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Hello, everyone. I'm Vickie Healey with the National Renewable Energy Laboratory. Welcome to today's webinar hosted by the Clean Energy Solutions Center. Our discussion today is focused on RETScreen which is a tool that allows participants in the policy process to consider the technology, business and finance of clean energy in an integrated fashion which thus helps to develop appropriate and successful policies. Ah, next slide please, Heather.

One important note to mention before we begin our presentation is that we have a little disclaimer which is the Clean Energy Solutions Center does not endorse or recommend specific products or services and the information provided in this webinar today is featured in the Solutions Center library as one of many informative and best practice resources that are researched and provided by our technical experts. Next slide, please.

Okay, before we begin, I have a few housekeeping topics to go over. One, to begin for audio, you have two options. You may either listen through your computer or over your telephone. And, if you choose to listen through your computer, please select the mic and speakers option in the audio pane. By doing so, we'll eliminate the possibility of feedback and echo. And, if you select the telephone option, a box on the right side will display the telephone number and the audio pin that you should use to dial in. We ask that you please mute your audio device before the presentations begin and again that's to prevent any background noise or things of that nature. If you have technical difficulties with the webinar we do have a toll free number for you. You can contact the GoToWebinars help desk at 8882593826 and they'll be happy to provide assistance. Ah, next slide please.

We encourage all of you to participate in the webinar by asking questions and providing relevant comments to the content. If you would like to ask a question or add a comment we ask that you use the questions pane where you may type in your question. And, if you are having difficulty viewing any of the materials through the webinar portal, you'll find PDF copies of the presentations on the Clean Energy Solutions Center training page at the URL provide on the slide and you may follow along as our speaker presents. Also on audio, I'd like to advice you that an audio recording and the presentations, PDF copies of the presentations will be posted to this

very same URL location within a few weeks so you'll be able to go back and review the audio and video presentation at your convenience. Next slide please.

Okay, our agenda. We have a really great agenda prepared for you today that will focus on planning, designing, implementing and reviewing the viability of Clean Energy Policies using the RETScreen tool. And, before our speaker Dinesh Parakh begins his presentation, I'm going to provide a short, informative overview of the Clean Energy Solutions Center Initiative. Following the presentations, we'll have a question and answer session and a wrap-up with discussion and closing remarks. I'd also like to add that we'll have three very—we'll have a short survey with three quick questions that we'll ask you to answer to provide your feedback on today's webinar. Next slide please.

This slide provides a bit of background in terms of how the Solutions Center came to be. The Solutions Center is an initiative of the Clean Energy Ministerial and supported through a partnership with UN Energy. It was launched in April of 2011 and is primarily led by Australia, United States as well as other partners. Outcomes of this very unique partnership include supportive development countries through enhancement of resources on policies that relate to energy access. We also provide no cost expert policy assistance to government agencies and institutions supporting government agencies with policy development and we offer peer to peer learning and training tools such as the webinar that you are attending today. Next slide please.

The Solution Center has four primary goals. First, it serves as a clearing house of Clean Energy policy resources. It also serves to share policy best practices, data, and analysis tools that are specific to Clean Energy policies and programs. The Solutions Center delivers some very dynamic services that enable expert assistance, peer to peer learning and sharing of experiences. And lastly, the Center fosters dialogue on emerging policy issues and innovation that is appearing around the globe. Our primary audience is focused on energy policy makers and analyst from governments and technical organizations in all countries that we also strive to engage with the private sector, NGOs and civil society. Next slide please.

So, now I want to tell you a little bit about our marquee feature that the Solutions Center provides which is expert policy assistance. We call this Ask An Expert and it is a very valuable service offered through the Solutions Center. We have established a broad team of over thirty experts from around the globe who are available to provide remote policy advice and analysis to all countries. And, I'd like to note that this service is provided at no cost to the requester. To date, the Solutions Center has responded to more than eighty requests for plain energy policy assistance

that have been submitted by over forty countries. If you have a need for policy assistance on regulations, renewable, energy efficiency, energy access, clean transportation or any other clean energy sector, we welcome and encourage you to use this very valuable service. And again, this assistance is provided free of charge. To request assistance is very simple, you may submit your request by registering through an Ask An Expert feature at cleanenergysolutions.org/expert. We also invite you to spread the word about this service to those that are in your networks and throughout your organizations. And, real quickly. Excuse me. There are certain ways you can become involved in the Solutions Center, we encourage you to explore and take advantage of our resources and services including the expert policy assistance which I just mentioned, you can subscribe to our newsletter and also continue to participate in webinars. We also invite you to recommend relevant resources that you feel would add value to the Solutions Center resource library. And, we have some tools that you can test such as the global renewable energy opportunity tool which is currently available on our websites. We welcome your testing the tool and providing feedback. Next slide.

We also encourage you to read and comment on our blogs which are located on our policy form page. And, on our policy form page you will find many interesting and informative articles that discuss progress of clean energy policy development and implementation occurring in countries all around the world. We also follow similar articles posted by our partners at the renewable energy, and energy efficient partnership, Leonardo Energy, and podcast through developed by Bloomberg new energy finance. Next slide please.

And now, it's my pleasure to provide you just a brief introduction of our very distinguished panelist today. I'm pleased to introduce Dinesh Parakh, he's program advisor for RETScreen International at Natural Resources, Canada's CANMOT Energy. Dinesh, welcome! I'll turn the webinar over to you.

Dinesh Parakh Thank you very much, Vickie.

Vickie Healey You're welcome.

Dinesh Parakh Welcome to all of you. Let me just show my screen. All right. Can everybody—you should all be able to see my screen with the RETScreen software.

Vickie Healey Yes.

Dinesh Parakh So, welcome to all of you. Thank you very much for being here in this virtual environment. It always astounds me how we can do this with people from all over the world so we're going to do our best to make this

as valuable as possible. So, the purpose of today's talk is to introduce the RETScreen software and more specifically the RETScreen policy toolkit. We have a lot to get through. I'm going to try not to rush it but at the same time I want to cover as much as possible so as to give you the tools and sort of the leads to follow up on your own at a later point.

So, I'll start first with a very brief overview of the RETScreen software for those of you who may not be familiar with it. RETScreen has been created to, specifically to empower cleaner energy decisions worldwide. What RETScreen does is that it significantly reduces the cost of both financial and time cost associated with identifying and assessing potential clean energy projects. Now, these costs can be substantial barriers. Not can be, they are substantial barriers to the deployment of clean energy projects. A lot of clean energy projects don't get off the ground because of these initial hurdles. SO, by reducing, minimizing, or removing these costs what RETScreen does is reduce the cost of getting projects on the ground, actually getting these projects built and doing business in clean energy. So essentially, what RETScreen is doing is that it's enabling clean energy by preserving capital and diverting it to more productive purposes. For example, perhaps away from pre-feasibility and feasibility studies and initial steps such as legal documentation etc., which can cost a lot of money towards the actual conception of viable clean energy projects. What the screen is showing you here is just an example of some of the world of RETScreen. I'm not sure. I think you should be able to see my cursor there. You'll see that there are different projects that have been built. There are universities, over 500 colleges and universities that we know of using RETScreen for teaching and research and probably a lot more than that, you'll see some examples of those thesis here, government use worldwide, training worldwide, we see happy campers selling the RETScreen software in different parts of the world. Just a quick snapshot, there's a sort of peep map here with all the different locations. RETScreen is used in every single country and territory of the world and this is just showing you a little example of that.

So, what is RETScreen? RETScreen is the world's leading clean energy decision making software. It handles clean energy, [inaudible][0:11:53.9], that is the primary reason that it has been created. Clean energy including energy efficiency, heating and cooling, renewable power generation and co-generation. What people sometimes don't understand what RETScreen—what we don't realize is that it also handles conventional fuels or fossil fuels. So, for example RETScreen can help you make a coal plant more efficient. It can compare the impact of two different conventional fuels. Let's say you're looking at the effects, how to analyze a coal plant versus a natural gas plant. And, it can also compare conventional fuels to renewable, for example a coal plant versus a biomass plant. All those capacities are built into the RETScreen software. It is available in 36 languages catering to two thirds of the world's population,

a little bit more on that later. So, essentially what RETScreen is doing is that it's allowing decision makers and professionals to determine whether or not a proposed renewable energy, energy efficiency, co-generation project, a clean energy project or conventional energy project for that matter makes financial sense. If the project is viable or if it is not, RETScreen is going to help the decision maker to understand this very quickly, unequivocally, in a user friendly format and at relatively minimal cost. It's just a little more restats on RETScreen. We have as of today more than 372,000 visitors in every country and territory of the world, approximately 40,000 new users every year, well over 500 universities and colleges that are using RETScreen for teaching and research, and well over 8 billion dollars in direct user savings. This is a result of an independent impact study that was commissioned a few years ago since 1998.

This is just to give you an example, a practical sense of how RETScreen has been used around the world. This is one of many, many projects. This one happens to be a Photovoltaic Water Pumping System in Africa. As of 2013, as of the present, RETScreen has been conservatively estimated to be responsible for over 24 gigawatts of clean energy capacity built worldwide with a value of over 41 billion dollars.

Here's another example of another project that's been facilitated by RETScreen. This is a Wind Farm in Ireland. On the screen, the quotation there says that RETScreen software used for 20 wind energy projects built or under construction totaling a hundred megawatts and investment of 210 million dollars.

So, you know, just to get again, just to give you a little sense of how RETScreen is being used practically, we have the Photovoltaic Water Pumping System, Wind Turbines in Ireland. Again, these are just two of many, many projects that have been built, and can be built, and used with RETScreen.

Okay, so now we're going to get into a brief overview of the RETScreen Suite software. RETScreen Suite, which we'll explain in a moment, was released in June 2012. It's regularly updated. We're hoping for another update in the next couple of months with some critical new items and software upgrades. I'm sorry, I muted my phone but I didn't mute my answering machines so somebody is calling in the middle of—my apologies. All right, the RETScreen Suite, the software suite—all right, what it's telling you here is that RETScreen software suite consists now of two separate programs. RETScreen suite integrates the RETScreen for clean energy analysis software, and the RETScreen plus Energy Management Software. RETScreen 4, as you can see on the screen there, is an Excel based clean energy project analysis software tool that helps analyze these projects. RETScreen Plus is new, it was only released last

year and it's a Windows based Energy Management Software tool that allows project owners to monitor target and verify the energy performance of their facilities. Also available on the RETScreen website is the Arena and Supermarket project model which is specific for arenas and supermarkets. They have their own challenges with analysis and this module is designed specifically for those types of facilities.

Now, I'm just going to quickly mention as a little bit of a teaser that currently in development is RETScreen Expert which is the next generation of the RETScreen software. By creating a virtual desktop expert, what this is going to do is actually make the analytical power of RETScreen which I'm going to demonstrate for you a little later, available to a much broader range of clean energy practitioners. This is expected to be released—the initial status in the next year or two with a long term development process. That's going to be an exciting thing, and perhaps we can do a seminar of that in another time but just to mention that that is the current work of the RETScreen team.

So, RETScreen is well known for its five step standard analysis. Actually, here you will see six steps. There's one, two, three, four, five, six. The first of course is the initial sight and settings condition so we don't count that as a step. We see here that you have the energy model, cost analysis, emissions analysis, financial analysis and sensitivity and risk analysis. Fully integrated into that 5-step analysis are databases and manuals. For example, we have the climate database here, product database, and different tools, engineering tools. A new feature that we added just last year is a benchmark database. What this does is it allows the user to compare the energy performance of various types of reference or benchmark facilities around the world with estimated or monitored annual energy consumption. So again, another integrated tool to help you solidify your analysis. Some of these things we have are just learning courses, training materials, very extensive training materials, and engineering cases textbook, case studies and templates, market place and maps. I'm going to show you these briefly. Okay? We're going to get into the policies soon but just to give you this overview of what RETScreen really is and what it can do.

So, RETScreen primarily does two forms of analysis, what we call the method 1 and method 2 analyses. The method 1 is a simplified analysis, everything is in one sheet so you see here you have the engineering details, you have... All right, here we are, we're back on... Let's get back to where we were. Okay. So, I was describing the method 1 and method 2 analysis. Method 1 is like a pre-feasibility, method 2 is a feasibility, there's also a method 3 analysis or a certain technologies, for example wind and things like that. You can get into even much more detail so RETScreen does do a really, you know, you can get into a fair amount of detail with RETScreen.

This is an example of the project data base. There are around a hundred and eighty case studies and templates that are built in to the RETScreen software. This helps you commence analysis very rapidly. What these case studies and templates do, where going to open one of these up when we get to the case study, is that it pre-fills the initial analysis and then you can just modify it as necessary. That's always very helpful rather than being confronted with a spreadsheet where you have to fill in all the cells, you have a very good starting point.

As I mentioned a few slides back, RETScreen is available in 36 languages which is two thirds of the world's population. And, I'm going to show you—you see there, it's showing you a screen shot of the drop down menu. You can click on English and you have all these other languages. With one click of the button you convert it to Chinese, or Croatian, or Czech, or Danish, or anything else. The advantage of this is that the user can work on his or her own language and send a very small RET file, which is measured in kilobytes, to a colleague in another country who can work in his or her own language. For example, let's say you have a colleague in China that you are working with, you can work in English, or German, or Hindi, or Swahili, or whatever language you like to and send your RET file to your Chinese colleague who can with one click switch the analysis to Mandarin, and then you can easily switch it back. So, I mean, most of us in the working world are working in English languages but people may feel comfortable working in their own language, and it just helps reach those barriers between project teams in different locations. It's really a great boon for collaborative work worldwide in project teams.

The legal and policy tool kits are another very important resource that RETScreen has. This is part of RETScreen's expansion to address non-technical barriers to the deployment of clean energy. The clean energy legal tool kit which you'll see some shots of here online, was really, as far as we know, the first attempt anywhere to attempt to address the legal transaction costs associated with clean energy project development. Just to basically summarize the reason that we engage in this toolkit, there are significant legal barriers to clean energy at the pre-feasibility stage, these barriers can include the cost of legal documents, and as well also a lack of knowledge and capacity surrounding legal strategies, and a lack of legal documents for clean energy projects. The goal of this tool kit was to raise awareness around legal issues associated with clean energy projects and also very importantly, provide sample documents and templates of commonly used legal documents that can then be customized for your own projects. For example, a power purchase agreement could easily cost over 50,000 dollars, even a hundred thousand. There are some very complicated power purchase agreements out there involving very large projects. Using our samples and our templates, your law firm may be able to customize one of our templates for 5,000 or 10,000 dollars. So again, the whole idea is to free up capital, we allocate capital to more productive

purposes and reduce the overall project risk. That is the legal—clean energy legal tool kit.

The policy tool kit which is going to be the 2nd half of this presentation is the newest and latest tool kit. This was just released in the past year. That's going to be the focus of the 2nd half hour. Training and capacity building is a very important focus for us, people need to know how to harness the power of this software. We're regularly given comments by people who are amazed once they realize what RETScreen can actually do. It is a tool—it can be a very simple tool but it's also a very sophisticated, very comprehensive tool. The training materials that we created, which are all freely available online is a way to help people understand what the value of this tool is and what can be done with it. Everything, again, is online, it's all free, it's multi-lingual, it's all available in French and some other languages as well. Not all materials are available in all 36 languages but we do have some of the materials translated into different languages. The training materials include webcast, presentations slides, speaker personnel, case studies, templates, and E-textbook, there's plenty of stuff out there. A diligent student could really learn the basics of RETScreen by going through our materials conscientiously. These are also excellent resources for teaching RETScreen and clean energy more broadly. Above 30% of our users, 40% of our users are colleges and universities. They're certainly using a lot of these training materials for secondary instruction. Even within the organization, let's say you've heard this presentation today and you want to share it with your friends, use some of our materials, modify as you wish and you have a readymade presentation.

The next thing is the RETScreen training institute. You'll see on the screen there a list of courses that comprise the RETScreen Training Institute. Basically, this is intensive training on RETScreen which is case study based, very heavily case study based, and delivered by the RETScreen development team, so the people who are actually creating RETScreen everyday are the ones who are teaching you how to use it through using case studies. This is the best available training on RETScreen by far. We do our best with the online material but there's no substitute for having a live person who really knows the software inside and out. Currently, we offer these courses in Canada, and Toronto, and Montreal, in English and French. We are looking to expanding it in other cities and other regional centers. You'll see there in bold at the bottom, we do do customize training. Any of these courses can be offered at your location. Last year our colleagues, my colleagues, trained the government of Chile. In the next two months at the end of July they're going to Saudi Arabia to train the government there. Just to mention that this is an option if you find that you've been intrigued by what RETScreen can offer, this is some possibility in terms of training.

So now, without further ado, we go on to the Policy Toolkit. Clean Energy Policy Analysis with RETScreen. Like the RETScreen Legal Toolkit, the Clean Energy Policy tool kit is part of our attempt to broaden the utility of RETScreen to address all the barriers to the expansion of markets for clean energy beyond just the technical. The goal of this tool kit and the presentation is to be an eye opener on how RETScreen can be used for clean energy policy and also through the entire policy cycle and hopefully we'll generate some "a-ha!" moments in terms of how RETScreen can be used in this way. One thing to keep in mind as I go through these few slides is that good policy in itself does not expand clean energy. Good policy leads to good projects, and by good projects we're talking about sustainable and financially viable projects. What RETScreen can be used is to test policy options, and design policy, implement policy, and then subsequently used to then build projects that result. RETScreen is really moving it from policy to project. It's sort of enabling policy to enable projects.

This is normally a longer presentation, in the interest of time, and we want to get into the case study so I'm not going to go through this in great detail. In the textbook which I'm going to show you and the actual tool kit on the website which I'm going to show you, you can get into a lot of detail. You can go there and actually learn all about direct cash claim. Again, we built this tool kit to cater to a basic level of instruction. Let's say there's an engineer who's working on a project and doesn't know anything about this incentive programs and would like to learn, very simple explanations as to what these categories are, you'll see here incentives are broadly defined, broadly categorized into direct cash payments which is subdivided, and then tax incentives which are subdivided, and loan programs. These are all types of incentive type programs. I'll show you where you can get more details on those elsewhere in the tool kit. Again, we won't get into this in the interest of time. I'm sorry. I just want to show you here. The screen shot here is about a Canadian government program for eco energy for aboriginal northern communities, that program requires the use of RETScreen.

So, Clean Energy Policy Regulations. Again, regulations are broadly divided into 3 major categories, building code mandates, favorable permitting rules, and interconnection standards. You'll see here on the right hand side, this is a screen shot of Texas', a law in the state of Texas that requires the use of RETScreen and again, that's also in the policy tool kit highlighted. then of course some of the big names, these are actually hybrids: feed-in tariffs, net metering, utility quota obligations, also called renewable portfolio standards, so RPS fall under utility quota obligations, and emissions and environmental attributes trading. Again, we won't speak in detail about them but what's important to note is that these are hybrids. In fact they often have elements of both incentives and regulations in them. These are just sort of the rough parameters of clean

energy policy, what's being used today in countries all over the world. This screen shot here is showing you Ontario's fit program and micro fit program which has used RETScreen extensively.

So, RETScreen, RETScreen for project and policy which I have just touched on. As I mentioned, RETScreen has been used as a tool to demonstrate the viability of clean energy projects but it is also equally useful for planning, designing, implementing, and reviewing the viability of clean energy policies, moving from policies to a successful project. RETScreen has always been used for policy but what the purpose of the policy tool kit is to make that very explicit and to give you concrete examples that you can then use in your own policy design for implementation processes, tools and resources that you can actually use to say this jurisdiction has done it this way, they've used RETScreen this way, we can also do the same thing. There's no need to reinvent the wheel when there's already something that's working well. Certainly, once you've seen how people have been using it, it's generating ideas, it's generating thoughts in terms of how we can all use RETScreen to make our lives easier and also to ensure that we have successful clean energy policies.

So the policy cycle: this again is covered in detail in the chapter on clean energy analysis with RETScreen and we won't get into the details of this here but you know, the chapter is 20 pages long and it goes into this in great depth but the image is really what's in the heart of what's in the chapter, it's describing the policy cycle and showing how RETScreen can be used for each step including numerous examples. This policy cycle is something that—you know there are different manifestations of the policy cycle out there if you type at any search engine. This is something that we find has worked for us in terms of how RETScreen is used for clean energy policy. We've categorized it as informing policy design, implement, monitor compliance with policy, and review policy. So then, we provided numerous examples on how RETScreen has been used to inform policy, how RETScreen has been used to design policy, how RETScreen has been used to review policy. So, here, finally some examples, RETScreen use for policy worldwide. There's all sorts of different actors using RETScreen for policy, primarily different levels of government, we're providing a few diverse examples here but there's many more in the chapter, and we also have a sample documents section at the tool kit. Once we've done these slides, I'm going to go on to the website and show you directly, live on the internet how this is set up.

We've tried to highlight particularly useful or prominent uses of RETScreen in the policy cycle within the actual documents. On screen here, we have 5 different categories: international, national, sub-national, municipal, and utility. What we have on screen here highlighted is the state of New Hampshire which has a solar thermal incentive application form. On the application it's clearly indicated that all applicants shall

submit a RETScreen model analysis. Again, this is a use of RETScreen to implement policy right in the actual policy documentation. Just as a note, the marketplace, which I'm going to show you on the website as well, is where to go to get all the documents, it's used as a browser for information, tremendous amount of resources there. That's always available on line.

This first document is a in the international category. It's from the UNFCCC, United Nations Framework Convention on Climate Change. This is a clean development mechanism, CDM executive word document. In it, RETScreen is singled out as the only pre-approved model simulation program for solar water heating systems. This is part of the rules of the CDM. I believe RETScreen in this case is used to determine the annual performance of the baseline and project system in order to calculate baseline and then projected energy use. This is from the UNFCCC.

The second one is a national example from Canada. I alluded to that a little earlier in a little screen shot of that. This is the eco-energy for aboriginal and northern communities. This is actually a subsequent base, this particular incentive program has had, I believe, it's on its third phase now. RETScreen has been used in each phase, clearly mandated that RETScreen needs to be submitted along with the application for project funding.

The next example here is a sub-national, this is provincial, state, anything less than that national government but higher than municipal obviously. What's interesting here is that RETScreen has been built into Texas state law. So this is the law here, SP 982, Energy Conservation State Buildings, RETScreen is one of only two packages recommended to do the mandatory analysis where new construction, new state building construction and retrofits of existing state buildings. This is sort of an example of RETScreen use in a regulatory sense as well.

Here's a municipal example. This is from the city of Toronto. This is a municipal project involving solar hot water systems. The RETScreen analysis was mandatory in the application process. There were over a hundred systems installed and you can see very clearly here the RETScreen analysis, RETScreen analysis over here, RETScreen simulations.

Finally, we have a category called Utility. This is from National Grid. It's a UK based company, and one of the largest utilities in the United States. It requires the use of RETScreen for the use of its commercial solar, thermal rebate program. This program includes solar hot water heating, solar space heating, high temperature process application, etc. This is from the slide from National Grid, and it's saying here that RETScreen is required.

Just a side note here, these are documents that we find publicly online. We're not necessarily really in contact with these organizations, these utilities in government etc., what it is is that they have found RETScreen to be a useful application to inform their policy processes. It is a free software, it is comprehensive, it is easy to use. These are just things that we've come across and some documents that are highlighted in the policy tool kit are things that we have come across but it is likely that there are many, many more examples that we are not aware of right now.

So, now that we have seen an overview of policies and some examples of how RETScreen has been used, we have tried to put all of this together in a helpful way in this clean energy policy tool, the RETScreen clean energy policy tool kit. So, again, developed by RETScreen International, financially supported by a grant from the Renewable Energy and Energy Efficiency Partnership (REEEP) based in Austria, they've been a long term partner of RETScreen, it includes case studies and templates, and E-Textbook chapter, training slides and sample documents, available on the RETScreen website and also within the RETScreen user manual. When you download the RETScreen software, you are able to access these training resources and tool kits through the actual software and you don't have to go to the website.

There are three case studies and one template that have been created specifically for this tool kit. We are going to get to the first one. We probably won't finish the whole thing in the time that we have but at least I want to introduce to you the first case study and show you how we can practically start to use RETScreen. We're going to use it in the context of developing Feed-in tariff or photovoltaic system. If we don't finish I encourage you then to use the introduction that we've provided and find out for yourself afterwards. Feel free to contact us at any time if you have problems. I believe that Vickie is going to be providing that contact information later on.

These are the four that have been developed specifically for the Policy tool kit. The first is power, photovoltaic, feed-in tariff. It is modeling different feed-in tariff rates for a photovoltaic system in Canada. The next one is, modeling different GHG reduction income credits, so different levels of greenhouse gas credits for an off-shore wind plant in China. The third one models capital cost incentive for solar water heating systems in the United States, that's actually related to the New Hampshire incentive that I just showed you. The final one is a template that allows an income tax analysis; it's 7 rate income tax scenarios, soft loan, accelerated depreciation, etc., etc. It's allowing those to be analyzed within RETScreen in a method 2 analysis.

What I'm going to do now—and I put here, + many more. I'm going to exit the slides for a moment and I'm going to go to the website, and I'm going

to show you now where the tool kit is. We're on the RETScreen website, this is in the user manual, I can show where that is through the user manual as well in a moment. We're going to training material. We go to clean energy tool kit. And, here's the tool kit. So, you have the presentation slides. So let's say you click on the presentation slides, it's giving you the html version, and then you can actually download the power point version, then you can modify as you wish for whatever purposes you have. This is part of the slides that I have just shown you just now.

Then we're going to the E-textbook chapter. Let's say I skipped over email incentives, and you look, oh I really want to know about those, I want to hear again a bird's eye view of what incentive programs are, what's out there, you simply click on its own hyperlink, an html, you click on incentives, and you've gone to, here we go, incentives, and then it's giving you all the different categories, the direct cash payment, what that's subdivided to. Again, it's not in great detail but it's enough to give you awareness of what those are and then that can always be investigated further.

We go back, and let's say the policy cycle is here. So, what works? What we tried to do is based on our research and our knowledge, we tried to come up with a list of criterion of what need to be, what are the characteristics of these successful clean energy policy. Okay, so there's lots of information. This is 20 pages in total. And, these are these sections here with actual examples, using RETScreen to inform policy for example. You go there and you're going to find several different references to different programs in different jurisdictions that have used RETScreen for informed policies. This case in the state of Massachusetts, renewable heating implement study, Canada CMHC, that's Canadian Mortgage and Housing Corporation, India, the State of California. The next section is RETScreen for policy design and implementation, the state of Wisconsin, state of New Hampshire, numerous other ones. We've just tried to select again, examples that we are aware of, and examples that we think add value to the reader, something that's going to be memorable and help you in your own work. And then, here for RETScreen for policy compliance, monitoring and review, all of these documents are available on the market place. I'm going to show you that in a moment. We provide here sample documents. This is the chapter again—I'm sorry I'm jumping ahead of myself. Let me finish with the chapter here. The final section of the chapter which is interesting is that this first feed-in tariff case study, we walk through that in much more detail. let's say you want to get all the details, all the different angles, and different considerations, this is walking through that whole feed-in tariff case study which is what we'll be doing later on in some more information here. There's some bit of information, there's some very good discussion and points to consider etc. So, that's the chapter. And then, we have the sample policy documents

here. If you go international, I just showed one example in the slide show but there's several other ones here which again we think are very good examples. We have something from UNFCCC again, the European Union, CARICOM, that's Caribbean Community. If you go to national, again we have some other ones. We have Greece, India, and United Kingdom. If you click on one of these documents, what it does is actually open up the documents. Let's say you want to see how RETScreen has been used to review policy in United Kingdom, so at the national level, you click on this one here and it's actually going to open up, you actually just open up the PDF document and it goes directly to that. This is the document where RETScreen was used to review a particular policy, a particular RETScreen policy. I believe this one was on the biomass heating. If you search here, you can see exactly where RETScreen was used in the document here. Okay? So, that is—and let's say you want to go to implementation, say in New Zealand, what they've done here with the solar water heating incentive, click on this thing. The beauty of this is that it gives you the actual document. These are all publicly available online, and you can see what New Zealand did, how they set up their policy and how they integrated RETScreen into it. You can see here, they have even RETScreen slides in here and everything. Okay? So again, very useful if you're trying to set up your own policy and you're interested in using RETScreen to help get that policy right, look at some of these documents and see what people have already been doing with it. So, that's the national level. And then, of course we have sub-national, we'll be looking at other different sample documents.

The case studies as I mentioned there. There were 4 case studies written for the policy tool kit. This is the one that we're going to get in to, Power Photovoltaic Feed-in Tariff. Let's see, if you click on this one, the Wind Turbine GHC reduction income, it takes you directly to the case study and it guides you through the way the case study has been written. It gets you to understand how to use the RETScreen software and it gives you hints in teacher's notes, how to start, what do these do, you know, we try to make them fairly comprehensive that way so that you can really get a lot of value out of them. When I mentioned other case studies and templates, there is the 4 that has been written specifically for the policy tool kit but there are about 50 other case studies and templates. For example, these are existing case studies in the RETScreen software which we have discovered have very important policy applications. For example, if you go to Heating, solar water heater hotel/motel India, let's choose this one here. This case study includes concessional debt financing A.K.A. a soft loan. It includes a tax analysis, it includes immediate expenses, these are also income tax type incentives, that's all inherent in this case study. If you go to energy efficiency measures, let's see here, commercial model national code for buildings. This one is demonstrating how one could model proposed energy efficiency regulations in RETScreen. The case study is asking you to model these regulations in RETScreen. So, again,

very useful to determine the effects of these regulations, the practical effect of how that's been used in an actual project. Okay. So, that is the—and I've already mentioned the presentation slides. Again, what I've been presenting here can be modified as necessary. I've mentioned the textbook chapter. I've showed you parts of that textbook chapter. So, this is your basic tool kit here, slides, chapter, the case studies, and the documents.

So, now we do have some time to get into the Photovoltaic Feed-in Tariff which I think you will hopefully find very useful and very practical. What we're going to do is now, ideally we would've had you review the case study ahead of time and you have a basic idea of the software functionality and perhaps follow along with RETScreen that's already downloaded on your computer but we're going to see what we can do with this one. We won't—I mean, if you have RETScreen on your computer, feel free to follow along within the software along with me. But, if you don't have it, it's no problem, you can just sit back and watch because I'm just going to show you a basic idea of guiding you through this, of how you can use RETScreen to model the type of policies. Again, if you have it feel free to follow along, you can enter it in your computer as I'm speaking or as I said, you can just sit back and watch, and you can see how we do this here.

What I'm going to do is, I'm going to click on the Photovoltaic Feed-in tariff case study. What I'll do, just for the benefit of the audience, I'm just going to read it. I'm not going to read the whole thing in detail but I'm just going to give you the essential features of what this case study is asking you to do. So, maybe actually what I will do is I'll just read the first paragraph quickly, all right? Or, I'll paraphrase.

What it's asking you is: The government of the province of Ontario wants to increase private sector investment in clean energy. You're involved in that policy analysis process. And, your task is to investigate 3 possible options for the electricity export rate. How much is paid to developers of—producers of electricity in terms of specifically photovoltaic or feed-in tariff projects. We're assuming for the purpose of this assignment that the hurdle rate, or the minimum acceptable pre-tax and return rate on equity should be at least 12% in order to provide sufficient incentive to private developers to engage in the process. Now, this is very important because if your incentive is too low, you're not going to have the uptake of the policy that you hope for. It's not going to be worth project developers while to engage in the policy. If your incentive is too high, you're going to have tremendous interest but you're also going to be wasting public funds unnecessarily by providing more than what's necessary to stimulate investment. So, what this case study is asking you to do now is, for each policy option, determine what the in-term of return is and compare it with that hurdle rate, and then consider doing analysis in terms of considering what the motivation would be to expect would be to develop projects that

you might expect from private developers and rich option. Based strictly on the rate of return here, again, this case study is very simple, it's only one variable, a normal process would have multiple variables but again, for the purpose of just demonstrating what RETScreen can do, at RETScreen we can incorporate, we can model multiple variable and we'll do some of that as well. Just to keep it simple, the very basic level right now, what we're doing is simply one variable, different photovoltaic feed-in tariff rates and we're looking strictly at rate of return, and then finally make a recommendation as to what you call the option is.

So, what we're going to do is, let me just grab my feed-in tariff one moment here. So, while I grab this, feel free if you want to, if you have this on your own computers, feel free to review some of the case study. All right, I'm just going to get the feed-in tariff case study here with my notes on it. Okay, what we're going to do now is, I'm going to go to the software. This is the RETScreen software, I'll zoom this a little bit so I think hopefully you should be able to see that clearly. The first thing we're going to do is we're going to open up the database. What you can do—you'll see here. Sorry, one moment. I'll just make sure I have all this. So, you'll see here that it's starting off with energy efficiency. This is just the general start screen. That's not the one that we want so you can click on here, and you click on, you know, you can choose power etc., etc. Once you click on power, it gives you different power options, you click on photovoltaic. There's an easier way to do this. And, before we get into the software, let me just give you a very quick hint on what the cells are. Any cells that are grey have no impact on the model, they're mostly descriptive cells, mostly it's for your own use. Any cells that are yellow, you have to have an input, use the drop down menu or through some other means, but there has to be an input into them. A blue cell, which you'll see later on are things that come directly from a data base. And, white cells cannot be changed. So, just a very quick overview, I'm using this now to show you the Photovoltaic feed-in tariff but I'm also showing you the basics of the RETScreen software, just very fundamental basics of how the RETScreen software works. You'll see here, this is the start page part, the first part of the 5-step analysis. This is the start minus one let's say, before the first step. So, again, I've showed you here the drop down menus, the power, and the photovoltaic, central grid versus isolated grid, off grid, etc., etc. Method 1 or method 2. If you click on method 1 here, you'll see down there that there are three, we have three keys. We have start, energy model, and tools. If you click on method 2, all of a sudden you have 5 options; there are 5 sheets—energy model, cost analysis, emission, financial risk analysis. It's all broken down into much more detail. Something like heating value, heating value reference, critical for getting a project analysis right but a lot of people don't even know what that is. At our level, at our stage, we're not, frankly we're not interested in the heating value, if it's higher or lower heating value. So, you can just keep it as a default, but what would be more useful is anything that you don't know

what to do here, you click on the cell and you click on the help menu. As soon as you click on the help menu, it goes directly to the online manual, and the online manual is going to explain this to you. What is the heating value? Measure the value of one of these fuels [inaudible][0:51:34.3]. This is all great, it's all very interesting but I'm sure you're not that interested in it. All you really need to know is this; higher heating value is typically used in Canada and the USA, while lower heating values are typically used in the rest of the world. That's all you need for the purpose of this analysis. So, since this one is Ontario, and it's a feed-in tariff. This is North America where we have the right one. We're using higher heating value. That's all you need to know for this ball park, initial analysis.

If you click here on show settings then, here is where you can change the language. So, we go from English to Finnish perhaps. That's not zoomed, but now it's in Finnish, okay? We'll go back to English. My Finnish isn't very good, in fact it's non-existent. I'm going to just re-zoom this again. You can change language of the user menu to English or French, you can change your currency units, and you can also have user to find currency units, you can change from metric to imperial for those who are still using imperial units. We're going to click on we do not want to show the settings. We'll keep this simple. We want to keep this interface clean as possible. Here we have show data. This is our climate data location. The default is the Ottawa International Airport otherwise the Canada government headquarters, that's what we have but you can select your climate data location. So, if you just click on show data, it's going to show you all of the data. This is all screened and directly from NASA. This is from NASA's satellite results. I think something like 7,000 stations now worldwide. So, you're getting very accurate information. If you want to change climate data location, and the case study is showing you, under sight information. I'm going to go back here under sight information. It says here, a sight located slightly north of Toronto, it's chosen to be represented in the program. If I'm choosing the sight, Canada, Ontario, I know that Toronto, so I'm going to choose Toronto, and Toronto Buttonville Airport, based on my knowledge I know that that is slightly north of Toronto, that's the slight location I'm going to choose. So, I'm showing you this just to give you an idea of the functionality. Here, if I click on show data, now you have the climate data for Toronto Buttonville Airport which is slightly north of Toronto.

Now, in this particular case study, this is actually not necessary to specify the climate data location because the climate data location is important for knowing the amount of resource that you have. So, in this case, what is the solar resource, for the wind project, what is the wind resource? In this case our capacity factor is already specified so we already have an approximation. Now, if you didn't have the capacity factor, you would need to have the—you would need to calculate that, and that would require the knowledge of the solar resource and the method 2 analysis. So,

again, this is just to show you how you can use the climate data location. If you want to do the same feed-in tariff analysis, you can do it anywhere in the world. So, let's see. Close that, select the climate data location. Oops! I think I've done something here. Okay, anyway, but you can select a location anywhere in the world. There are thousands, and thousands of stations, all with the latest climate data on it. So, what we're going to do now is, if you go to the energy model, this is the method 1 analysis, this is the simplified analysis, if you go to the energy model, you're going to see all these intimidating cells which you now need to fill in.

There's a much easier way to handle it. If you know RETScreen, by all means you can start filling in the cells. But, the easier way to handle it, and what you'll see here in the first teacher's note, it says here, start with the project data base templates power photovoltaic hundred kilowatt, and select method 1 on the start work sheet then modify as necessary. So, what we're going to do is, go here, we're going to go to the project database, and we're going to go—so we have templates, case studies, and again, we have over a hundred eighty of these, then we go to case studies, we're going to select by type, it's already sorted by type, we're going to look for photovoltaic, photovoltaic Canada, Toronto, feed-in tariff—no actually, I'm sorry, that's not the one we want. That's the solution. So, we're going to see, what it's asking is to do the case state, asking to choose power photovoltaic 100 kilowatt. Actually, that's a template. I'm sorry. I was running ahead of myself again. This is the solution to the case study so don't open that yet.

Let's go through the case study first. We're going to go to template. Go through type. Photovoltaic, so power, photovoltaic, 100 kilowatt, we're going to select that, we don't want to save the changes that we made, and what it's done now is that it has loaded this template into the system already. So, you have a hundred kilowatts system in Canada, power photovoltaic, and in the energy model, lo and behold, you already have all these wonderful things filled in. So, all right, I have to zoom this as well, as well as this. Okay. So, there you go. All you have to do then is modify. You already have this sort of half filled in, you already have a lot of the work already done here, and then it's just simply a question of modifying it according to your case study. So, let's see what it says next in the case study. What it's telling next, and again if you have this in your computer feel free because I'm going to be flipping back and forth between the software and the case study so if you have this in your case study or if you want to print it out so you have it for reference, by all means please do that.

So, it's a 50 kilowatt rooftop PV installation with a 14% capacity factor. Here, the capacity factor is given to you. So, we go back to the software. Again, this one is only descriptive cell, so we're just going to type in 50 kilowatts, okay, Canada, power is already filled in, it's already

photovoltaic, it's already a method 1 analysis. Higher heating value we've already talked about. Again, this one is not relevant for the analysis but we'll do it all the same. We'll just change the climate data location to Toronto, a location just north of Toronto, Toronto Buttonville. And then, we go to the next sheet, the energy model. So now, you change that to 50 kilowatt, you have to change this here. Now, the important cells, again as I've said, the blue and the yellow, these things have to be filled in for the model to work properly. I'm going to minimize this emissions analysis because we're not going to handle that this time so I'm just going to close that so we have a little less to look at on the screen. We're going to change that to 50 kilowatts, and you'll see that this cell is already linked to it. This is the size of the system. This cell here is incremental initial cost, so this is assuming that its 8,000 dollars per kilowatt is the size of the system. That's not what we've been given in our case study, so we have to make some modifications.

Now, because this is excel you can do this as a formula, but to keep it simple, I'm not that good at Excel, so I'm just going to type it in here. This is a simple analysis, I don't need to start messing around the formulas. So, what it's telling us in here, it's telling us in here the installed cost is 7,000 dollars per kilowatt. So, we're going to go back here, 50 kilowatt system, 7,000 dollars per kilowatt, we're at 350,000 dollars in initial incremental cost. That's the cost of building the system. So, again, these are all very important. Sometimes you'll do the analysis and you'll forget something critical like this and then your analysis is off, so it just takes a little bit of time to understand what needs to be filled in but once you've done that, it really, it's really wonderful how quickly you can come up with the analysis. Now, the capacity factor in the template—I'm sorry, in the template comes up to 15%, we are given 14% capacity factor. So, we're simply just going to modify the capacity factor to 14%. I did this in Namibia last year. For Namibia, we modified the case study for the Namibia context, and we used a capacity factor by I believe 18 or 20% based on obviously the much higher amount of solar radiation available. And, what we're going to do here then is now the financial information. You may assume the following financial information: installed cost of 7,000 dollars per kilowatt, project life of 20 years, 7% debt financing at 7% interest over 15 years. So, we're going to take this information and see if the template already has that. So, it was saying, let's see here, the inflation rate—okay, so the inflation rate, we are assuming operations and maintenance cost to be zero. If you look at one of the teacher's note, it is going to explain that a little bit further. We'll see here, yes, it does explain that a little bit further in here. In a method 1 analysis, you cannot separate, so what this does in a method 1 analysis is showing you the inflation rate of the electricity cost, so the electricity escalation rate. We're assuming that there is no escalation so we're going to make that zero. Now, if you do a method 2 analysis, you can break it down further so you can have separate rates of inflation for the electricity escalation rate. Let's say that's

provided for in the feed-in tariff contract. So, if you have a 20 year contract, and the escalation rate is 1% a year, and you have a general economic rate in a general economic inflation rate in a broader economy of 3% a year, you can specify those 2 different inflation rates. Again, for the purpose of this case study, and to keep it simple, we're assuming that there is no escalation of the electricity rate over a 25 year project life or 20 years. So, the project life is 20 years, the template is giving us 25 years, we're going to change this to 20. The debt ratio is 70%, which is the same as what we've been given in our case study, financing of 7%, and template is giving us 10 years debt term but case study is telling us to put in 15 years so we're going to change this to 15 years. All right, so now we've entered in the financial information. Oh, that's my answering machine again. Sorry.

All right, so that is now—now, we've entered in this information here, 50 kilowatts, [inaudible][1:02:18.3], we've entered in the financial information, now, we're ready to test policy option number 1. Policy option number 1 is no incentive beyond typical market rates paid to electricity producers, assume electricity export rate of 5 cents a kilowatt hour. This is the first option, to have no incentive. It's essentially in clean energy policy. So, let's see, is there an incentive for a developer to develop, to create a solar photovoltaic system in Ontario in the absence of an incentive. That is our first policy option. So, 5 cents a kilowatt hour, now RETScreen—electricity tariffs are normally specified in kilowatt hours but RETScreen requires that it be entered in megawatt hour. To convert, simple multiply by a thousand. So, it's telling you, 5 cents a kilowatt hour is going to become 50 in terms of megawatt hour, 50 dollars per megawatt hour. This little button here, if you click this, show alternative units, it just gives you the amount in kilowatt hour so you can just verify because you'll be surprised or maybe not surprised how often very small errors of arithmetic these days, we're not in that sort of mode anymore, but very small errors of arithmetic or magnitude can completely affect analysis. So just to double check, 5 cents of kilowatt hour is 50 dollars a megawatt hour. We have a 50 kilowatt system, we have initial cost of 350, 000 dollars which are based on 7,000 dollars a kilowatt, we have a capacity factor of 14%, we have 50 dollars a megawatt hour, or 5 cents a kilowatt hour, so basically no incentive, we have our financial information here, 20 years, a project life, a ratio of 7% interest and 15 year debt term. If you scroll down, this is now giving us our results. And this, I think you can all see very clearly is not a financially viable project. This is in fact, worse than a financially viable project. This is a situation where your plowing money into this project, you're consistently plowing more and more money into a project and you're never going to get a return. Your simple payback is a 14 years from now. Basically, what this is trying to tell you in a very simplified form, in a simple graph, and simple numbers here, but again a very thorough analysis behind it, the engine behind this is very sophisticated, is that in the absence of a feed-in tariff,

or some sort of policy instrument, it's not cost effective, it doesn't make sense to build a photovoltaic system in Ontario. There may be some other reasons why somebody may want to do it, there may be a very committed environmentalist, or you know some other concern that might be getting some other benefits from it, but from a purely financial returns stand point, this is not viable. I mean, you're going to be plowing money into this project, more and more money every year, and you're never going to get a return on investment. So, this is with no incentive. So, the government knows this, the government knows that with no incentive there's really no option, so the whole idea that that government want to promote the development of photovoltaic systems in Ontario.

So we now go to policy option number 2. Policy option number 2 is saying, assuming electricity export rate of 42 cents a kilowatt hour. So, in fact your feed-in tariff rate is going to be 37 cents. Let's assume that you're—the normal rate is 5 cents a kilowatt hour, your feed-in tariff is 37 cents right, if your designing the feed-in tariff. So, to model the second option, all we have to do—everything stays the same, we're not changing anything else. What we're going to do here is we're going to enter 42 cents a kilowatt hour, which equals 420 dollars per megawatt hour. And again, we just see, verify that this is 42 cents a kilowatt hour. then we scroll down, we haven't changed anything else. We scroll down. Okay, it's not nearly as much of a black hole as the last example, but still this is a very poor return of investment. I mean, you're not going to start making returns for 14 years, you're pre-taxed, you know later return on equity is 0.3%. Again, it's not enough. If you are a business person, if you are a project developer, this is not something you would consider investing in. This is not a good investment. This is not a good project. Even with a feed-in tariff of 37 cents on top of the 5 cents that you only get, so 42 cents per kilowatt hour, it's still not a good investment.

So, now we go then to policy option number 3. Electricity export rate of 71.3 cents a kilowatt hour. Now, for some of you these numbers may sound familiar because these are actual numbers that have been used and are being used in Ontario incentive programs. So, 71.3 cents. We're going to go back here and we're simply going to modify that one more time. So, instead of 42 cents we're going to have 71.3 cents time a thousand that becomes 713. Again, we verify 71.3 cents. Everything else stays the same. We still have the same system, 50 kilowatts, same incremental cost, same capacity factor, same financial information. Lo and behold, all of a sudden, going from 5 cents to 42 cents, they were both bad projects, going from 42 cents to 71.3 cents, all of a sudden the entire picture have now changed. You're pre-tax in term rate of return equity is now closer to 17%, and I'll just remind you what the hurdle rate was, the hurdle rate that we discussed here was 12%, the in term of return equity should be at least 12% in order to provide sufficient incentive to private developers to engage in the process. Based strictly on that criteria, this is a good return

on investment. It's giving you 16.6% pre-tax IR on equity, an 8 year payback, and you see it very clearly here in this graph. You see the difference. This is something I'm going to want to look at again. I'm going to want to do some more detailed investigation. If I know that I'm going to get 71.3 cents a kilowatt hour, and I know that my project life is 20 years, this is something I want to investigate in more detail because this could be a viable investment. This could be a sustainable project with a long term financial return.

And you're done. This is the simple analysis. You have just tested 3 feed-in tariffs for a photovoltaic, a simple photovoltaic roof mounted photovoltaic system in Ontario. Now, there are additional layers, and layers, and layers of complexity. You can get into a lot more detail if I just switch your method to method 2. You can start specifying a solar resource. You can start specifying capacity factors and look at the equipment etc. There's a lot more that you can add to make the analysis more complex. But, what's important here is that you have determined the rough ball park. If you are in Ontario, a 42 cent an hour electricity export rate is not going to be sufficient. Something around the 70 cent mark may be sufficient. And, maybe it doesn't have to be 71 cents because we said we are looking at a 12% hurdle rate, so even if you made it let's say 60 cents a kilowatt hour, how much is that going to give you? 10.4%. You're getting close to that. You can start playing with different numbers in here. You can use goal seek to come with the exact amount for a 12% return etc.

So now, what we're going to do is go back to option 2. I'm going to show you how you can now combine options, combine policy options. So, 420 dollars per megawatt, that was option number 2. Recall that. We have 3 options: policy option number 1, 5 cents, 42 cents for policy option number 2, option 3 was 71.3 cents. So, what we're going to do now is combine options. Back to 42 cents a kilowatt hour, not a good project, this is not a financially viable project with 3.3% return on equity. I know these days fix deposits don't offer that much more than that but this is still not a good project, okay? What would happen though if you added something else to it? So, let's say for example there was an initial capital cost subsidy amounting to 10% of the installed cost. So, your installed cost is 350,000 dollars, you have a capital cost subsidy, a onetime payment equal to 10% of the installed cost which would be 35,000 dollars, and you have a convenient little cell here for incentives and grants. We could enter in 35,000 dollars to model what would look like a 10%, what would amount to 10% subsidy. You see here it comes up to 10%. All of a sudden, now your 0.3% rate of return is now 2.4%, still not a good project but not as bad as the previous one.

But, what if we did something else? So now, we have 42 cents. Let's say for example, let's say you're in the situation where with the government, you only have, hypothetically there's only a fixed amount available for a

feed-in tariff. So, the maximum amount for some reason, the maximum amount that can be given for a feed-in tariff is 42 cents a kilowatt hour. You just can't go beyond that. But there are other policy options available. So, we maintain the feed-in tariff rate at 42 cents a kilowatt hour, we added the capital cost incentive, this made a little bit of a difference, not a lot. Let's say we add a capital cost incentive of 20% of initial cost, so 70,000 dollars. Again, a little bit better, 5.9%, again not something that would pick my interest in terms of engaging in the process. So, let's just go back to a 10% subsidy.

But what if we start playing with other numbers? So, let's say the government of Montreal says well we can only do this much in terms of feed-in tariff. We can only offer 10% capital cost subsidy. Or, say the government of Ontario offers the feed-in tariff of 42 cents and your local municipality, the city of Toronto is offering a 10% subsidy on the capital cost on the initial system, so you have the government of Ontario, the city of Toronto, and then you have the federal government kicking in a soft loan, a reduced interest rate loan. So, instead of 7% commercial financing, you have a 3% kicked in by the federal government. So, now you have three different levels of government operating with three different subsidies, only in our dreams, I think we could wish for that level for cooperation but anyway, now look what's happened, all of a sudden now you have a 9% rate of return. You still have a 42 cent per kilowatt hour feed-in tariff. Now capital cost incentive modeled in there, plus you have a soft loan of 3%. Now, you're up to 9%, so you're getting closer. This is now something that is a little bit more interesting. This is something that's a little more interesting. I'm going to look at this twice. Still not really the 12% that you're looking for but then change something else, change the project life, instead of a 20 year project life. Guarantee the project for 25 years. And, all of a sudden you're now up to 11%. You're getting closer and closer.

So, what this is doing, and I hope you can see the power of what I'm doing here on my desktop within a matter of minutes. I'm taking a basic small system, small photovoltaic system, and I can test different policy options, wither singly or in parallel. So, in this particular situation, I have now tested 4 different policy options, I have a feed-in tariff, I have a capital cost incentive, I have a soft loan, and I've experimented with increasing the project life. And, they could all be the same level, it could be the government of Ontario providing all these things. It could be in conjunction with different levels of government, whatever it is, but the whole idea is if you're limited, if you're constrained in certain areas, there are always other areas that you can use to design your policy to make that policy attractive to investors, and that's what we've tried to show here. So, I mean, this case study only consider one variable but a normal policy design process would definitely consider additional variables either independently or in combination.

So, variables that could affect the availability of systems are some of things that we've seen here. It could be capital cost, project life, debt ratio, debt interest rate, initial cost, incentives and grants, O and M, we didn't touch that one, savings foci, we didn't touch that one there as well, okay. All of these things you can modify and model, and then you can use all these to now design the parameters of your policy to get you something that's going to be close. And again, this was model alone on Ontario, you know, the 42 cents a kilowatt hour was modeled on the Ontario's renewable energy standard offer program.

So, if you go back now to the case study, and you get here under the teacher's notes some really good tips, it's telling you here, start with the project database template, the electricity specified in kilowatt hours, megawatt hours, site location capacity, it's giving you some really helpful hints on how to use RETScreen, how to instruct others in this, how to compare the 3 options. It's stating quite clearly, if the overall policy goal is not developing photovoltaic systems in Ontario but reducing gas emissions, then maybe it's the quantity of greenhouse gas emissions that's going to be most critical as opposed to the purchase rate offered to producers. This is about the different variables. Let's say you wanted to add a greenhouse gas analysis, you open up the emissions analysis here, and I'm going to make this a little bit smaller so you could see this. Let's say an international level of government, so here you have the Ontario government, you have municipal government, you have federal government, they're all playing this game. Everyone wants clean energy. All of a sudden you have an international body in a greenhouse gas emissions credit, okay? So, let's say the credit rate is 10 dollars or 10 of CO₂; the credit to ratio is going to be 20 years, collision rate 2%. In addition now to the feed-in tariff, addition to the capital cost incentive, in addition to the soft loan, you now have a GHG credit as well, and you're up to 11.1%. Again, just showing you how you can play with what options are available to you. And, you can put in the model what's going to work. I need to design a policy and here's how I'm going to design the policy, and here's—I mean, I have a good understanding of what's available to me in my jurisdiction. So, using what I know, using what's available to me, I can model all these different policy options here. So, we have now modeled 4 different policy options in one, and we're getting close to an acceptable rate of return, 12%. Now, this would be a pretty complicated policy because you have all this different levels of government participating, you have different credit. Now, what you would normally do is you get rid of all these other stuff and you just ideally increase the feed-in tariff. Let's see, 60 cents or something like that you're up to 25%, okay? So, you know, that's sort of like using the hammer. But, again, I'm just—the point here is just to show you how easy it is to combine different policy options.

And then, here in the case study it gives you the results of the real projects. The Canadian province of Ontario's [inaudible][1:17:24.9]

program, it talks about that, it talks about the new feed-in tariff program. The [inaudible][1:17:29.1] offered a solar photovoltaic projects guarantee with a 42 cents kilowatt hour, and the new Ontario feed-in tariff had a higher rate and these rates have now also been reviewed. Those are slightly different now as well. It gives you the lessons learned, okay? And, again it's giving you a very strong conclusion here that based on the current state and cost of photovoltaic technology, current state in cost, make sure because this two may be different. But, in the absence of a feed-in tariff or singular policy instrument, an imprint can be made that building grid connected photovoltaic projects in Ontario would not be cost effective for private developers. And, the whole big picture is giving you a little more information about the actual project. If you go back—if I go back to the clean energy policy tool kit, and I go back to the chapter I showed you this as well, there is additional detail in this chapter. Using that same photovoltaic case study, I can now go through all these additional factors and features, and it just adds a lot more flesh, it adds a lot more nuance to the whole analysis because doing policy, as I said in the preview is not easy. Getting good policy right is not easy. Getting an appropriate policy that's going to be successful, that accomplishes your objectives is not easy. There are all sorts of points to consider. We've tried our best to try and put these things together so that it's a help to you as you design and implement policy. Hopefully I've been able to show you now how you can use the policy tool kit but more importantly how you can use the RETScreen software to very quickly model those types of things.

Okay, I didn't have any more slides. I think everything is all finished actually. The software demonstration is done. So, I'm actually finished on my end. I'm going to turn this over I believe back to Heather and Vickie. Oh, Vickie is the presenter. And, I believe if there are any questions we have a couple of minutes before 11:30. Feel free if anybody as questions to—we'll do our best to answer them.

- Vicky Healey Okay, great. Can everyone hear me? I'm having audio difficulties.
- Heather We can hear you, Vickie.
- Dinesh Parakh I can hear you.
- Vicky Healey Oh, great. Okay, terrific. So, Dinesh, we have a couple of questions that came in. We'd like to take a couple of minutes to present these questions to you. One question that came in was, if you would be able to explain a little bit more about emission analysis and what that mean.
- Dinesh Parakh Okay. Sure. I can show you very quickly how we would do that let's say in RETScreen. Now, can I take the screen back? Or, let's see here. Heather, can you give me control again? I'll just do it very quickly. Okay, great.

Heather

Okay.

Dinesh Parakh

Okay, I believe you can see my screen again. So, let's go back to the start page. Let me load up. So, we do have for example—again, we don't have time to get into the details, I want to take some other questions, but I'll show you how you could do that, all right? So, if you had emissions analysis, we do have one GHG case studies specifically on GHG reduction income using wind turbine, using off shore wind project in China. Again, this is a very simple analysis, not a lot of variables. It's something that you can easily model. If you go to the software, if you select, go to the project database, and you can actually select—there's a whole, I mean, there is a case study so this software is telling you to open up the database, power, wind turbine 50,000 kilowatt, but I want to also show you that these solutions are here as well. What you can do is you go to the project database, and you can actually open up the solution. This one is wind—let me just open this up. So, wind turbine, China, GHG reduction income. So, I don't want to save the changes. We're now loading up that. So, basically by using the case study, and by using this solutions set here, this is actually showing you what level of greenhouse gas emissions credit are you going to require to have a rate of return—what is it asking for here... I'm sorry, Vickie, is it okay of we go a few minutes over or do we need to stop at 11:30?

Vicky Healey

I think we can have a couple of minutes over.

Dinesh Parakh

Okay. Just so we don't have to cut out. I'll be quick. What it's showing you here is you're looking for an 18% internal rate of return. That's what the case study is asking you to do. What the solution model here in RETScreen is showing you is, what you are going to require for a greenhouse gas rate per ton to get an internal return rate of 18%. The rate of return you're going to need is 48 dollars in that sense of time. Now, I'm sure most of you are aware, but the price of greenhouse gases is nowhere near that right now. I think it's like 5 or 7 dollars. The prices have crashed recently. So, the whole point of this case study is to show that greenhouse gas emissions credit on their own are not really viable policy options unless you combine with other options. So, the short answer to your question is yes, most definitely, you can use it to model this. What I would encourage you to do is if you want to investigate this further is go to the website, go to—what I would do actually is, go to training material, go to power, go to wind, here you go, and look through some of the initial slides here, the slides on wind energy project analysis, and then you'll see the case studies right here. So, go through these first so you have an overview of how the RETScreen wind analysis module works. So, we look at the PV analysis module, this is the wind analysis module, and then you can do the case study, you can play around with the software yourself. Okay, so, another question?

Vicky Healey Go ahead. I'm sorry. I didn't mean to talk over you.

Dinesh Parakh No, no, go ahead, I was going to give the screen back to you but maybe I'll keep it in case there's something else.

Vicky Healey Yes. And also, when you do pass the screen back over, can you pass it to Heather. She can run those remaining slides. Okay, terrific.

Let's see, next question is: The one presenting the question is wondering if there is a website with national capacity factors and all other input variables?

Dinesh Parakh Capacity factors, I guess you're talking about capacity factors for photovoltaic, correct? I guess we can't really have a back and forth dialog so I'm assuming you're talking about photovoltaic capacity factors. I'm going to show you very quickly how you can get that, okay? SO, if you are here in the software, I'm going to go back here, I'm going to go back to a photovoltaic template. Photovoltaic hundred kilowatts: that was our template. The user manual is really important because the user manual like anything that you don't know in cell, like let's say you're here, and you have no idea what to enter, you're clueless. I have no idea what the foci factor is, should it be 90%, should it be 10%, should it be 5%? I have no idea. The very easy way to handle that is to click on this—sorry, let me find my help bar here. I seem to have lost my help bar. Oh there, that's okay. So, I click on the cell, I have no idea what to put in here for capacity factor. The case study is specifying that I'm doing this totally blank, click on this here, and it's actually giving you sample capacity factors for hydro turbines and then typical capacity factors. So, typical capacity factors for photovoltaic systems are between 5 and 20%. So, that may not be very helpful but it's definitely somewhat helpful because you know that the capacity factor is not 90%, you know it's not 95%. You know what the magnitude is going to be, it's somewhere between 5 and 20%. And then, yes, you can then further refine that online. I'm sure there are. If you send a message to our customer support, we'll be able to find out. We'll be able to let you know if there are some specific websites. But, while you're doing the analysis, this is all you need. And, if you just choose a midpoint between 5 and 20%, choose 12 percent, 12.5% or something. You're still going to get a rough approximation on what it is. Let's try 5 versus 20%, let's look at the pretext IR. With a 5% capacity factor the pretext IR is negative 5%, and with a 20% capacity factor it's 11.6%. So, it's a pretty wide variability. But, again, at least you know that you're not going to be putting a 90% in here because that doesn't exist yet. So, I hope that answers that question.

Vicky Healey Okay, great. Thanks. I think we'll take one more question and then I have quite a few questions that came in and they're really great, I was

wondering if you would mind if I sent them to you and you can maybe respond to the requestor directly via email.

Dinesh Parakh I'd be happy to do that. So, you can send them to me and also if you could put on that if the email address for RETScreen customers is retscreen@nrcan.gc.ca. Maybe I can type that here. I guess you can probably see that if I type it. Oh, it just to the organizers and panelists so I'm not sure if everyone can see that. It's on our website. Once you've had a chance, go through some of the training materials, go through some of the policy materials there, and you'll find most of your questions answered there but if there's something that you don't understand or just can't get, feel free to contact either myself or customer support and we'd be more than happy to get that back to you as soon as possible.

Vicky Healey Okay. I'm going to take this email address you typed in and I'll send it to everyone right this second. So, with that if you could pass the control back to Heather?

Dinesh Parakh Yes. I will do that. Let's see here. Okay. There we go.

Vicky Healey Everyone, I am sending out the email address that Dinesh just provided, it's in the chat bar. If you look to the right of your screen, you'll see a chat function, and within that chat function you'll see that I've included the retscreen@nrcan.gc.ca so all of you will have that information. So, thank you. And, with that I've finished. I just really want to thank you very much for this outstanding presentation and demonstration of the product. Everyone, again I would like to remind everyone on the phone, on the webinar, excuse me that copies, PDF copies of this presentation are available at the clean energy solutions center training page at the URL I provided previously. And, I'll type that in as well really quickly. With that, Heather, I'd like to—before we close this webinar, if I could turn this over to you for the polling function so we could get a little feedback from the audience.

Dinesh Parakh Great. And I just want to thank everybody as well for attending. I know it's always hard to take time away from your day. I hope that this short presentation was of some value to you and that you'll find some value in using RETScreen. Thanks again for attending.

Vicky Healey Thank you for presenting.

Everyone, the first question is: the webinar content provided me with useful information and insight. We'll just take a few seconds to give you time to answer that question.

Great. Thank you everyone. With that we'll go to the second polling question. Our second question is: the webinars presenter was effective. Again, we'll take a few seconds to answer.

Okay. Then, we'll close up and go to our third and final question which is: over all the webinar met my expectation.

With that we'll close the poll. Thank you, everyone who voted, I really appreciate your feedback. So, with that... Heather, next slide please. Here we go. Everyone, on behalf of the Clean Energy Solution Center, I'd like to extend a very hearty thank you to Dinesh, and to all of you attendees for participating in today's webinar. I sincerely apologize for some of the audio and difficulties we have previously. In spite of all that, we had a really terrific audience and we very much appreciate your time and the questions that you provided. And again, I'll remind those of you who did submit questions that we ran out of time before we could answer them, I will send those questions off to Dinesh and he can respond to you directly. I invite all of our attendees to check out the Solution Center website over the next few weeks if you like to go back and view the slides and listen also to a recording of today's presentation, as well as review some of the previously held webinars that we had. We have a URL on the screen where you can find copies of the presentations. They are already there for you so you can go to the URL immediately and find PDF copies of the presentation that I and Dinesh provided today. Additionally, you will find information on upcoming webinars and other trainings that the Solutions Center is holding. We again, invite you to inform your colleagues and those in your network to check out Solution Center resources and the services including the no-cost policy support that I mentioned earlier. With that, I wish you all a great rest of your day and we hope to see you again at future Clean Energy Solution Center events. This concludes our webinar. Thank you.