Financial Analysis with RETScreen

—Transcript of a webinar offered by the Clean Energy Solutions Center on 27 April 2016—
For more information, see the clean energy policy trainings offered by the Solutions Center.

Webinar Panelists

Dinesh S. Parakh	CanmetENERGY
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Stephanie Bechler	Hello, everyone. I'm Stephanie Bechler with the National Renewable Laboratory, and welcome to today's webinar, which is hosted by the Clean Energy Solutions Center, in partnership with CanmetENERGY. Today's webinar is focused on how to use RETScreen clean energy management software for financial analysis. One important note of mention before we begin our presentations 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's resources library as one of many best practice resources reviewed and selected by technical experts.
	Before we begin, I'll go over some of the webinar features. For audio, you have two options—you may either listen through your computer or over your telephone. If you listen to the computer, please select the Mic and Speakers option in the Audio pane, and if you choose to dial in by phone, please select the Telephone option, and a box on the right side will display a phone number and PIN that you can use to dial in. If anyone is having technical difficulties with the webinar, you can call the GoToWebinar help desk at 888-259-3826 for assistance. If you would like to ask a question during the webinar, and we encourage that you do, we ask that you use the Questions pane where you can type that in.
	If you're having difficulty viewing the materials through Webinar Portal, you'll find PDF copies of the presentations at cleanenergysolutions.org/training. Also, an audio recording and—will be posted to the Solutions Center training page within a few weeks, and it will also be added to the YouTube—to the Solutions Center YouTube channel, where you can find other informative webinars, as well as video interviews with thought leaders on clean energy policy topics. Today's webinar agenda

is centered around a presentation from our guest panelist, Gregory Leng, with our Dinesh Parakh also on the line. Our panelists have been kind enough to join us to show us how RETScreen can be used to identify, assess, optimize, and track the performance of clean energy investments over the entire project life cycle.

Before the presentation, I will provide a short overview of the Clean Energy Solutions Center initiative, and then following the presentation, Dinesh will moderate a question and answer session where Gregory and Dinesh will address questions submitted by the audience, and then we'll conclude with a brief survey.

This slide provides a bit of background in terms of how the Solutions Center came to be. The Solutions Center is one of 13 initiatives of the Clean Energy Ministerial that was launched in April of 2011 and is primarily led by Australia, the United States, and other CEM partners. Outcomes of this initiative include the support of developing countries and emerging economies through enhancement of resources on policies relating to energy access, no-cost expert policy assistance, peer-to-peer learning and training tools, such as the webinar you're attending today.

The Solutions Center has four primary goals. It serves as a clearinghouse for clean energy policy resources. It also serves to share best policy practices, data, and analysis tools specific to clean energy policies and programs. The Solutions Center delivers dynamic services that enable expert assistance, learning, and peer-to-peer sharing of experiences. And finally, the Center offers dialog on emerging policy issues and innovation around the globe. Our primary audience is energy policy makers and analysts from governments and technical organizations in all countries, but we also strive to engage with the private sector, NGOs, and civil society.

A marquee feature that the Solutions Center provides is a no-cost expert policy assistance program known as Ask an Expert. The Ask an Expert Program has established a broad team of over 30 experts from around the globe who are available to provide remote policy advice and analysis to all countries at no cost. For example, in the area of finance and markets, we are pleased to have Toby Kachur, director of renewable energy at E3 Analytics, serving as one of our experts. If you have a need for policy assistance in finance and markets, or any other clean energy sector, we encourage you to use this valuable service. Again, the assistance is provided free-of-charge, and if you have any questions for our experts, please submit it through our simple online form at cleanenergysolutions.org/expert. We invite you to spread the word of this service to those in your networks and organizations.

And now I'd like to provide a brief introduction for today's panelists before we get started. First up is Dinesh Parakh, a Program Advisor with RETScreen International, where he manages strategic partnerships, communications, and business development. Dinesh is the lead author of the RETScreen Energy Legal and Policy Toolkits. After Dinesh, we have Gregory Leng. Greg is the creator and director of RETScreen Clean Energy Management Software at the National Resources Canada's CanmetENERGY Research Center. He

Dinesh Parakh	specializes in clean energy market, technology and finance interface, and has been working in the renewable energy and energy efficiency field since 1987. And with those introductions, I would like to welcome Dinesh to the webinar.

Thank you, Stephanie. I've shown my screen. Well, thank you again, Stephanie. Good morning, good afternoon, good evening to all of you from around the world in different countries and different, perhaps inconvenient time zones. We do really appreciate you making the effort to attend the webinar today. This is the fourth in a series of webinars on the RETScreen Clean Energy Management Software, which is provided as part of Canada's contribution to CESC's Ask an Expert Service, which Stephanie just mentioned. After a very brief overview of the RETScreen software that I'll provide right now, Gregory J. Leng, who is the creator of RETScreen and the director of RETScreen International is going to do a live demonstration on the new RETScreen Expert Software.

So, what is RETScreen? RETScreen is essentially software that allows the user to determine whether or not a proposed renewable energy, energy efficiency, heating and cooling or co-generation project makes financial sense. If the project is viable or if it is not, RETScreen helps the decision-maker understand this quickly, unequivocally, in a user-friendly format, and at relatively minimal cost. You'll see on the bullet points above that the software is available in 36 languages, covering two-thirds of the world's population. At present, we have over 465,000 users in every country and territory of the world. This software is growing at a rate of about 30,000 new users every year. A large number of universities and colleges are using RETScreen for teaching and research, and we estimate that RETScreen has been responsible for well over $8 billion in direct user savings since the first edition of the software was made public in 1998.

This particular webinar is going to be demonstrating the new RETScreen Expert Software, which is currently being beta-tested and is scheduled for public release in October. If you are interested in beta-testing the new software, you can contact us through our website— http://www.RETScreen.net. It's up at the upper right-hand corner of the screen there, and what we'll do is add you to our list of beta-testers, who will receive a copy of the software towards the end of May. For now though, the internationally known and very well recognized RETScreen Suite is available for immediate use. You can download the software right after this webinar by going to our website. The software is free of charge, and you can download it in the language of your choice.

I want to stress that the stats that I have outlined here on the screen—these are for RETScreen Suite, so you don't have to wait for RETScreen Expert to start achieving real results. In fact, starting to use RETScreen Suite is going to give you a real head-start on using the new software RETScreen Expert, so we do encourage you to download the software, if you don't already have it. This graph is just a snapshot indication of how RETScreen has become the most widely used software tool for clean energy project and performance analysis. |

It very quickly depicts RETScreen's growth, which I mentioned is more than 30,000—it's probably well over 30,000 new users every year.

RETScreen has really become the de facto global standard for clean energy analysis—whether you judge it by metrics of market penetration, use by key organizations, including governments, private sector, and academia—and of course, energy and money saved. RETScreen is used by many, many more people than all other clean energy analysis software combined—we estimate roughly double the number of all of the other software combined. And you'll see on the right-hand side of the slide there just the top 20 countries in terms of RETScreen use and all the largest economies of the world are represented there, so it just gives you an example of how RETScreen really has become sort of a universal software tool for clean energy analysis.

And finally, this slide shows the home screen of the new RETScreen Expert. So, RETScreen Expert is the next generation of the RETScreen software, and as mentioned, it's scheduled for public release in a couple of months—in October, it will be available on our website. RETScreen Expert has been funded primarily by Natural Resources Canada with important contributions from partners, including the National Aeronautics and Space Administration in the US, NASA, the Renewable Energy and Energy Efficiency Partnership in Vienna, and Ontario's Independent Electricity System Operator. So, the best way to understand RETScreen Expert is to see it in action. You are actually one of the first groups to actually see the software demonstrated live. So, I am now going to stop talking and let Greg give you a live software demonstration. Greg?

Greg Leng   Thanks, Dinesh. Just want to confirm, Dinesh—can you see my screen with the software showing?

Dinesh Parakh   Yes, I can.

Greg Leng   Okay, great. So, welcome everybody, and also thank you to CESC and NREL for inviting us to make this presentation. The CESC service, I think, is an excellent service that NREL and its partners are providing. So, today I'm going to be presenting the new RETScreen Expert software. Dinesh mentioned it is currently in beta-testing. It will be released to the public in October, but we will expand our beta-testing at the end of May. So, for those that are familiar with the current versions of RETScreen—RETScreen Suite—within RETScreen Suite, there is a product called RETScreen 4, which is a feasibility analysis tool to determine does your renewable energy, clean energy, energy efficiency project make financial sense. Then there's a RETScreen Plus product which is your measurement verification or your monitoring tool to actually track the performance of your investments over their life cycle. So, those are available in RETScreen Suite.

Today, as we're showing the RETScreen Expert, there are sort of three major new upgrades to the software—to the RETScreen software package. One of them is the—those various modules—feasibility analysis, performance analysis, and a new benchmark analysis module—they've all now been integrated into one software platform, and this software platform now is a

4

Windows.net platform, no longer linked into Microsoft XL, et cetera. So, that has been a major component—it is integrating all the software into one software platform, available in 36 languages.

The second major component is we've developed what we call a virtual energy analyzer, and this allows you to do rapid energy modeling or remote energy analysis without having to visit the site to get a—do a quick feasibility analysis or a quick energy audit or facility—to basically get an idea—does the project potentially make sense, and if so, you adapt—you adjust your analysis with more onsite information, et cetera and refine your analysis as you move forward. So, I'll demonstrate that through a live example of a project in China.

And then the third major component of the new version of RETScreen X—which is RETScreen Expert—is what we call My Portfolio. And so, it's a portfolio analysis tool and what it does is it takes all of your different analyses of—for example, wind farms and power plants or buildings, factories, et cetera—and if you own multiple facilities or are looking at multiple facilities, you can combine them all now into this one tool called My Portfolio, where you can manage all those—your portfolio of facilities and projects, and you also can analyze them and look at the overall impact from a climate change or greenhouse gas mitigation perspective, financial returns, energy savings, et cetera—you can do that all though this new My Portfolio tool.

So, the—today we're really trying to answer the question here—does our clean energy project or projects make financial sense? So, we're going to focus more on the financial aspects of projects today rather than the detailed technical aspects. So, looking first at the platform of—or and the workflow of doing an analysis, the RETScreen Expert is made up of three key modules. There's one which is a new benchmark analysis module, where you do a—you can benchmark your facility, such as a commercial building, or a hospital, or a school, for example—and how it compares to other similar facilities, so standard benchmarking, or you can also enter your own benchmark information if you want to compare it to corporate standards or targets that you want to set. And within the benchmark module here, there are separate worksheets. The first worksheet is a location worksheet, and the second one is a facility worksheet. And you can see those actually at the top of the screen going from left to right. So for example, the location worksheet is where information about the—where your project is located, climate information, et cetera, and then facility is, therefore, about your facility, et cetera. So, you access the various worksheets at the top of the screen, as I'm just doing there. So, I'm going to go back to the File home here. So, that's the benchmark analysis module.

Once you've done a quick benchmarking—how does your facility look—you then can move into feasibility analysis, which is going to be a more detailed analysis than basic benchmarking, where you're going to go in and look at how much energy does your wind farm produce, or how much energy can you save in your energy-efficient or green building, for example. And

that's—you do your energy analysis on the energy worksheet highlighted here, and then you can summarize and do more detailed cost analysis, if you want, on your cost sheet. Then there's emissions analysis, where you do your standardized greenhouse gas emissions analysis. Then there's financial analysis, where you determine the financial viability of your project—calculating things like internal rates return, and simple payback, and net present value, et cetera. And then there's the risk analysis, and that's where you do a more advanced analysis, and sensitivity analysis, where you're trying to look at various different uncertainties in your analysis and try to predict future returns in different scenarios. So, that's on the financial feasibility side.

Then the performance analysis module—and those that already know RETScreen, that would have been what you've recognized as RETScreen Plus—this is our measurement verification or monitoring targeting reporting tool, and that's to allow you—once your facility installs your individual projects, that you can then measure and verify over the life of those facilities—are you actually getting the performance that you expected, are you getting the returns, and the energy-saving, for example, that you expected—the cost-savings, et cetera? And that's made up of a series of worksheets. Again, there's a data worksheet, and that's essentially a database that allows you to collect data such as how much natural gas you use, how much electricity, and also other parameters that correlated with that, such as climate data, weather data, things like heating degree days, solar radiation, et cetera. So, that's stored and filtered in the data analysis worksheet. Then there's an analytics worksheet where advanced regression models are used to—predictive models that take into account and normalize your energy performance based on varying parameters, such as weather or production in a factory, et cetera.

And then it links in then to a reporting tool, where you report your results to decision-makers and facility operators, et cetera. And one of the key things here is, as you see, is a circle. So, the idea is once you report—say you compare your results to benchmarks again—you continue to set over the life of a facility—continue to look for more and more ways to reduce energy consumption, save—reduce greenhouse gas emission, save money, et cetera—and it's a continuous process, including commissioning—re-commissioning of facilities, et cetera. So, that's depicted in that workflow there.

Now, I've mentioned some different types of facilities that the software can be used for. So, RETScreen could be used—and this module or this new version of the software—can be used for various types of power plants, such as very large combined-cycle steam turbine plants and coal plants, even; hydro wind, _____, solar thermal power, et cetera. And then on the building's factory side, it can be used for all sorts of industrial facilities—same on the commercial institutional side—commercial buildings and institutional buildings, like schools and hospitals, et cetera—on the residential side, such as apartment buildings and houses. On the agricultural side, it can be used for analyzing greenhouses and chicken coops, for example; and/or

you can do your own user-defined analysis. So for example, it might be street lighting or, in this case, lighting of peers or sidewalks, et cetera.

And in addition to being able to do a full facility analysis, you can also use the software for just specific individual measures, such as solar water heaters, or just lighting replacements, or pumps and motors, fans—any individual measure that you want to look at. And, of course, the software can be used for both new construction, and it can be used for existing facilities. And this picture is quite good because it shows the concept of before and after—left side to right side—base case, proposed case—what do you have now, and what do you want to do. In this case, they're improving the building envelope of that building.

So, that's just to give the concept of doing basic financial analysis. Integrated in within the software is some key features that you should be aware of. So, one is a user manual that—so basically for every cell in the software—so I'm going to move my cursor here—for example, I'm moving it over the term "Getting Started/Options". So, if I click on that—when you see the little Help button appears next to the cursor—if I click, it opens the user manual specifically for that topic. So, that's a great way to quickly understand what's going on in the software, and if you want to learn more details about any section.

I also have a product database of over—I think we're approaching 50,000 different products from power products, heating, cooling, pumps, motors, and lights, and et cetera. So, that product database continues to be updated and improved. We've built in a new cost database of what various energy efficiency measures cost, et cetera, in our renewable energy systems, so that we'll show live in the software. There's a benchmark database of typical benchmark facilities around the world. And there's a climate database, so I'll just click on that just to show you.

So, we have in the RETScreen software 6700 ground stations around the world, and those are represented by the red dots there. Those are typically airports or military bases, et cetera. And then for communities around the world which do not have a ground monitoring station, we then supplement that data with data from NASA satellites, which provides the climate data. And so, for example, if I click on the map and move it—and say the project is located right where that little house icon is—the software will automatically find the closest station for you and tell you the distance to each station, and you can change stations, if you want. So, that's an extremely valuable tool, and that's a global tool—that's for across the globe, we have climate data. So, that's a very valuable tool in the software.

We also have weather data—so climate data has long-term averages, weather data is what happened yesterday, basically, or today. And weather data is used when you're doing your measuring verification and your ongoing performance. And so, with our collaboration with NASA, we can actually stream near real-time data from NASA satellites through their large computer systems directly into the RETScreen software. So, that's an extremely

valuable tool. And then there's a new tool called the feasibility analysis dashboard, and that I will show in a few minutes during my demonstration.

So, let's get right into doing a demonstration now of the virtual energy analyzer, and let's do a project. So, I'm going to click—and this is a great way if you're doing benchmarking and feasibility analysis—where if you're doing more detailed performance analysis—it's a great way to start within the software, if you're starting an analysis of a facility for the first time. So, I click on the virtual energy analyzer, and so it opens, again, the big map. And the basic concept here is that by answering basic three or four questions—so, what type of facility are you—with a bit more detail—and where are you in the world—just with that basic information, the software will be able to provide you with a rapid analysis—feasibility analysis—depending on the type of facility and where it is, and a relatively accurate analysis, to rapidly get you started on a more refined feasibility analysis, energy audit, et cetera. The idea is to get you anywhere from 50 to 90 per cent where you need to go in doing your analysis—to significantly save you both time and money, and improving the accuracy of getting to the right answer.

So, for example—so, like I mentioned earlier for power plants, the software can be used for various types of power plants—_____ wind, gas turbine, combined-cycle, et cetera—steam turbines, and then with biomass fuels, et cetera—but we're going to—the other types of facilities, again, are industrial—so this virtual energy analyzer is made up of a database of archetypical facilities and within that database, we have a varying level of details, but we're—before what you see as five-star ranking of any archetype here—is we've actually gone in and done the base case energy analysis, we've done the proposed case and what are some of the things that you can do for the facility, and we've actually done the incremental cost analysis. And that's what, in this case, we'll call a five-star archetype.

And so, for example, under industrial, we've so far built up some key industrial facilities where we've done both the base case, proposed case, and incremental cost analysis, and of course, this software can be used for all sorts of other types of industrial facilities. And then the same thing on the commercial and institutional buildings. So, for example, education—we have archetypes for elementary or high schools, the same thing for food retail, grocery stores, food services, but quick-service and full-service restaurants, healthcare facilities, outpatient clinic or very large hospitals—these are all what we call five-star archetypes, where we actually have the full analysis done for you—hotels, large and small, et cetera. And then the same thing when we have—same thing for a residential, for apartment buildings, and then we're working on ones for housing, et cetera. And then agricultural—right now, we've built up a couple for greenhouses and poultry and we'll continue to expand that.

So, let's go in just—today, as an example—at something that could be applicable to many of the people in the audience today. So, let's take a look at an office building and in this case, let's do a medium-sized office building. And we're going to look at doing energy-efficiency in that, and a bit of

renewables, et cetera. And let's assume that building is in Suzhou, China—just outside of Shanghai. I've done a bit of work there, so I've chosen that as an example. So, I'm just going to double-click here, and it automatically brings me to Suzhou, China—just zoom out—you can see Shanghai is right here, so you can see where it is within China, and I'm just going to zoom in—center it—I'm just going to center again using this feature—and center it right to where I clicked.

So, let's go in and let's find a building—so I'm sitting here in my office near Niagara Falls, Canada looking basically live at doing a project in Suzhou, China. And let's go in—I remember seeing there was a football stadium, and its right here—so I remember there's an office building and stay right near there. So, there's an office building right there. So, we can—again, here I am remotely going in, looking at this facility, seeing this sort of heating ventilation equipment on the roof, and that's it. I've just chosen three simple parameters and where are you in the world. I'm now going to hit Calculate.

So, I hit Calculate, and I'm not going to save what I did before. So, now the software decision engine is calculating, it's gathering climate data, it's gathering cost data, it's gathering product data—and boom, it's done. It's now done a feasibility—a pre-feasibility or quick energy audit for that facility in China. And then the idea now is I can go through and adapt it and modify it to more accurately predict the potential energy savings and the financial returns for that facility.

So, let's go through now over the next 15 to 20 minutes or so—just going in and taking a look at how that analysis was done and how we get to determining is this a financially viable project. So again, we're looking at this mid-sized commercial office building. So, the software automatically brought us to the location page. So, this location page is where you have your key information about your facilities—the map is right here, you can zoom in, if you want, into the map and change to a street view, if you want, et cetera—so it just shows the flexibility in the software. And the software—using the RETScreen climate database—has gone and gathered all the climate data. It's also gone in and gathered climate zone—or calculated climate zone information for that facility, and in this case, we're seeing that the source of the data is NASA, and the reason is that there actually is not a ground monitoring station available there, and so in this case, we're using NASA satellite data to calculate our heating or weather-dependent variables—or climate-dependent variables in doing our analysis.

So, the information is brought into the software—you can always modify it, if you want, but it's from our database, and including things such as—the blue bars here are the solar radiation available, the green line is the average temperature of that facility. You can do precipitation, for example, if you want. So, just this tool alone here is extremely valuable when you're doing energy analysis of a facility. So, that's—there's not much we need to do here—the software's done it all for us, so we have all the climate information.

So, let's go now over to the facility information. This is the facility worksheet that I'm clicking on at the top of the sheet. So, the software has gone in and,

again, filled in everything automatically for you because I used the virtual energy analyzer. I want you to take note of the ribbon at the top of the software—that's very much like a wizard. If you follow the steps at the top, it makes it quite straightforward, but I wanted to note here when you use the virtual energy analyzer, the virtual energy analyzer is actually filling in most of the cells for you, and then you just simply need to modify them. So, for example, just so we understand the color-coding for the software—so yellow cells are user inputs and required by the user to run the model. White cells are output calculated by the model—you can't change them. Blue cells also are required to run the model, but there's a database available for RETScreen, such as product data or cost data that will help you fill it in. And gray cells are just for user information.

So, for example, let's—we're preparing this for this CESC webinar and it's prepared by CanmetENERGY, just to give you an example of how you could use that. And then facility name, right here, let's say it's ABCD Corp head office. So, that's just basic information using the Bing Map—it knows that we're already in China and we built in a series of additional input parameters, if you'd like, so if I click on here, you can actually go in and have much more information about that company and who's doing the software. And this all gets added into the database in the software, so you can use that over and over. You can also modify the images, if you like, and put your own photos in. So, that's just basic—keeping information available for your facility.

Now, the next section, which is Step Two here, is the benchmark. So, this archetypical facility is 4500 square meters, so you can, of course, use _____ units, if you want, but we'll stick to SI units right here—metric. So, you basically use the facility size—you can determine when you're looking at energy use intensity, you can, of course, change your energy units. So, the software automatically has gone into the benchmark database and gathered— so for a typical office building in the US, we're using US as the baselines for the basic benchmarking—is 293 kilowatt hours per square meter, plus a range of values for average—for typical "benchmarkers." And then the base case is for your facility. So, the software has actually gone in—because we use the virtual energy analyzer—it's actually gone in and modeled that building already, and come up with a base case energy use intensity for that facility. And through a series of proposed cost-effective measures, it's come up and calculated that the software can reduce 25 per cent of that consumption, and we'll show how that's done.

So, that's a quick benchmark analysis. And each of these values, of course, can be changed by the user. You might have your own benchmarks that you want to set—it might be a corporate benchmark. You might want to change your targets. So, for example, the base case and target is _____ here. So, for example, you might want to set a corporate target—and I can just drag the target on this graph—so you might want to get to a 50 per cent energy reduction. That might be a corporate target—or you might even go down to a net zero target of—no net energy consumption basically at the facility. And this is where renewable energy would come into play. But, we'll stick to the 25 per cent target here—that's just to show you how easy it is to do

"benchmarketing" and targeting for a facility. So, that's it. The benchmark analysis is done for you again.

So, let's now go to the energy modeling, which is more detailed. So, again because we use the virtual energy analyzer, the software has gone in—it's actually run a feasibility or energy audit for this archetypical facility in Suzhou, China. And then we can now go in, if we want, and begin to modify some of the parameters, et cetera. But first I want to show you the structure—so the—and you'll see that along the ribbon. So first, you identify your types of fuels and any schedules you have in the building. Then you'll go in to find your heating and cooling equipment—what type of heating systems you have, et cetera, cooling systems, and the manual to support that. Then you'll go in and define your end-use, and so as I go across the ribbon here, you'll also see it's the same structure as I go down the left menu here.

So, for example, you go in and define your building envelope, and your lights, and you might have processed heat, processed steam, compressed air, et cetera. So, these are end-use—again, the manual can support that. And then for Step Four, you might want to optimize supply, so in addition to your standard efficiency measures, you might want to come in and add solar air heating, solar water heating, for example, or go in and add some renewable energy to help you get closer to your net zero goal, for example.

And then Step Five is really your summary—this is where we are right now, we're in the Step Five, which is the summary view of all the analysis. So, the software did all the analysis for you, and it's summarized by key parameters—so how much fuel saved, both electricity and other fuels, or you can also look at how much base case energy is used, or how much proposed case energy—but we'll focus on the savings at this point. And then it breaks it up by both—for heating loads, for cooling loads, and for electricity loads, plug loads, et cetera—and then what are the incremental costs, which the software automatically goes in and calculates and the user can modify; and then the fuel cost savings, also incremental; operation maintenance savings or cost. And then a quick calculation of simple payback to give you a basic idea, and then you can do more sophisticated financial analysis after.

And then this column over here on the right, which is –basically, this becomes your energy plan for your facility, and then you can tick these boxes and turn on and say, "OK, I want to do this"—if I untick it—so for example, right now we have solar water heating and portable tanks that are unticked—we'll come back and look at those after. So right now, they're not in this plan. And so, we can see down at the bottom—it shows us the total heating savings, cooling savings, electricity savings—and then how much all that would cost, the cost savings on an annual—from a monetary perspective. And then those who know how to calculate simple payback—it's quite simple—proves it's a 6.1 year of a simple payback for this facility.

So, just to see now how you can zoom in and begin to do and modify a more detailed analysis. So for example, let's take a look at lights. And so, within lights, there's various type of lighting—in the offices, in the cafeteria, outside parking, et cetera. So, I'm going to click here on Office, and it's going to

bring me to a light form, and you can also see it on the left menu over here. And I can navigate between the various forms there as well. But we're going to look at the light in the office.

So, in the base case, we have fluorescent T8 as assumed in the archetypical facility, but you very quickly can change it to any other sort of base case lighting that you might have in your facility. And then the proposed case we're proposing here—light-emitting diodes, which are rapidly expanding globally as an energy efficiency measure. But there's various other type of lighting systems that you can put in, depending on the end-use—a hockey arena is going to use different sorts of lighting, for example. And we also have different databases to—if you don't want to use our generic values, you can also go into individual manufacturers and use their product data.

So, there's various base case/proposed case information entered about the lighting—for how many lighting fixtures, et cetera, and how many hours a day they're used, and also the life of the lamps, et cetera, which is a key parameter. And so, for example, I mentioned there is a new RETScreen cost database, so if I click here, this actually opens the new RETScreen cost database, and it is specific to each technology, so we have one for pumps, one for _____ modules, et cetera, et cetera. So, this is for lights, so it gives you typical lamp costs, installation costs, and also hours for various different types of facilities, and then you pick and choose which one you want, and hit Go, and the values get pasted into the software. So, it's a great starting point if you have no information on costs or if you want to check or refine. It's extremely value that way. And in the end, basically we're interested in both the energy and the cost savings, then ultimately the greenhouse gas savings as well.

So, on the electricity side, the base case lighting load on an annual basis here for the offices would be roughly 92,000 kilowatt hours, and in the proposed case scenario, it would be 46,000 kilowatt hours. So, basically there's a 50 per cent savings by going to the light-emitting diodes. Another important parameter here—and that often gets forgotten when people do analysis of facilities, buildings, factories, et cetera—is they forget the heating and/or cooling impact of the efficiency measures that they're implementing. So, for example, if you put in more efficient lights, you're actually going to have less waste heat available in that facility because your lights are using that energy much more efficiently. And so that waste heat—if you reduce the—you increase the efficiency of the lights and you have less waste heat available— that's going to help you on your cooling loads. That's going to reduce your annual cooling requirements. But on the other hand, it's going to increase your annual heating load requirements because you're going to have less waste heat off the facilities, and depending on where you are in the world, that can actually be a pretty significant value. So, it's important to consider also this dynamic impact of individual measures, such as lighting, on the overall system. And the RETScreen Analysis Module Software does that for you.

So, I'm going to go back to the summary page, and those results are just summarized here and then you calculate the simple payback for each measure, et cetera. And just to show how the same approach—same process is done for other measures—the piece of equipment, for example. So for example, we look at motors for the elevators in the office building. It's the exact same user interface—the only difference is now we're dealing with motors, and size of motors, and RPMs of motors, et cetera. And the base case—we're using standard efficiency—there's efficient or premium efficiency motors, or you can do a user-defined and use a motors database to calculate the values. And the same thing—there's also the heating and cooling impact of putting in more efficient motors. So, same approach throughout the software.

So, that was a very basic financial analysis of an archetypical, mid-sized office building in Suzhou, China. So, you can do a series of measures and roughly get a 6.1 year payback, and you can see the details on each of those, if you want. So, let's continue to move now through the RETScreen software so we can look at other aspects of how do we do a more detailed financial analysis, for example. So, there's a cost analysis worksheet where your costs are summarized—you can show the details from the previous sheet of each individual measure—or if you want, you can get very detailed at Level Three and zoom right in and do a very detailed cost analysis, if you want. But we're going to keep it a bit more simple today. It just shows you how you can go from higher Level One to deeper levels and deeper level analysis over time using the RETScreen software.

The software automatically calculates the greenhouse gas savings for you—this is work we've done with the UN and the World Bank. Here in China, it's used as emissions factor for the savings for the facility, so that those measures that we just did is equivalent to about 20 North American cars taken off the road, or about roughly 25 acres of forest absorbing carbon. And you can do carbon trading, if you want, by putting a carbon price in a cell down here. On the finance side now, we get more details going from just a simple payback calculation, which is simple, it's easy to assess why people use it, it's a starting point.

But if you want to get into really promoting and deploying clean energy and helping governments and organizations, private sector/public sector organizations identify financially viable projects, you need to make your financial analysis a bit more sophisticated. Because often—for example, a 6.1 year payback as was calculated in the software—if that's a company, that might actually be too long. It's okay for a public institution, like a school or a hospital, but companies might have a shorter payback requirement. But that same project—6.1 year, which is highlighted here—it actually has a pre-tax internal rate of return of 34 per cent. That's basically your return on investment of 34 per cent, which is far greater than any return you're going to get by putting it in bonds and investment, even in the stock market. So, the project might get rejected with a 6.1 year payback when, in fact, it's actually an excellent financial investment with the organization.

So, this is why we move to a more sophisticated financial analysis in RETScreen to actually help decision-makers find these viable projects and implement them over time. So, again, the software has gone in and automatically done the financial analysis for you. The user can go in and change the value, such as inflation rate or whatever values they want—it goes in and assumes 70 per cent debt, meaning your financing—70 per cent of the project putting 30 per cent of the money down yourself—and the interest rates, but you can modify all those. And then the cash flows for the projects are shown here, and so you can see that after the first year, you spend money to implement the project, but then it's a series of positive cash flows, and then in this year when your loan is paid off, the cash flow is improved even more. And we can do more sophisticated things like income tax analysis, et cetera—we'll show that in a few minutes. So now, we've done the financial analysis—our software's done it for you actually.

Then we move into even more sophisticated financial analysis, and this is where we look at risk analysis, where we do both sensitivity and risk analysis. So, sensitivity analysis is you look at the performance parameters. So, let's go back to finance for a second. So, we said the internal rate of return was roughly 34 per cent, and net present value is positive—it's in this case, it says $74000.00, so it's—the project is making money. So, let's just go now—and that's for a single run of the software for a single value—now let's look at running the software many, many times and look at various different scenarios. And this is often also called due diligence analysis.

So, for example, let's say we're interested in looking at the parameter internal rate of return on equity, and the sensitivity range means I just sat here, remotely from Niagara Falls, Canada doing an office in China. So, I'm guessing at some of these numbers, but using the RETScreen cost database—so, it gets us in the right range, but let's say we're plus or minus 25 per cent in our guessing. And the threshold is also what's known as the hurdle rate—this is what the investor will want as a return—internal rate of return on their project.

So, let's say, just as an example—let's say their—for a clean energy project, so we're looking for a hurdle rate of 14 per cent. So, what the software has done is quickly run a sensitivity analysis for key parameters. So, this was the 34 per cent internal rate of return that was calculated on the finance sheet, and the idea is along the X axis we're varying the initial cost of the projects, and on the Y axis, in this case, we're saying what was the base case fuel costs—what are we displacing actually. And of course, you can change those parameters and choose whatever you'd like to look at along the axis. So for example, just to show how this works—so for example, if our project actually cost 25 per cent more—so moving this way—we would still have an internal rate of return of 23 per cent, so that's still a good project. And if the project actually ended up being cheaper, you'd have greater returns. Falling on the Y axis is what if our estimates of our base case fuel—how much fuel we use in the base case—was we actually didn't use as much in the base case or we didn't pay as much for it; therefore, we're displacing less cost savings,

basically—we see that our internal rate of return would drop to 13, and the software just highlights that for you automatically.

And you can go in and add parameters. The software automatically goes in and looks at debt interest rates versus debt ratios, and in this case you see it really doesn't have much of an effect at all. So, that's sort of traditional sensitivity analysis—the software does it for you automatically. And now risk analysis—this is actually much more sophisticated. It's a statistical analysis using what's called a Monte Carlo simulation. In this case, let's look at the _____ value. It'll actually run automatically in the software for 500 possible different combinations, looking at the various uncertainties in each of your parameters to help predict what your potential outcomes are—what are the returns, in this case, in that present value. And in the new version of the software, we've increased that now to up to 5000 combinations, but I won't do that here because being connected to a GoToMeeting might slow it down a bit.

So for example, what if our cost—we're really guessing—let's vary that parameter by 50 per cent. The software is now—when I just clicked that, the software just ran 500 times, and re-predicted the outcomes of that present value based on varying the range of these input parameters. So, for example, and let's do another one. Let's say, for example, our interest rates that were paid were also maybe varying by 50 per cent—you see the range of value changes. So, what this graph here—this is called a tornado graph—what this is doing is actually predicting the relative impact of each of these individual parameters—it's basically telling you which ones are important—which ones do you need to focus on as you refine your analysis? And it very clearly says, in this case, that both your base case fuel cost and your proposed case fuel cost are extremely important in terms of the possible outcomes of your net present value. This is really the parameter that you need to look at, and this is where you might use our performance analysis module to really go in and look at—for example, for existing buildings, what is your actual energy consumption, and in our energy model page, refining your energy calculations. It's telling you those are the really important parameters to look at.

Initial cost is also important, and it's telling you in this case actually that your debt interest rates and your debt term—how long the loan is and stuff—actually have very little impact, and so it's probably not worth spending much time on that in the initial stages, at least. And then it also—the software also provides a probability distribution, and this is what banks and insurance companies will use when loaning money on a project or providing insurance on a project—they want to see is this project going to go bankrupt? So, they look at the probability distribution of essentially negative returns. And in this case, this project—it's only one case where at the extreme left of this project distribution where there's potential for a negative net present value. So, this has actually run the model 500 times and come up with these possible scenarios for net present value. So, this, from a risk perspective, would look like a very stable project from that perspective.

And just in the four or five minutes remaining for this section of the presentation, let's go in now and look at the reporting tool. So, the software— we've built in an automatic reporting tool that goes in and automatically prepares the report for you. You can go in and—for example, you can go in and search your own logo, for example—I'll just give an example from File, and then go onto my desktop just to show you—for example, let's say, McGill University— _____ it—so it's a very rapid way to prepare a professional-looking report as well. And then the software automatically prepares things like your cash flow graphs, et cetera.

And we mentioned the software is available in 36 languages, so in this case, our client is in China, so I would switch the software and the report over to simplified Chinese, and the software is going to do that all automatically. So, just the cost savings in terms of doing translation of reports—you can see now the entire software is operating in Chinese, so you can actually switch that for your client, they can review it in Chinese, and then switch it back to English, if they have questions or comments, et cetera. So, RETScreen is also a great communications tool among these 36 languages that we have in there. So, that is sort of the overview of the sort of financial analysis and using the virtual energy analyzer.

So now, I want to dive a little bit deeper in the next five minutes or so and show you some other features that allows you to do "what if" scenarios in financial analysis. So, one thing I'm going to do here is open what is called our new feasibility analysis dashboard. So, I'm going to drag that right over here. So, this is a really nice feature that lets you carry all the key calculations, such as the cash flows and things like that—and it's moveable between sheets, so you can actually go in and do "what if" scenarios and change figures, and see the results. So, I'm going—and it has multiple views—you can do it as dynamic enlarged slideshows—you don't even have to prepare PowerPoint slides—it's all done automatically. I like this one-column view, so I'm just going to click on that—and that's just loading—and I'm going to go in just to show you quickly how easy it is—I can go in and say, "What do I like to see?"

So, I can do, for example, fuel savings—how much gas, how much electricity did we save in that project? And I like to see the annual cash flows, for example. And so that graph—I can show how much gas and electricity before and after, and this is how much is saved, and then the annual cash flows down below. So, you get to pick and choose what you like to see. So, actually what I like to see actually when I'm doing financial analysis like this is I like to see the financial viability at the top, and the cash flow below, but again, you can customize the dashboard as you like. So, again, you remember here's our 34 per cent return on investment, key parameters are summarized, net present value.

So, let's go back now and look at this quick energy audit or feasibility study that the virtual energy analyzer did for us. Now, the virtual energy analyzer will automatically go in and also size-in a solar water heating system, and a _____ system. And it's usually unticked, meaning it's designed, et

cetera, and the user can go in and decide to add these. Typically, they tend to be more costly than traditional energy efficiency measures, but they also help you reach green building standards, reducing greenhouse gas emissions, particularly for net zero energy buildings. So for example, if I go in and tick and add the solar water heater system, we can watch the internal return here is 34.1. If I go in and tick on that, the software, the engine—everything is being recalculated—the returns, everything throughout the software is being recalculated there—and you can see that the solar water heating system will save just about 10,000 kilowatt hours of heat per year, at a cost of about $15000.00—simple payback of about 52 years. So, a long payback, but for example, if the owner of this facility says, "Look, we're willing to accept any green energy, clean energy project overall at any facility that gives us a return of greater than 14 per cent," for example, or 18 per cent, what we can do is go through and say, "Well, what else can we do to maximize clean energy in this facility while still meeting our financial objectives of our senior decision-makers?" for example.

The next thing we would do is go in and look at the _____ system. Now, again, looking at the internal rate of return, looking at the cash flows over here, I hit Go—so it's now taking this 59 kilowatt system that the software automatically had _____—so it's roughly ___ per cent of the roof area of the building done automatically, and you can see that actually the cash flows all of a sudden get negative, until—or quite low until the loan is paid off, the internal rate of return has dropped significantly. And that's because the system relatively—it saves quite a bit of electricity in a net metering situation, but the system cost is quite high and you see that reflected in the simple payback.

So, just like we before went in and looked at the lighting system and the motor system, let's go in just rapidly now and look at the _____ system on this facility. And let's go in and say, "Look, let's go with a small 10 kilowatt system," because we want to get as much clean energy or green energy out of that building while still maintaining our internal rate of return target set by our senior management. So, we'll go in and right now it's a 59 kilowatt system—again, the inputs, the outputs, the interface of the software is the same that we were looking at lighting before and now this is a _____ system.

Let's go into the product database just to show how that works, and what I'll do is I might actually choose a Canadian solar plant because they've actually got several plants in Suzhou, China, and let's go in and choose one of their modules there—let's see, a 200 watt module—so a 200 watt module, and I want to do a 10 kilowatt—you can also toggle up and down, if you want, but I'll do a 10 kilowatt here—it's got the efficiencies for those modules in the area, and I hit Go. It's now pasted their value, it's updated the software throughout all _____. We have our cost database for our power plants that's also been used. And so, this is interesting. So now, we can still afford to do a 10 kilowatt system, rather than a larger 59 kilowatt system. It still has the 42 year payback, but overall the payback for the entire analysis is 8.6 years, and it gives you a return on investment of 18.4 per cent.

So, in the last minute here, that's just an example of how to use it—how to use the dashboard. So, in the last section here, let's just go in quickly and show how you can dive even deeper into the financial analysis, such as doing income tax analysis. So, if this is a profit-making company, often people forget when you reduce your energy consumption, you're actually increasing the profits of your company—you're actually increasing typically your income tax on the facility, and that's usually forgotten when people do their analysis. So, I've just saved 33 per cent—you have different depreciation methods, et cetera. And let's say in China they have a five-year tax holiday for any green energy projects. I can show you how you can also use it for policy analysis, and I hit Go—and so, the software again has automatically updated and we can see now the pre-tax internal rate of return is the same. But here now a new value has shown up—the after-tax internal rate of return is about 14.8 per cent, after you pay your income tax on that project.

So, that—so we're right on time, and so what I'm going to do is I'm going to keep control of this screen, but I'm going to tell Dinesh now that we're ready to open up the floor to any questions that people in the audience might have.

Dinesh Parakh   Hey, thanks very much, Greg. We'll go quickly back to the example you were just showing. A question came in with regards to that, and the question is: In your example measures for space heating and domestic hot water—sorry, in your example, measures for space heating and domestic hot water were included, but all results were zero. Is this—am I misreading this?

Greg Leng   So, that's a good question. So, space heating and domestic hot water—so, that's a good question. So, there's two things that we need to do when we do analysis. If we're going to do a full facility, we actually need to model the entire facility, and all the different measures. So, even if we don't improve the heating system or improve the cooling system, we need to model them so we can model the total impact on the facility. So, we were looking at fuel saved, okay? So, we've done nothing to the heating system or the cooling system in this case. It's the same base case/proposed case for the heating system/cooling system. We could go in, for example, and put in a high-efficiency boiler. So, I'll just show that here quickly. 80 per cent—I could put a cost in, but for now, I won't. And if I go and look now, there's actually now a fuel saving for the heating system. So, that's why it was there before—because we were actually not upgrading the heating and cooling equipment.

Dinesh Parakh   Thanks very much, Greg. The next question here—this one actually came in near the beginning, but if you could just explain the quick—the basic difference between HOMER and RETScreen.

Greg Leng   So, the basic difference between HOMER and RETScreen. So, HOMER is primarily focused on sort of off-grid or mini-grid type systems, and HOMER tends to be—is more of a feasibility and optimization tool, whereas RETScreen is a broader-use tool, so it covers energy efficiency, grid-integrated systems, et cetera, and—Dinesh, if you can just—Dinesh, if you can just mute your mic—thanks. And, so RETScreen is a pre-feasibility tool, if you're looking at an off-grid system or a mini-grid in a developing country, you might—or remote area—you might use RETScreen on the feasibility/pre-

feasibility side, and then use HOMER to do your authorization. So, often we see people using both and HOMER is an excellent software tool as well, particularly when you get into optimization and sizing and designing. But again, the other big difference is RETScreen is a fully comprehensive energy management software, so not only is it looking at power systems, but it's also looking at energy efficiency buildings, factories, and it's looking at ongoing performance analysis, measurement, and also has a portfolio feature as well, so it's a much more comprehensive tool.

Dinesh Parakh   Thanks, Greg. The next question is: Could you show the new portfolio tool, which you mentioned earlier?

Greg Leng   So, we'll probably organize with CESC chat sessions later on doing performance analysis, and also doing portfolio analysis with RETScreen, but just quickly—so, for example, so as I mentioned, one facility—you do analysis for one facility, but now you can combine many facilities together. So, we do that through My Portfolio. So, I click on My Portfolio—so it's all within the same platform. So, what we're going to do is you can open a portfolio file, or create a new one, and in this case, we have a sample portfolio, in this case, for some projects in Ontario. So, let me just click on that—I'm not going to save what I did before. So, it's the same software platform. You see the worksheets at the top of the software have now changed and it's now our portfolio analysis module. So, I'm going to click on All here, and so what you're looking at is essentially a database of many different product ticks.

So, we were looking at a medium office building before, but what if we did a small, large—so it's a database of multiple projects, saved on this portfolio page. You can easily go in and add other projects to that database just by adding them there. And just to give you an idea of the file format—so, the portfolio file is, again, made up of a series of individual facility files. You can create separate groups, like only looking at agriculture facilities, or commercial, institutional, et cetera. And just to help you manage your facilities, we also have built in the big map in terms of helping you manage your portfolio. So, for example, you can see the projects in Ontario here and see what facility is up there—it's an elementary school that they're working on—or you can zoom in in Ontario, for example—plastics factory, things like that. So, it's a great management tool that way to visualize your entire asset pool.

So, we have pension funds, universities, industrial manufacturer, school boards, et cetera, hospital networks—that are using RETScreen in this way. And we're beta-testing in a number of these different organizations. So, that's on the portfolio _____ , such as your database of all your projects or facilities. And then you can actually go in a—what's it called—a new dashboard worksheet, and actually do an analysis of your entire portfolio. So, for example on the screen here, we can be looking at—for example, we were doing a feasibility analysis before, so let's look at commercial/institutional buildings. So, the key information is summarized here—how much fuel consumption—for each of the buildings here, you see down the left menu

here how much fuel consumption, base case, proposed, and how much saved, the fuel cost savings, the greenhouse gas emissions, and your key parameters, such as how much it costs, simple payback, and internal rates of return. And then that data is shown graphically here, so I can scroll the bar down.

So, we see the hospital for example—the base case versus proposed case system. This is showing just the total energy consumption. So, that can show you that if you're looking for a large quantity of savings, or you can modify this graph and say, "Well, no, actually I'm interested on from an energy use intensity perspective," so I click Go here, and it'll actually tell you actually on a square meter basis which facilities are actually consuming a lot per square meter, and you can see now in this case, it's the quick-service restaurants and full-service restaurants.

And there are some other nice features in there that you can show quickly—so, for example, you might want to look at which ones give you the best internal rates of return on your equity. So, you can target—if you're doing an investment over an entire portfolio of facilities—which ones do you want to focus one first. So, it's showing you that the high school and the hospital have the two highest returns on investment. So, it shows you how you can use this to manage your portfolio, and I'm just showing the feasibility analysis, but you can also, of course, do it for performance analysis and what is the ongoing savings and consumption in greenhouse gas use, et cetera. And of course, that's linked into an automatic reporting tool as well, just like the feasibility analysis.

Dinesh Parakh Great. Thanks, Greg. Very interesting. The next question is: Can we use this model if we use the software for industrial process heating at a hot water of 90 degrees Centigrade?

Gregory Leng Yes, so process heat—you could use a virtual energy analyzer and go in and take one of our industrial examples that way. We also—if those that have used RETScreen in the past—we also have case studies and templates. So for example, heat recovery—for example, in a brewery or a petrochemical plant. So, if I double-click on here, it'll open it up—so this is essentially an individual measure for an industrial facility, and I'll go in after and look at— so it's processed steam—you can go in and set your flow rates and your temperatures, et cetera. And you can go in and look at process electricity, existing losses, the whole bit. You can do various sophisticated analyses that way as well.

Dinesh Parakh And the next question is: Can this model be used for a solar cooling system?

Gregory Leng Yeah, so the—yeah, it can. We're actually in the process of installing a solar absorption cooling system—sorry, an ejector cooling system on our roof of our facility at our lab in Montreal. You can do it—you would probably need to do it—we don't have a direct model for solar cooling yet because we tend to focus primarily on commercially-available technologies that are widely used, but we add technologies over time. So, the way you do it probably is you'd probably do it as an absorption cooling system depending on the technology you're using, and you assume the amount of heat that's actually

available from your solar system. So, you can do it—that one, you contact us and we can show you how to do it because it's a bit more complicated as it tends to be a sort of one-off system.

Dinesh Parakh   Thanks, Greg. The next—another question is coming. I would like to see an example of using the software for monitoring and verification for a building.

Gregory Leng   So, that in itself could be a whole other webinar, but let's—so when we're talking measurement verification, we're really talking about the RETScreen performance analysis module and this is where you do monitoring on an ongoing basis and the measurement verification is a very specific term used under different protocols for verifying that you actually get performance—the actual performance versus predicted performance of your measures. So, RETScreen will do that automatically for you. So, probably the best way to do that would be go into our case studies again, and I'm going to look at— I'm sorting by analysis type here. So, we have some examples that you could look at.

So, I'm going to take a performance analysis for a small office building here in Canada. This is a built-in example. So, given the amount of time left, I won't go into any detail here, but just to show you how you can look at it. So, you can go into our case studies and template section, but it's the same look and feel. The location—this is in northern British Columbia—and the facility page are the same—there's the building we're looking at. And the difference is now the worksheet's at the top—data and analytics. If I click on All, you're going to see the other sheets that we were looking at for energy costs, finance _____—but to keep the analysis more simplified, we're going to look at the data.

And so this is essentially the database, and I click on—so we have some natural gas information there. This is the actual consumption, and then we calculate the heating degree days for the exact same time period, and this is where you do your—it sets you up for doing the regression analysis, where you take your actual consumption, for example, versus a factor of influence, such as the weather—like heating degree days, et cetera. Then you use that data and do analytics and this is where you do things like regression analysis, where you're trying to create a predictive model given certain temperatures, et cetera. And then out of those analyses you can create automatically in the software measurement verification graphs, which is a standardized graph.

So, the software—so, just quickly to show you—so this is given the historical and baseline information, this is the consumption, the baseline year consumption of the building for natural gas, and if you did nothing to that building—in this case, this building—there was a high efficiency boiler put in, a gas boiler—so, if they had done nothing, the blue line—given the heating degree days, the outdoor temperature—this is what you had expected the consumption to be, the blue line. The green line—as you see when the project was actually implemented—is what the actual consumption was after the—and the area between those two curves is actually your energy savings. So, that's a standard measurement verification graph—the software does that for you automatically. And then, of course, the same reporting features are

built in and you can see it's all automatically built into the report, including all the graphs, et cetera, and the data, if you want to see the data, as well. So, I think we still have time for another round of questions.

Dinesh Parakh   There's one question related to that—what you just showed, Greg. How does RETScreen verification implementation compare to the international performance measurement and verification protocol standards?

Greg Leng   Yeah, so great question. So, what I'm showing you here is—we developed this with this organization that's called EVO—I think it's Energy Valuation Organization—who developed the IPMVP, as it's called. It's just the standard for doing measurement verification. So, we actually developed it with them— _____ Air International was the company that worked with us who was on their EVO board—and we validated and tested it and they _____. So, this is developed within that standard—specifically, for it. And they validated it versus the standard, so this graph was done specifically for IPMVP.

And on top of that, we're also working with organizations who are using RETScreen for ISO 50001 energy management standard, which is excellent. And also now looking at the superior energy performance standard in the US for industrial, we're also looking to make sure the software is compatible with those standards as well. So, we're fully integrated with our users and these sorts of standards.

Dinesh Parakh   Thanks, Greg. A couple of more questions—I think we have time for one or two more quick ones here. The question here is: The emission reduction calculation—is it as per the UNFCCC methodology—CDM mechanism?

Greg Leng   That's a good question. So, let me just load a building here for us—I missed loading any building for our virtual energy analyzer. So, we actually worked with the UNFCCC, originally through the United Nations Environment Program and their resource center in Denmark, and then with the World Bank's prototype carbon fund. And so, yes, we developed this tool with them—the emissions factors that were reported into the UNFCCC for each country, we validate them with the GHG protocol, for example, and we also might have some additional national numbers, like for each province in Canada, and the US—or for each state in the US. But it's done within the UNFCCC. And for example, there are—within the UNFCCC—I'm just opening the manual here—for example, for solar water heating projects, RETScreen is actually the tool requires under the CDM to be used to do your CDM projects. So, not only are we integrated with them, in some cases, RETScreen is actually the required software tool to be used under a CDM project, for example.

And I'll just sort of—while we're on that—because we have built-in electricity factors and various types of fuels, and also again as part of our work with the UN, you can also go in and do a more detailed emissions analysis—and you can see the IPCC—_____ numbers above—but you can go in—this was one of the requirements that the UNFCCC requires from us and the World Bank—is that you can do a marginal analysis as well, and go in and actually change the mix of your grid, and even change your

baseline. This is also another requirement—being able to change your baseline in a certain year, for example. So, you can get very detailed and even go in and customize and do a Level Three and actually customize your emissions factors as well.

Dinesh Parakh There's a couple of more questions, but I think we don't have time—they're a little more detailed, so we can get to those questions—we can respond to them afterwards. It's just about 11:25 now, so we're right on time. I think at this time, I'm going to pass it back over to CESC and ask them to conclude and as well, I believe they have a brief audience survey.

Stephanie Bechler Thank you so much, Dinesh. And yes, we'll be able to export the question log and get answers after the webinar concludes for the questions we didn't get to. Right now, we have a brief survey that we would like to issue—just one moment. Right now, if you could please select the first—select an answer for the question showing up on your screen: The webinar content provided me with useful information and insight. Thank you. The second question on your screen: The webinars presenters were effective. Thank you. Our next question: Overall, the webinar met my expectations. Our fourth question: Do you anticipate using the information presented in this webinar directly in your work and/or organization? Thank you so much. And our last question: Do you anticipate applying the information presented to develop or revise policies or programs in your country of focus? Great. Thank you all so much for answering our survey.

On behalf of the Clean Energy Solutions Center, I would like to extend a thank you to all of our expert panelists, and to our attendees for participating in today's webinar. We've had a great audience, and we really appreciate your time. I invite our attendees to check the Solutions Center website if you would like to view the slides and listen to a recording of today's presentations, as well as any previously held webinar. Additionally, you'll find information on upcoming webinars and other training events. We're now posting the webinar recordings to the [Clean Energy Solutions Center YouTube channel](), and please allow about a week for that to be posted. 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. Have a great rest of your day, and we hope to see you at future Clean Energy Solutions Center events. This concludes our webinar.