project in a separate instance of RETScreen and edit it, if that file is available to you.

Just to maybe reinforce what I've been saying, I have here on a help menu this file format dialogue, and when I bring that up, here I'm showing how the portfolio is constructed. So right now, I'm up here in a portfolio, and the portfolio links to and is made up of individual RETScreen facility files, project analysis. And you'll see that the portfolio doesn't need to be static, so over time you may acquire or build new projects. And you can add facilities to an existing portfolio. So a portfolio is not static and can be dynamic as you add or remove projects from your portfolio. Another thing you can do is you'll see here in the province and country column that these projects are geographically diverse. In the menu, if I click on the Show Map button, the Show Map button will bring up a map which shows me the location using these colored icons on the map of everywhere where these projects are. So for example—and if you hover over any of them, you'll get a quick thumbnail sketch of what that project is. So here is a laboratory in Quebec, and here for example is wind powered project in Ontario and so on and so forth.

I'm going to close the map now, and I'll focus here on the left hand side where we have these groups. So you'll see here that I have a group. We're looking at all of them, but I also have sub-portfolios or sub-groups. So if I click on, for example, commercial, I will—this one is only the commercial institutional buildings in my portfolio. Or if I click on green power, we'll see just the power projects in my portfolio. Same again for office and laboratory. These are just the offices or laboratories in my portfolio. So how do you create these sub-groups? I'm going to click on settings and you can see that we get this simple dialogue where we name our group. You'll see I've named

it office laboratory, and we have conditions on the over- on the complete portfolio list under what conditions we'll include a facility in this sub-group.

So here is if the description has the name laboratory in it and a facility size is greater than 5,000 square meters. So this sub-group has those in it. Now the next thing you might want to know is how would I add a project to this portfolio. So we have 17 buildings, and maybe we have a new building that we've acquired or that we're interested—we have data on, and we'd like to add it. So to do that, we'd click on Import Red File, and we'd select the file, and before I do that, I'm going to prepare this file. So the file I prepared is this hospital here, and this hospital is in Detroit. There's two very important steps that we need to do to prepare this file for the portfolio. So this is we're doing a performance analysis here, so we're doing energy tracking, monitoring, and verification of the energy bills for this hospital. You only need to do these steps if you're doing performance analysis.

We need to—I've done this project previously, and we need to now prepare for the portfolio, and the first step is in data, under the summary consumption section, we need to prepare the data to tell RETScreen what we want to use in the portfolio. So you can see here I've already collected data. I have temperature data and natural gas and electricity and so forth, and now we need to prepare this to tell RETScreen what's needed and summarizing and telling RETScreen what is important. So if I click on the summary consumption button here, I get this dialogue. And this dialogue allows me to tell RETScreen what data—specifically what energy data I want to use in the portfolio. So you'll see at the top in addition to energy data you can have emissions and cost data.

For now, I'm going to remove cost because we don't need that. And so for the emissions, I'm going to first look at the data table natural gas, and I know that in the column called fuel consumption, I have natural gas there. And you'll see that you get to tell RETScreen here exactly what fuel type you have. So we have natural gas and all sorts of units and propane and even district energy, district steam and hot water and cool water systems. And all sorts of bio-masses. So, this column is in natural gas, and the unit is in million BTU, and RETScreen will calculate for us the conversion factor, and the emissions factor for that. Now I also have electricity in this table, so I'm going to click on Plus, and now I'm going to select the next table. The next table is Electricity.

And I have the column is called Electricity, and the fuel type here is also called Electricity, and the conversion factor for electricity is one kilowatt hour for every kilowatt hour, and the emissions factor, which is taken from the location. So this is the emissions factor for Michigan. Next thing I get the chance to do is I can now filter this data. So I can now filter this by year, by quarter, by month, even week or day. I'm going to filter this by month, and on what basis do I want to calculate these months? I can calculate it on a fiscal year or calendar year basis.

In my case, I'm content with calendar year, so I'm going to click that. Just to summarize what we've done here, we've taken each of the fuels we want to bring into the portfolio, we said where to find them, what kind of fuel they are, and how to convert them into an equivalent energy base unit, into a kilowatt hour. Now once I do this and click okay, RETScreen is going to create this table where it's aggregated all of this together. So in Step 4 of this data worksheet, we've created a consumption, production, or user defined, if you want, summary table where the data is converted into equivalent units, and we grouped it by either year or quarter or month or week. And when your data is grouped, the values and the columns are aggregated. So the columns in the original sheet now are aggregated.

You can then track the performance of the consumption using the performance tracker if you want, and this is a key step to let you compare multiple projects in the portfolio analysis. You can also use this table in the analytics section to plot graphs and/or do regressions on this table as well. So just to see what we've got here, we now have our natural gas for each month. We have also the electricity for each month. You'll notice that the units are now the same. They're energy units. We've converted this fuel into energy, and now we can sum the energy. So we have a total energy for each month, and we do the same for the natural gas emissions and emissions associated with electricity consumption and we can sum the total emissions.

So for each month now, we have the energy, total energy, and total emission, as well as a breakdown by fuel. Next, we need to do the same thing with our weather normalized model, with our regression analysis. So now that we've prepared this, we know what fuels we're dealing with, we'll now look at our regression and aggregate that as well. So if I click on analytics, you'll see here I have different dashboards and different regressions in analytics. But once again, in the portfolio section of the menu, I have this tool here called Predicted Bar Actual Summary, and I can create a consumption summary, just like we created a consumption summary on the data page. I can create a consumption summary for my models, for my regression. When I click that, we get a similar looking dialogue. Right now, I say we know what fuels we have prepared. We have natural gas and we have electricity, so you'll see that we have the two fuels that we took the time to aggregate on the data page. So for the first one, natural gas, RETScreen is asking me which regression that uses natural gas do you want to use to calculate your predicted values. Which baseline do you want to use? So the regression I want here—in my case, I'm going to take natural gas before. So there were some energy efficiency measures done on this building, and I want my baseline to be before those. So the predictions will calculate the savings. In addition to natural gas, I have electricity.

So I'll click on Electricity, and now you'll see that which regression analysis has electricity. So there's two regressions that have used electricity, and I'll click on the before one. You notice that if I have duplicate fuels—we can't—to avoid double counting, RETScreen will not let you have—use the same fuel twice, so each has to be use only one regression, and RETScreen will warn you if it notices that you have previously selected that fuel in this

summary table. So now I'm going to remove this by clicking minus. Now I have the fuels that I want and the regressions that they come from. So I can click on this button, okay, and RETScreen once again will create my summary table.

So the monthly predicted and actual consumption in equivalent kilowatt hours for each fuel type selected as well as the totals are calculated and displayed in the summary table. So once again, let's look at what we have. We have for each month—we have the predicted natural gas consumption, predicted by our regression, by our equation. We have the actual natural gas consumption, and then we have the same thing for the emissions, the predicted and actual emissions. Then for the other fuel as well, which is electricity, the other consumption unit. So we have predicted and actual electricity consumption and predicted and actual emissions for associated with electricity.

And if I move all the way to the right on this table, we now have the total. So we have the total predicted based on the regression, two regressions that we have. And the total actual energy. We have the total emissions predicted and the total actual emissions. So now that I have this information, I need to—I've prepared this file. It's now ready to be added to my portfolio. This is a very important step. So I'm now going to save this file. I'm going to go to file, save, going to save it here in my directory, and now, I'm back in my portfolio. So now I'm back in my portfolio RETScreen, and I want to add that file, that Detroit file. So now I click on import. I'm going to pick this file, which I called Detroit, and you'll see it will appear at the bottom here. And here is the file that I have. Notice now that my group has 18 files. So I have—this is how you add a file to your RETScreen portfolio.

So now that I've successfully added and I have sub groups, now I want to start looking at what these sub-groups contain, what these portfolios—what do I have in them. So I'm going to go to the next tab in the portfolio analysis of RETScreen, which is called dashboard. Now with a populated database, we can enable a portfolio wide analysis dashboard. So this dashboard can be configured to conclude the results of benchmark, feasibility, and performance analysis for the individual facilities in the portfolio. And this dashboard lets us consolidate the results to readily track energy consumption or production as well as the cost in greenhouse gas emissions, all of which we can sort into facility type, fuel type, country, et cetera, and we can use these results to report key metrics to various stakeholders.

So you'll see here that I've already selected one. I have some dashboard views and graphs prepared, and let's see what we have here. So on the left hand side, you see that in—I have—can do portfolios, dashboards for benchmark analysis, and different sub-groups within those. You may recognize those from the previous page where we had green power and commercial. We can have it for feasibility analysis, and also for performance analysis. When I select one of these views, the—that dashboard view and its table are shown in the main part of the window. So you'll have—we have the chart on top and the data which is used to draw that chart that makes up that

chart is always below. So let's start looking at what we have. So I've selected here—so on—I'm looking at performance analysis types of projects.

I'm looking at the sub-group of office laboratory, and I'm looking at a consumption summary, I'm looking at the fuel consumption grouped by facility name. So let's break that down and see what we have. We have the consumption summary, the fuel consumption for each of these facilities for each year. So you can see that the fuel consumption for this sub-portfolio, the total fuel consumption was almost 18 million kilowatt hours in the year 2006/2007, and the next year was a little 17,700,000 and so on and so forth down the line. You can see when I hover my mouse over any of these bars, I get a quick thumbnail with a little summary of the data that makes up that part on the chart. And this data comes from the table below. So if I look at this year, 2009/2010, you'll see the total is 17,390,000, and if I go to 2010, you'll see that data point comes from here.

And the various parts of that bar graph come from this table. You'll see that we have the total number of facilities, the total facility size, the total square footage or square meters of the surface area as well as the consumption of each individual facility and their aggregate total. We also calculate the energy use intensity and the kilowatt hours per facility. The average use intensity. So how do we get a graph like this? So the way you would get a graph like this is using the menu here, we can create new benchmark, new feasibility, or new performance dashboard views. For any of them, if you have them selected and click on format graph, you get the same dialogue. I'm going to now look at how we went and created it. I'm going to spend some time here on this dialogue because you will need—we'll see this over and over, and this is sort of the main control center of performance analysis dashboard.

Within the portfolio analysis in RETScreen. So the first thing on this dialogue is we're asked to give a name for our view. And on the left hand side here in this box, we're asking what you want to graph, and below it, how you want to graph it. On the right hand side, we asked when you want to graph it, what periods you want to graph, and are there any exceptions or conditions or filters that you want to apply. So let's go through this step-by-step. For this graph I have here, I have a consumption summary. So this is what we created in the data and analytics page in that Detroit file. So we created a consumption summary. We want to look at fuel consumption. We could also look at fuel cost or GHG emissions. And in this case, we want to look at fuel consumption and the base energy unit, we want to be a kilowatt hour.

Since we took the time before to specify the conversion factors, and all energy units are now in a base unit, we now can convert them all to a common energy unit. Now do we want to look at the energy per unit of square foot or per employee or facility size? You can do that as well, or—so an energy intensity view. And you can also compare that value to a benchmark, a baseline or base case, to a target that you've set, a corporate target or facility or portfolio target, and you can also compare it to a predicted value. We'll get to that in a moment. So what am I graphing? I'm graphing the consumption summary, the fuel consumption for my buildings and

kilowatt hours. The next thing is how I want to graph it. So, RETScreen allows you to show this on an annual bar graph or a moving graph. So say a moving average or a rolling total.

I'm going to leave it on an angle bar graph, and we can either have it as a bar graph or a stacked bar. So this is the what and now the how. Now let's see what we're going to—if there's any exceptions or what periods we're going to do. So on the right hand side, the filter, you'll see here are these sub-portfolios, these groups that I have on the portfolio page. So we could apply this to the whole group, to just the commercial building, to just the offices and laboratories or the green power laboratory. I'm going to select. And how do I want to group this by facility name or fuel type or maybe by country or division? I'm going to put this as facility name. And do we want to consider all the fuels or look at just a single fuel within the list of fuels that are used and consumed in these buildings? I'm going to look at all of them for now.

Now the next question is when do you want to look. Do you want to look at it over a fiscal year or calendar year? And do you want to look at, for example, the last five years or do you want to set a begin and end date? So in my case, I want to have a begin date, April 1, 2006, and look at ten years' worth of data. So when I click on okay, the graph I get is the one we have here. So now we understand a little better what we're seeing. We're seeing the total energy consumption, total fuel consumption in standardized units, which are kilowatt hours for all these buildings.

So now that we have this data, we can start asking questions of this sub-portfolio. So we could say which facility is consuming more energy. So looking at this graph, we can see that this green bar and purple bar are definitely bigger than the others. And if we hover over any of them, we can see for each year which one of these facilities consume more. So one of them is called—the Quebec one is called—is green, and the purple one is called Edmonton, and we can see over the years, they change. This data is also reflected down in the table below, and we can see and get an intuitive sense that the Quebec facility sometimes consumes more but sometimes consumes less. We can also look at this graphically in a different way. Again, if I click on format graph, if I right click, I can also get to this graph format.

And instead of looking at fact bar, I can look at a bar graph if I click on that and then click on okay. We'll now see each of these instead of stacked on top of each other, we can see each individual facility on its own. So you can see that, sure enough, the green bars start off consuming more, being higher, but near the end, they seem to have decreased their fuel consumption.

Whereas the purple one has also but not quite as much. Now some of you may be saying, "Yes, but some of these—this is just looking at the raw fuel consumption, but some of these buildings might be much bigger than the others," and you're correct. So for that, we can click on format graph, and remember we have this per unit of—if I click on per unit of square meters or square foot and click on okay. Now we get this graph that on energy—in energy use intensity based on surface area on square foot. And so you can see a similar picture, but they don't look—these other facilities seem to be

catching up. So you can see that the Quebec facility, once again, the picture is slightly different. It doesn't seem to be consuming nearly as much, but its savings in the last few years really are quite a bit more.

Another question we could ask is what are the main fuels being used here. So what fuels do we have? So again, if I click on—I'm going to click on this graph here, which I prepared by fuel type, and you can see the overall fuel consumption, this time broken down by fuel type. You can see that electricity is yellow, and the orange, which is natural gas, are by far the most used fuel. Followed closely by steam district energy. Let's see how we constructed this graph. I'll click on format graph in the menu. And you'll see here that we have the similar settings as before, but now the group by—I selected group by fuel type, and that's how I get this graph.

Another thing we can look at is the fuel cost. So how much does it cost per fuel. Fuel cost is different in each region, but that's taken care of in the performance analysis when we did our consumption summary. So here, we can see our overall fuel spend broken down per facility. You can see that some of the facilities don't consume very much. Here is [inaudible] end, and some consume quite a lot. We may also want to look at emissions, GHG emissions. If I click here on this graph, you can see which facilities contribute most to the GHG emissions of this sub-portfolio. And so if we want to reduce our fuel cost, we may choose one building to focus our reduction on, whereas if our goal is to reduce GHG emissions, we may focus on another building, or you might want to look at net zero energy. You may choose another one.

So the portfolio section here in RETScreen allows you to drill down and slice and dice and compare through different lenses the portfolio, the fuel consumption of this sub-portfolio. So you'll remember one of the things we did is we took the time to create a—we did the fuel consumption—the consumption summary not just on the fuel consumption, but on the predicted values, the regression. So how do we go about doing that? So if I click, I'm going to create a new one here. So let's call this fuel consumption. Now remember that we had compared to. We had compared to predicted. When we click on Compare to Predicted, it's going to do something a little different.

We're going to now compare our predicted and actual consumption. Again, I'm going to select just the office laboratory group, group by facility name. I'm going to put this over fiscal year, and let's look at the data from 2006 is what we had before until the end of a full period. So now that I've clicked on predicted, RETScreen is going to know that it needs to pick up that data from the predicted actual. When I click on Okay—so the graph looks quite different here. So you'll see here in the graph we have two columns. The purple one is the predicted value, and the green one is the actual, and this small one down here is the difference, the savings.

And that is all reflected also in the table below. We have the actual consumption in this section, we have the predicted consumption in this, and the savings below. So let's see if we're actually saving energy. So in the first years, we make modest gains. We're actually saving energy, and then we seem to be saving less. And then more recently, the savings seem to have

picked up the pace. Now this data is also reflected in the table below, and this is—this data is now normalized based on the regressions in our performance analysis, so if we did regression with heating degree days and cooling degree days, this takes that into consideration.

So the Edmonton and Quebec facilities would have very different climate, but the regressions are normalized to each of their conditions. So we may now ask the question, "How much did we actually save compared to the baseline?" And if I put my mouse on these last savings, you'll see I have a savings of 1.4 million kilowatt hours, which is a savings percentage of ten percent. And that can also be found at a table below if I scroll down. You'll see here that after the savings section, we also will calculate the total savings and percentage. So now we're looking at our portfolio, the sub-portfolio of office laboratory, but what if we wanted to look at the same data, but just for one of the facilities. Say the Varens facility.

Well you'll see that there's a button up here in the menu called Per Facility, and when you click on that Per Facility, you'll generate these facility specific dashboard views below. So I'm going to click on Varens, and you'll see we have a similar graph now, but for the facility of Varens only. So you can see what the energy consumption or the energy savings, the actual and predicted are for this specific building. And you can look at those for the other buildings. So by clicking on the Per Facility, you can break this down for each of the buildings in your portfolio group. When you click on the portfolio group, it'll take each of the buildings and run the analysis on them individually.

Whereas up here, they're done on the portfolio as a group. So we may now say, "Well, in this building in Varens, how did it achieve those savings? How did it get there?" So just like before, we can go to the format graph, and let's look at it on a fuel by fuel basis. So if I click now here on single fuel, I can get this actual versus predicted in the savings on a fuel-by-fuel basis. So let's look first at electricity. I click on Electricity. So now the actual versus predicted is only going to consider the savings of electricity, and you can see that in the beginning, there were modest savings, but more recently, there are actually no savings. There's actually higher actual consumption than there was predicted. Let's look at a different fuel.

Right click and click on format graph again. Let's look at say natural gas. Wow. Here we really see where the savings are coming from for this particular building. You can see that the savings are mostly coming from natural gas. This savings column is really quite high, and the reductions in natural gas consumption are quite significant. Once again, you can look in the table below to see what the total savings are on natural gas from the baseline, and there's 76 percent savings of natural gas for the fuel consumption. So I spent quite a bit of time here in the performance analysis looking at the performance analysis of buildings, but remember that we can also do a portfolio analysis on the other parts of RETScreen, namely the feasibility analysis and the benchmark. So, for the feasibility analysis, in the last menu, if I click here on the buildings and factories.

So this is looking at all the buildings and factories in RETScreen at their feasibility study. So we have certain energy efficiency projects associated with these RETScreen files, and we're looking here at the pre-tax internal rate of return on equity per facility. Once again, the graph up top is echoed by the data below, and you'll see that we have fuel consumption, fuel cost, and GHG emissions. Those three main categories of things we're interested in in a portfolio. On the last section here of the table is a different financial variability of parameters calculated for each of them. So right now, we're looking at pre-tax IRR on equity. That's this last column here, and that's shown in the graph. Once again, we can modify this graph or create a new one by clicking on format graph.

What if we were interested instead in say a simple payback? If I click on simple payback, click okay, the graph changes to show me what the simple payback is for each of these projects. This is how you'd do a feasibility study in the portfolio looking at the portfolio of feasibility studies for buildings and factories. We can also do this for green power, so power generation. If I click on this sub-portfolio, this group called Green Power, I have a dashboard view here, which is the electricity export revenue. So once again, the graph on top is echoed through the table below. I have the fuel type, the electricity export and revenue and GHG emissions, and the financial viability parameters. In this case, we're looking at the electricity export revenues in dollars for each of the projects.

What if in this one, again, we click on format graph. You'll see the dialogue again is very similar, and if we wanted instead to look at the pre-tax IRR on equity and RETScreen would then show us the graph there. So the pattern is often the same when using the RETScreen's portfolio analysis is you can change the view using the format graph dialogue. Lastly, we'll look at the benchmark analysis. I'll click here on this sub-portfolio of commercial buildings and factories and look at the kilowatt hour per square meter. So this view is a little bit different in the sense that we now have listed all of the benchmarks available in the portfolio in the commercial building sub-portfolio, and we have here a benchmark of 320 kilowatt hours per square meter, and that's reflected by this diagonal line.

For each of the facilities in my portfolio or sub-portfolio, I can draw out where the base case and proposed case targets—base case and the proposed case targets are on my benchmark, and they're graphed in relation to this benchmark. So we can see here that some of these facilities are already below my benchmark, and some of them are above. The ones that are above are graphed in a different color to highlight them.

You can see how big the proposed changes are. Again, once again, the table below reflects what's graphed above, and you can see that difference in target in the table here. Lastly, looking at green power, this green power sub-group, if I click on power plant, we get yet again a different graph. So this graph here is showing for some of the technologies that can be modeled in RETScreen what the energy production cost range is for those technologies, and then RETScreen will place a marker on the relevant technology line and

show that in relation to the range. So you'll see here, for example, this sub-portfolio contains two wind turbine projects and two photovoltaic projects. Now the wind turbine project in general—wind turbine projects have an energy production cost in this range, and the energy production cost for my two projects are here: .109 dollars per kilowatt hour, and .12 dollars per kilowatt hour. That again is shown in the graph below, in the table below. So once you have your various dashboard views available to you, you can use RETScreen's reporting tool to do the report for your portfolio analysis. So once again, the report writing in RETScreen is mostly automatic, and you can customize it at will. So for example, I have executive summaries and all of the various graphs we looked at are here in the RETScreen portfolio. Here is the Varens building with its actual and predicted with the table below. So this is a great way to communicate the findings you did as you are analyzing the portfolio and looking at different ways through your building.

Once again, RETScreen is multi-lingual, so all this information is also available in 36 languages. So let's suppose that we had a Chinese colleague or consulting company who was working with us on this project. You can translate the report into 36 languages, but also all the dashboards are available in 36 languages, just like they were before. The whole thing is translatable. I'm going to switch back to English. And then of course what you probably want to do is communicate this, so you can send the report as a PDF by e-mail or just the figures and graphs, and importantly also, you can share the portfolio file with your colleagues, and you can do this analysis on the portfolio file itself so your colleagues can look at that.

You can also export it and the report or the figures if you want to use your own presentation software. And with that, I'm going to hand it back to Dinesh for some Q&A, and if anyone has more detailed questions, we can look at those in the Q&A section.

**Dinesh S. Parakh** Great, thank you Kevin for that comprehensive presentation. So we have some questions coming in, and I will start off here with one. What happens to the portfolio when I update the bills?

**Kevin Bourque** So that's a good question. So first, let's go to here. So remember, we have this Detroit file open. So I'm going to open that file now. Here is my Detroit file, and let's suppose that it's next month and we've gone ahead and updated the data. We've added some new bills, downloaded some NASA data, and the file is now updated. So I've now just gone ahead and changed some information. And to make this very clear, let's say that I'm going to call this—it's called Detroit General Hospital. Okay?

And I went and updated the data as well. Now when I go and save this file—file, save—okay. Now I'm going to go back into my portfolio and you'll see here there's this clever little icon beside that specific facility that says there's an update available, and to apply that update in the menu, there's a button that says Refresh. And when I click on Refresh, it'll go to that file if it's available and fetch that new data and apply it. So you'll see here that I—remember, I changed the name to Detroit General Hospital and that's now reflected. So I

changed something in the file, and then I've gone and applied it back to the portfolio.

**Dinesh S. Parakh** Great, thanks Kevin. Just a quick one here. Can you show the map on the dashboard?

**Kevin Bourque** Sure, the map on the dashboard. If I click on the map button in the menu, what it'll do is for the currently selected portfolio—so now I've selected all, I get an icon for each of the facilities. So I have some in British Columbia in Alberta and in Southern California, and a bunch more concentrated here in the Midwest and in Ontario and Quebec, and I can actually zoom in and put my mouse on these projects and see what the facilities are. Get a thumbnail view. I can also go into satellite view and really zoom into where those projects are and see geographically where they are. This—I mean I've done it here on a continent, but it also works if they have multiple projects in a city. So suppose we have five or six projects or hundreds of projects within more narrow geographic regions.

Say just in Toronto or in Southern Ontario, you can do that as well.

**Dinesh S. Parakh** The next question—there are two that are similar here, I'm going to combine them. So the first part is is there now or is there a plan to implement an API or STK for automating access to RETScreen as a way to potentially model the energy systems at large numbers of buildings pulled from a separate database. And another question which is related to that is how is it possible to pull more information to RETScreen. For example, we have energy use from other types of energy modeling.

**Kevin Bourque** Yes, so the answer to that question is yes. So we are currently piloting a project called RETScreen Connect, which allows specifically this. We're working with some facility owners that have in some cases dozens, in other cases hundreds, 150 buildings across a geographic area. So for example, a school board or facilities on a university campus. So we definitely are working on that. It's currently in just a trial phase to see and plan that out. If you are interested in this API, please send us an e-mail. You can send us an e-mail. The easiest way is on the file page, go to Help, and under Help and Contact Us, if you want, you can click on this button here, RETScreen Customer Support, and the e-mail will come to—I'll be happy to answer that. Next question is about—from other modeling software, so that is also part of the RETScreen API or the RETScreen Connect.

We're looking into it and we have plans to do it. Once again, if you'd contact us, I could answer your question maybe a little more in technical detail, and see how we can maybe work together.

**Dinesh S. Parakh** Great, thanks, Kevin. The next question is can you show different options to the group files within the portfolio page?

**Kevin Bourque** Right, good question. So I showed you how—I showed you these groups which are already done, but you can create other groups. So let's—the way you do that is by clicking on this button in the menu called New Group. So if

I click on New Group, I have two options. User defined or advanced. So I'm going to click on Advanced first. If we click on Advanced, we get this dialogue which allows you to create this sort of smart filter or this list. So let's call this group—you know, I have this hospital bed I just added. Let's create a group with all the healthcare facilities in my building. So I'm going to call this healthcare facilities. And here in my condition list, I'm going to say if the type is healthcare, you'll see how the list automatically auto-populates with everything in my portfolio in the All group. So if type is healthcare, and I click on okay, you'll see now on the left menu I have a new sub-group called Healthcare Facilities, and there's two hospitals there.

I can also do it by geographic region, so I'm going to create another one. I am going to call this Ontario Projects. And my condition is going to be that the province or state has the word Ontario in it. And if I click on Okay, I have here eight projects that are in Ontario. The other option that is here is say for—it is called User Defined, and what this does is it simply allows you to—you'll see this checkbox called Include is Now Activated. So you may want to say—associate these with a person who is responsible for them if that isn't somewhere you can filter by, and maybe only facilities that start with the letter ABC if you're sorting alphabetically. And now this group I've selected will only show those. If I want to hide the ones not selected, I can click on this button in the menu here, which says Hide Excluded Rows, and you'll see that we really only show the ones that are part of my manually clicked on and selected sub-group.

**Dinesh S. Parakh** All right, thanks, Kevin. This module is full of some really fantastic new features. The next question is here to create a fuel cost consumption summary, do you have to create a cost predicted analysis summary for each facility? And then some explanation to that, in the first steps, you had only clicked emissions cost. Does that have an impact on what information you're able to access in the portfolio section?

**Kevin Bourque** So that's—I'll answer the second part of that question first. Yes, it does have an impact with—of what you can do in the portfolio section. So if you haven't selected cost here, you don't have that available to you in the—you don't have that available to you in the portfolio. If you want to—the first and most important step is to create a consumption summary or production summary if you're generating electricity or user defined summary here in the data page. By doing this, you're aggregating the data in preparation for being used in the portfolio. Once you have this, then you can create the consumption summary in the regression analysis, in what we call the predicted actual summary. If you haven't done the step in data, you don't have the option to do this. The reason is that when you're in data, you're telling RETScreen what are the important tools here. So you may have in the data you've imported, you may have multiple meters, you have calculated columns, you may have special columns which are used for other purposes. RETScreen doesn't know, can't guess what's important to you in your data page. So the step of creating your consumption summary is very important because you're now telling RETScreen what's important and what you want to bring out of this individual facility and use in the portfolio, use as a group.

So it has to be something that is comparable to your other groups. That's why we focus on fuel consumptions. If you'll see here, I'm in the Varens example here. Here, I have cost data, so I've selected cost, so that will be available. You noticed in—[inaudible] have cost data, then it's not available to me in the portfolio.

**Dinesh S. Parakh** All right, the next question is can you look at other things such as water consumption.

**Kevin Bourque** Yes, absolutely. So I focus exclusively on energy, but actually now that I'm in this screen right here, you'll see that I have consumption summary, and for kilowatt hours, but I also have something called a user defined summary. So the user defined summary, I'll click on it here. Here is an example of water specifically. So you have water. You might want to aggregate. If you're using different gasses, nitrogen. There is all sorts of things you could aggregate here. If you're trying to compare facility and factories, you could do output and production and so on.

So this user defined summary is where you would do that. In fact, here is an example of it here. So user defined summary. You'll see here that we have the water consumption. So the water consumption and cost of water for each of these months. Once again, if this is used in the analytics, you can do a summary there. You do have to be careful, though, because RETScreen—these aren't fuel, so we don't know how to convert them, so it's up to you to really make sure that you follow standardized way of naming things and aggregating things correctly. If you're comparing water consumption across facilities, make sure that they all say in cubic feet or cubic meters so that you can compare them properly.

**Dinesh S. Parakh** And I think the follow up question to that, Kevin, maybe just some additional clarity on the water, how did you get the water consumption in the portfolio?

**Kevin Bourque** So everything—if anything is going to be in the portfolio, it needs to be created here within the software, within the performance analysis using one of these three buttons up here in Step 4. So for the electricity data, I had to click on consumption data. Electricity and gas. For water, I had to click on user defined summary. So you'll see here I had to first of course import my water data, so I have a table here with my water bills, and then I need to summarize that by using this user defined summary. So once I do that, then it's available to me in the portfolio, but let me show you concretely.

So I have here my water consumption summary, and you'll see here it's called user defined summary. Now when I go to my dashboard, if I want to go say in Varens and look at my format graph, I do have my user defined summary. I can look at water consumption for that building. So I have consumption summary and user defined summary where my water is. Where is the data I want to look at? If I click on that, I'll see this is the water consumption of my building.

**Dinesh S. Parakh** Excellent, thank you, Kevin. We still have a few more questions. We'll try to get to all of them if we can. The next one is as we know the period in utility bills is different. I think the question here is how does RETScreen handle that. So I'm assuming what the asker is referring to is that there are different time periods. How is that handled in the portfolio tool or how can that be handled?

**Kevin Bourque** Right, so I encourage you to look at the webinar where we actually talked about the portfolio analysis because I do talk there about how we aggregate and normalize the bills there. So as a first step when you're filtering and merging in RETScreen, RETScreen will do that on a daily basis. And then when you're doing this here, so I'm going to go to consumption summary, when I group by year or quarter or month, so RETScreen will know how to break that data down. So for example, in a year, it'll take 365 days, and for months, which are partly in one year and partly in another, it'll do sort of a daily average.

So, RETScreen will know how to aggregate that data into consistent period. And that's the key when you're working with portfolio analysis, and one of the headaches if you ever try to do this manually using 1,000 Excel pages is getting everything on a consistent basis is very challenging. That's exactly why you'd want to use RETScreen for this is RETScreen will smartly identify which part of a month belongs in which year, and aggregate them correctly. And that's done. And then once you have this table, then these are inconsistent units of a year that are then used in the portfolio.

**Dinesh S. Parakh** And just to clarify, Kevin, you do get more into detail in the performance analysis webinar, which was done a few months ago and is available on Solutions Center's YouTube site, correct?

**Kevin Bourque** That's exactly right, yes.

**Dinesh S. Parakh** So that's the performance analysis webinar, thanks. All right, the next question here is how do you determine the emissions factors.

**Kevin Bourque** That's a good question. So if I—I'm here on the consumption summary, and I'll click that here again. You'll see here that on the right hand side, I have the emissions factors for each of the fuel. For the fuel consumption, I have the conversion factor and the fuel emission factor for that fuel. So we have a database of standard emissions factors. However, if you don't like that, you can change that. If your natural gas—you use a different emissions factor for your reporting, by all means, you can type that in this cell. RETScreen will suggest a value, but you're free to update that to the one you want. Concerning electricity—so electricity is assumed to be—the admissions factor is taken from the emissions page and our emissions database in RETScreen based on your location. So in this particular example, I'm in Varens which is in the province of Quebec, Canada, and the emissions factor for our electricity is 0.0088 tons of CO2 per megawatt hour. Now if you need to use a different emissions factor for your reporting, you simply can type in here and type in your own value. And that's certainly your prerogative to do that. To answer the question succinctly, RETScreen has a database of emissions values for the fuels, and we have an emissions database for

electricity based on location all around the world. But you're always free to change those values if you want.

**Dinesh S. Parakh** All right, excellent, thanks. The next question is a simple one. It sounds simple, but I'm sure it involves some complexity. Kevin, what is the performance tracker?

**Kevin Bourque** Yeah. So the performance tracker is a dialogue you can use to consult. It's here in the dialogue. You click on the icon in the ribbon to track the performance of the consumption based on the consumption, prepared using the other things we just did, the other features. For consumption, you select a reference period here that you want to compare your actual fuel consumption, fuel cost and GHG emissions, and RETScreen will calculate the savings or losses. It's the difference between the reference period and the actual period. Also calculate the percentage of savings, sometimes called the variance over the reference period.

You can also do the same if you're doing electricity production or energy production, so we'll calculate the revenue for you here. So concretely here, so we want to say look at the reference period, say our building changed considerably, and we consider our new reference period 2014/2015 fiscal year, RETScreen calculates that the fuel consumption was 1,386 megawatt hours and it costs $108,000 in fuel costs with these emissions, and now how does it compare with the current fiscal year. So, RETScreen has those values, and it shows you the savings. Interestingly, also, is you can do these on an intensity basis. You can say, "Well what is the energy intensity per square meter?" So this allows you to compare per building.

For example, you can look at the megawatt hours per building, you can also look at the fuel cost per square meter, and even the GHG emissions per square meter to allow you to compare between different building sizes. This number actually is very important. You can use this as part of your benchmark on the facility page. So here we have .26—our reference period is .26 megawatt hours per square meter. You can use that. I'm going to move to the facility page now. You can use that down here in RETScreen as part of your base case and your target. So if I change this unit to megawatt hours, I can put .26 was my baseline there.

This is a very useful feature, sort of a built in calculator that you can use in RETScreen. There's one more quick note. This performance tracker is available to you. It's also very handy we found with working with different people to include in your report in the executive summary. It very succinctly will display the—well the performance over a—your base year. So it's right here at the top over your reference year. So if I select performance and my performance tracker and I click on Okay, it's available in the executive report and the summary. It's a nice succinct table that summarizes your project.

**Dinesh S. Parakh** That looks really useful, thanks, Kevin. The next question is if you could give an example of who are some of the bigger users of the software for portfolio management. Like what types of organizations, just so I guess the questioner wants to have a sense of that.

**Kevin Bourque** Yeah, so confidentiality reasons, I won't give out any particular names. But we have some large industrial and manufacturing facilities that are global that have operations all over the globe, every continent, and we're looking at them with some their Canadian manufacturing facilities to do some reporting. Also, with some of these projects, we're looking at doing ISO 50,001 compliance, and also superior energy performance, SEP, and are integrating that within RETScreen. We also have some top notch universities around the world who are using RETScreen for portfolio analysis of their building. We have municipalities who are looking at the buildings that they're responsible for that they report to their city council. We have school boards who are using it for hundreds and hundreds of schools throughout their territory that they're responsible for.

And also, these schools change in their behavior, they add wings, they add temporary classrooms, and so on and so forth. Yes, I said we had some municipalities, so we also had some property management, some Class A commercial real estate property management companies who are using RETScreen as part of their—to track the performance of their portfolio of consumption for their buildings. So really, all across commercial, institutional buildings, municipal, industrial, all sorts of very large companies are using RETScreen in the portfolio analysis.

**Dinesh S. Parakh** Great, thanks, Kevin, and I'll just mention to the audience that some of these companies have given us permission to—they are public users of RETScreen Experts, so I can mention that, for example, Oxford Properties, which is a very large property developer and property manager internationally, is a user of RETScreen Experts portfolio tool, and so is 3M Canada, and they'll be looking at 3M Global. Those are some of the examples Kevin gave. University of Michigan are using it for all their facilities. So, definitely some very big users who are very heavily invested now in the portfolio and have found it to be very, very useful, so thank you, Kevin. There are one or two more questions, but we're at 11:28, and I have assured the organizers we'll be on time, so I think we'll stop there. We can answer some of those questions offline and through e-mail. So thank you again, Kevin, and with that, I'll turn it back to Katie for the conclusion of this webinar.

**Katie** Great, thank you very much. On behalf of the Clean Energy Solutions Center, I'd like to extend a thank you to all of our expert panelists today, and to our attendees for participating in today's webinar. We very much appreciate your time and hope—and return that there was some valuable insights that you can take back to your ministry's departments or organization. We also invite you to inform your colleagues and those in your networks about the Solutions Center resources and services including no cost policy support through our Ask an Expert service. I invite you to check our Solutions Center website if you'd like to view the slides and listen to the recording of today's

presentation as well as previously held webinars. Additionally, you'll find information on upcoming webinars and other training events. We're also now posting webinar recordings to the Clean Energy Solution Center YouTube channel. Please allow for about one week for the audio recording to be posted. Finally, I'd like to kindly ask you to take a moment to complete the short survey that will appear when we conclude the webinar. Please enjoy the rest of your day, and we hope to see you again at future Clean Energy Solution Center events. With that, this concludes our webinar.