

*[Speaker: Kristen Ardani]*

**Cover Slide:** Thank you everyone for joining us for today's webinar of the DG Interconnection Collaborative, the topic that we are going to discuss are Highlights of SunShot Projects, Interconnection as Part of a Strategic Resource Planning Process. Today we are going to hear from RMI, Virginia Lacy and Mark Dyson, and also Alison Kling from Con Edison. With that, I would like to introduce our speakers.

**Slide 2:** Virginia Lacy is principal with Rocky Mountain Institute's electricity practice. She specialized in electric utility resource planning and corporate energy and climate strategy. Ms. Lacy manages RMI DOE SunShot funded projects, innovative core business models which is aimed to partner with key electric sector actors and pilot test new solar business models that recognize and create value for multiple stakeholders.

Mark Dyson, is a senior associate with RMI's electricity practice. Mark's work focuses on characterizing the technical and economic factors important in improving electric utility planning for the distribution edge. Mark has worked on several large projects across RMI's practice areas including leading development of RMI's in house electricity analysis software tools and applying them to reinventing fire analysis in 2011.

Then we have Alison Kling of Con Edison. She joined Con Edison in December 2013 as a specialist in the Distributed Generation Group. In this role she supports the DG Group with implementation, planning, and policy initiatives for Distributed Generation projects in Con Edison's service territory. Prior to working at Con Edison Ms. Kling was the NYC solar coordinator at the City University of New York from 2009 to 2013.

At CUNY she supported Solar America City and Rooftop Solar Challenge Initiative supported by the U.S. Department of Energy. So with that, I would like to turn it over to RMI for their presentation.

With that I want to go ahead and turn it over to Virginia and Mark who can walk us through their presentation.

*[Speaker: Virginia Lacy]*

**Slide 3:** Great. Thanks very much for the opportunity to join the webinar and talk a little bit about the work that we've been undertaking. We can go ahead and advance to the first slide.

**Slide 4:** I just wanted to provide everyone with a little bit of an overview of us at RMI and also about our eLab initiatives which are the context of some of the work that we'll be talking about today. First RMI; we're a 30-year-old what we call a think and do tank. We work across industries on challenging energy issues to drive the efficient and restorative use of resources with market based approaches.

We were founded by Amory and Lovins a little over 30 years ago. And we basically combine research and collaboration with practitioners across the four major economic sectors: transportation, building, industry, and electricity. We have most recently in the electricity space launched about two years ago the Electricity Innovation Lab which we call for short eLab which is coalition of about 35 to 40 meeting companies from across the electricity sector.

And the overall intent of eLab is to try to collaborate to address some of the challenges and opportunities facing the sector as we enter into a period of rapid evolution led in part by Distributed Energy Resources and increased customer participation. We can go to the next slide.

**Slide 5:** A little bit about this work that Mark Dyson is going to elaborate on further. RMI – through both our work in the electricity sector generally and then also as we have delved further through eLab has really identified increasing need to provide clearer insights to regulators, utilities, customers, and developers about the system level technical and economic effects that increasing adoption of Distributed Energy Resources. I've listened to a few of the questions that we hear often and that are being bandied about throughout the industry.

For example how will Distributed Resources, led currently by PV, help or hinder distributions of system operations. Where are the best areas for deployment? How will the new resources effect the operations of the rest of the system? What are the long term effects on planned investments? Whether there are large-scale investments are being considered? How could increased distributor resources impact the bottom line for utilities that are making those investments?

What is the effect on retail rates and then the economic impact on both customers and other rate pairs? As we think about and have heard those questions RMI has been involved in a couple of different ways to try and better answer those questions in two distinct projects. One is the DOE SunShot funded project that I have been managing along with a few others including Mathias Bell. And in that work we have been really aiming to partner with key electricity sector actors and pilot test new solar business models that recognize and create value for multiple stakeholders.

As part of that work we developed and continue to develop a tool that we've been calling the EDGE model which is a MATLAB-based simulation tool that incorporates EPRI's Open DSS open source model to comprehensively assess the value proposition of distributed solar PV in different regulatory and utility business model environments. So that's one piece. The other is through some of the work that Mark Dyson will be highlighting here over the next few minutes through our eLab regulatory tools work. And as we advance to the next slide I'll hand it over to Mark who can talk a little bit further about what we've aimed to do with this work.

*[Speaker: Mark Dyson]*

**Slide 6:**

Well thanks Virginia for the introduction to this particular project that I'll be discussing for the next few minutes here. Basically with the recognition of all of those questions and the importance of those questions to regulators, utilities, and other stakeholders we've come up with three objectives for the current work products that we're developing. We want to characterize best practices for the creation and review of Distribution Resource Plans. And you'll see them abbreviated as DRP in this webinar.

We want to look at the analysis tools available for the creation of those and the linkages between different models or the potential lack of links between different models. We want to identify all the relevant stakeholder concerns. We've identified many of the stakeholders that are important in this process and we'll go into that list and some of the concerns that are important to them. And we want to look at the capabilities or the lack thereof of the software tools that are available to these stakeholders to make sure that planning on the distribution edge meets their goals.

And finally we want to come with a process framework for utilities and regulators and stakeholders to really make this process better and enable these cost outcomes. So today during this webinar we'd like to present some of our initial survey results to everyone on the

phone and receive feedback on some of our initial hypothesis and results and what we're actually going to do as part of eLab with this work product over the next few months. We can go to the next slide.

**Slide 7:**

I think it's good to start off here with a look at current processes and compare them to future needs for this process of distribution planning. With California as an example (and again this is going to be very broad strokes) utilities submit general rate cases detailing the investments that are needed on the distribution network within various budget categories. And we know in reading some of this rate case documents that a variety of modeling tools are used and a variety of teams within utility are involved in creating these plans.

Regulatory staff and interveners then review these rate cases and the planned investments contained therein, but the availability of the input data that are used in creating a rate case projection and the modeling tools that are used in analyzing that data is inconsistent across the country, general unavailable to regulators and interveners. And then based on this evaluation and third party comment regulators approve, modify, deny requested budgets in the rate case process.

Now if we fast-forward to future needs that have been – that we've identified sort of common threads from different proceedings around the country that I'll go into in a minute in the future distribution planning should be link explicitly to policy goals and other stakeholder concerns. Advanced capabilities of DERs that are currently not modeled most of the time in the distribution planning efforts of utilities; those should be captured in order to evaluate their value to the system.

Regulators should have increase ability to vet Distribution Resource Plans – regulators and stakeholders I should say – third parties as well. And that will require some access to models and data or at least a subset to ensure that these DRPs are meeting the criteria of policy goals and stakeholder concerns. We hypothesize that this may require a new breed of integrated model or at least connections between existing models within a consistent framework to allow this actually produce least cost plans. We can go to the next slide.

**Slide 8:**

The future needs that I just went over on that last slide really came from synthesizing some of the common themes among the three proceedings. And they're ongoing right now in three different states listed here: Hawaii, California, and New York. And there

are other proceedings as well but these I think provide a good cross-section of some of the issues that are on the minds of regulators and utilities today.

In Hawaii with the rejection of the 2013 IRPs by the DER companies and the related requirement of a Distributed Generation Interconnection Plan the focus has been I believe on alleviating issues with existing high penetrations of PV on certain feeders. And there's an alternate emphasis on incorporating some advanced capabilities of DERs in order to deal with some of these very high penetrations such as advancing capabilities or maybe solar-plus storage or solar-plus DER.

In California with the requirement for Distributed Resource Plans that must be filed by the utilities on July 1<sup>st</sup> of 2015 there's an ongoing rule making and its focus is really on lowering interconnection costs by finding optimal locations. That seems to be the primary goal there, increasing value to the system in that way. And then of course on defining what those optimal locations are, what are the criteria that need to be looked at here.

And in New York with the Reforming the Energy Vision initiative the prime focus there (among many others in that very long Straw Proposal has been on defining markets and really opening – leveling the playing field for different DERs to provide services within the distribution system. And there's a related acknowledge interaction with the ISO and the bulk power system. I've sort of laid out three of the states that are sort of on the edge here. But in addition to those characteristics that we just discussed the common themes among those three states are planning should be rooted in public policy goals.

There is always an emphasis on safety, reliability, and resiliency of the electricity system and the possible value that DERs might provide there. Of course the driving goal is also lowering that cost for rate payers including explicit acknowledgement of deferring traditional capital projects with targeted DER adoption. And all three states are acknowledging the need potentially for new rate structures or compensation mechanisms to effectively incentivize adoption of these DERs. We can go to the next slide.

**Slide 9:**

There are several precedents for this kind of more holistic look at the distribution system including DERs as a potential resource. And the regulatory systems project put out this work in 2012 that these examples are drawn from. And without going into too much detail here I think the general theme is that in the past there have

been these one off cases where there is an explicit recognition of the value of DERs and mitigating very expensive transmission or distribution level infrastructure upgrades.

And these can provide a very good example or case study for what aspects of the integrated distribution planning process might look like in the future. However I think the important note to realize here is that since these are sort of one off studies and a variety of models and tools were used in coming up with these they don't necessarily have the integrated framework that has been identified as necessary in several of the ongoing processes around the country. We'll talk a little bit about the tools that can be used as we go to the next slide, and some of the limitations.

We've put together here just a very brief and very rough categories of some of the tools used by utilities that are relevant for distribution planning. And this list has been adapted from a Consulting and Energy Storage Alliance report that recently laid out sort of this list of tools used in valuing energy storage, but these are very broadly applicable – or very applicable to DERs in general as well. So we've got five or six model types and then an example of a commercial product within that category.

**Slide 10:**

I've listed the key outputs here and then the modeling relevance for Distributed Resource Planning. So the first three: capacity expansion models, production cost models, and transition planning models; these are in the domain of integrated resource planning and are fairly standardized offerings. The relevance for Distributed Resource Planning here is really focused on the interplay between what is going on with customers at the distribution level and impact on bulk power.

So in this fourth column, modeling need for DRP, for fast expansion it's important to have the ability for DERs to offset bulk power capacity needs. Within a product cost framework it's important to model the impact on both power commitment and dispatch logic. And then in transmission planning it's important to understand the impact on power flows and contingency responses. And so the pluses and minuses you see in the last column are sort of our initial hypotheses about the level of sophistication in accommodating these Distributed Resource Planning needs within these three bulk power models that I just referenced.

The lower three rows are more on the distribution side. These are tools that are traditionally used for distribution system investment planning. And then the modeling need – We'll focus on

distribution planning models for a second. The modeling need for a more integrated Distribution Resource Plan is looking at the impact of DERs on equipment use, safety, dynamic conditions on the low voltage side. And we've got the plus here – the green plus – because to a large extent this has been done and demonstrated in several case studies both on the research side and also within the utility industry.

It's a lot of work but at some level it's very doable with the current crop of tools. Moving down one to real time management models – and here we're talking both at the ISO levels or market management and real time and big control, and also the distribution system management that a distribution company might use. It's not as clear that the interaction of aggregates fleets of DERs is correctly or accurately represented within these models. The linkages might not be there.

And then finally there is a class of model that is focused on Distributed Energy Resource Management and control which are sort of exactly what we're talking about. But again the interaction with other distribution management tools and then all the way up to the bulk power analysis tools is as of yet unclear. We can go to the next slide.

**Slide 11:**

We have started to look at the gaps in a more visual way here between these modeling tools and certain functionalities that may not be represented. We recognize a fundamental gap that both power tools and the distribution side tools don't necessarily talk to each other very well. Those are the left and right side of this slide. And on the left side the capacity expansion, production costs, transmission planning and ISO management tools; there's a pretty robust and well-developed way to think about that.

Vendors are – You know this is how the grid has been operating for decades. This is quite well-understood. The gaps start to emerge as we cross into the right side and we want to start integrating these distributed resources into things that go on in the bulk power system or thinking about planning the bulk power system. And so there's really a lack of linkage that is standardized at least between current tools that are used for network planning on the distribution side and integrating Distributed Energy Resources on the distribution side and all of the categories of model in the bulk power side.

This is definitely limiting the perceived value of these resources being represented in the model. We recognize another sort of basic

gap and that's listed at the bottom here. The tools are available to utilities and used by utilities. But as we mentioned at the beginning of the presentation there's a perceived lack of availability for regulatory staff and stakeholders to really get their hands dirty with the same processes that the utilities are using and evaluate whether they're stakeholder goals are being met with the same framework.

**Slide 12:**

If we go to the next slide the last category of tool that we talked about dealt with Distributed Energy Resource Management Systems; an abbreviation is DERMS that has been popping up a lot. This chart or this suppology rather is from an upcoming research report that attempts to categorize the software solutions into a hierarchy in terms of where they came from, what their goals are. This report isn't available yet but this is sort of from the brochure and it provides a useful description of where these lie in the spectrum.

It's come up that there are several issues important to determining how useful these DERMS tools can be. And they're listed on the right side of the slide. And I think in terms of interaction with the bulk power system how well these tools can give us metrics that are relevant to generation in transmission side, decision criteria and both capacity planning and production costing it's not clear that a lot of these tools are actually meant to be used as planning tools for simulation purposes in say testing out scenarios for infrastructure investment or DER adoption scenarios on the distribution side.

Rather a lot of them seem to be focused on controlling resources that are already there or evaluating different management schemes and things like that. And then fundamentally the data requirements and accessibility that these tools have for people that are not utilities with all of their proprietary data is unclear. Not to say that these are not the solution, but those three questions are as of yet unresolved at this point in our work. And as we move forward with this analysis of the tools and the gap analysis we're going to be digging into these questions a little bit more.

**Slide 13:**

The next slide presents a very rough, very broad framework for how we see – how we're going to structure – We think of structuring some of the work we're going to be doing in this area. So to start off the process will look a lot like the current process does that we went over at the beginning of the presentation but with a few important changes in emphasis from the current system.

Regulators in mandating or requiring DRPs should be very explicit and ask the right questions of the utilities and make sure that when utilities are checking the boxes on making sure that their plans are going to be transparent and easy to evaluate by regulators and other stakeholders.

Then moving down to the second green box the utilities will need a different variety of tools or at least linkages between existing tools that are more standardized and more transparent in order to actually check the boxes and make sure that these are useful plans. And then we've got an arrow going on for the right to represent the expanded role of stakeholder review. And an important part of this work is really identifying these stakeholders. We've got four examples here. For example the ISO or the bulk power or the balancing area authority – They're interested in the bulk power impacts of distributed resource planning and how well forecast adoption levels are going to play with the bulk power grid.

The PV industry or other developers or vendors of different kinds of DER; they're going to care about how easy it is to interconnect what the value of – what value they can extract from being part of this process. Also compatibility in making sure that things are interoperable. But I know this is a big part of the New York REV Initiative. And then finally the rate payer advocacy groups and other – We don't have it listed here but like environmental groups or other stakeholders in that space are going to care more about system costs or emissions and things like that.

This is just an example of the kinds of stakeholder review that we feel is important and making sure that is transparent – that the resource plans are transparent and provide at least a subset of data and models so that people can independently evaluate how well these plans are supporting their goals. There's a recognition of course that at some level you're always going to have – You're always going to run into proprietary data or proprietary model that is not able to be shared.

But to the extent that that can't be eliminated it's important to make sure that the methodology should be transparent so that interveners can go out on their own and at least attempt to look at these metrics with their own tools if necessary. And then finally going back down to regulatory review and approval by the regulators that process remains in our framework much the same as it is today but with an expanded recognition of the role of independent evaluation and looking at how well these plans actually do need policy and other stakeholder goals.

**Slide 14:**

With the next slide what we want to do is take this framework and start filling it out with an in depth work product. eLab, as Virginia introduced to us is in a pretty unique position as a convening authority with access to and membership of many of the important stakeholders in this process: regulators, utility staff, developers, ISOs, software vendors. We have convening power at a national or state level. So we're considering two choices or a combination of two or maybe something else entirely.

But for discussion today we have two choices in how to approach the next stages of this work product. We would start with a breadth for synthesis looking at common experiences across the nation or maybe in the top five or ten states that are dealing with these issues in ongoing proceedings. Partnering mostly then with stakeholders with a national interest: developers and vendors as well as a selection of regulatory and utility staff in order to make sure that it's grounded and the existing process to arrive at a broadly applicable framework that sets the stage for a deeper dive work product.

The other option is to start very narrow with a specific state working mostly with state-specific stakeholders like utilities and regulators as well as with input from national stakeholders of software developers and vendors that this product would provide actionable recommendations that would then lend insight to a more broadly applicable synthesis. These are the questions we're considering as we start fleshing out our initial work that we've presented today and start scoping out our more in depth work in the future.

**Slide 15:**

That's the last slide we have. We're looking forward to a good discussion at the end of this call as well as some feedback on what we've discussed here: our results as well as our proposed plan moving forward.

*[Speaker: Kristen Ardani]*

Great. Thank you so much Virginia and Mark for walking us through the framework of eLab and some of the items that it's attempting to address, and the work being done in that area. In looking at some of the group's questions that have come in can you explain a little bit in more detail what the kinds of or specific organizations that are working with eLab in terms of utilities or regulators? I think there are just a couple questions here looking for more detail on the folks that are being engaged in the effort.

*[Speaker: Virginia Lacy]*

Sure I can speak to that. We had tried to have a cross-section of a variety of stakeholders within the electricity sector. As Mark mentioned more specifically around technology providers, as an example we have Spurey actually here in Colorado is a member of eLab which has the software that Mark was referencing. But we also have large customers; Walmart is an example there as well as utilities which range from Duke Energy to PGE – let's see Avista – just great areas around the country.

And then we also have some regulatory either experts or staff members that join in conversations as well. So we try and actually have – We're really trying to get representation across the sector 'cause we really believe given the issues that the sector is wrestling right now it takes a collaboration from a lot of different views in order to be able to start to get at some of the solution sets that are really going to be needed for dealing with some of these more challenging issues.

*[Speaker: Kristen Ardani]*

Thanks so much. Is eLab or folks in your group looking at UL 1741 at all, specifically with respect to smart invertors and how that might play into the distribution edge? Maybe not necessarily specific to resource planning but has that come up at all in some of your meetings or thoughts and ideas around how you UL 1741 could play into using new invertors with advance functions like global push, etc.? Or is the work that you're doing really focusing more at the higher level – not necessarily at the system level?

*[Speaker: Virginia Lacy]*

Yeah, to date, not yet. I think the question is really about what's necessary in moving forward in this work stream. But in the meetings that we have had to date and a lot of the conversation we haven't actually gotten into a standard of late. But that may actually become more necessary as we start to get into more of the regulatory tool side and understand some of the underlying factors. We'll want to see some sort of ability to be able to talk across utility territories and compare notes as it were. Obviously standards will play a pretty significant role.

*[Speaker: Kristen Ardani]*

Great. Thanks so much. Well at this point maybe it would be a good idea to hand it off to Alison so that she can walk us through her presentation and then we can open it up again for questions at the very end. With that I'd like to pass it off to Alison Kling of Con Edison.

*[Speaker: Alison Kling]*

**Slide 16:** That's great. Thank you. And thanks to everyone, can everyone hear me.

*[Speaker: Kristen Ardani]*

Yeah it's clear. It sounds good.

*[Speaker: Alison Kling]*

So thanks to NREL for running this collaborative. And it's also been a really great experience co-presenting with RMI. We're glad to be here today. My presentation will get into more detail on interconnection, obviously specifically within Con Edison's service territory. You know we're doing a lot around this area, particularly given the context of what RMI was speaking about. But today I'll be focusing primarily on a process we're designing for residential PV and how to streamline that process.

**Slide 17:**

If you'll go to the next slide I'll just start with the basics on Con Edison. Most of you may know but we are an investor-owned utility with 3.3 million electric customers in New York City and also in Westchester County. If you look at the map on the right-hand side we also serve gas and steam customers in certain boroughs around the City. As it notes on this slide our electric system is largely underground and most of it is a network distribution system.

This system was really built for reliability and we don't often see outages in our service territories. It was built to serve a very dense population, obviously New York City and Manhattan. The reason this is important to note is that in terms of distributed generation this type of system can sometimes pose challenges to interconnection. We can go to the next slide.

**Slide 18:**

I'll briefly go over the components of our network grid system. And I'm not an engineer so I'll stay pretty high level here, but it's important to understand how our system works when we're thinking about DG or DER. We have 83 underground networks in our service territory and most of those are in the five boroughs. Each network works independently of the others and is served by its own area substation. And this area substation is where the transmission voltage is stepped down.

From there several feeders – You can see the blue lines on the diagram. Those feeders go out to the network transformers. You can see those little blue boxes. There's an arrow the top. Those

network transformers take the service down to the secondary service voltage. That's where it goes from the blue lines down to the purple lines which indicate the secondary network grid. And general these networks are designed so that two feeders, two of those blue lines, can fail and customers won't notice any problems.

One the right you can see some representations of typical customers. We've got our current PV customer on top. You know a resident, and then just something to note on the bottom we have our lovely Empire State Building here – high load customers that might require a dedicated transformer. Those are in the spot or isolated networks. How this impacts PV really centers around those network that are protected by generators up at the top – those purple boxes that you see.

Those are really sensitive equipment and if they sense power coming back from the grid in the event of export that exceeds the minimum loading they'll open to protect the substation. And if this happens frequently or if it starts to cycle, that can really cause damage to the network equipment. Generally we're talking about residential PV today. That really exports enough to be above the network's load.

So that's really not an issue right now for us. However larger systems and especially those with a dedicated transformer, that spot or isolated networks can cause a real concern. I'll put those aside for now and just talk at the end about a few projects we have going to address those situations and to make that an easier way to actually interconnect.

**Slide 19:**

If we go to the next slide just a step back and to think about what this kind of system means for PV and other kinds of DG. The system necessitates a very specific approach to Distributed Generation. And it's really driven how we've handled interconnection both from a technical and from a policy perspective.

If you're interested in more technical detail and you like leek out on a report NREL did a great study in 2009 on interconnecting PV on our secondary network system. That was a partnership between New York City and CUNY and Con Edison all working together on that study. And then our networks also allow us and have allowed us over the last few years to really think about DG and its possible impacts or benefits on specific parts of our system which I think is a very relevant point to bring up in the context of REV and all these different proceedings around the country.

In terms of solar for the last few years we've been working with NYSERDA and the City and CUNY to help align state solar incentives with the concept of placing PV in networks with high solar coincidence. And that's an effort to drive the technology into locations where it might have infrastructure benefits for the grid. So that map on the right that you see – each of those areas divided by the white line –

That represents the network and depending on the color those are different zones where PV projects will get higher incentives in different years. Just a note that that's something that our network has allowed us to kind of think about, and that thinking will continue to evolve in future years.

**Slide 20:**

Moving onto the next slide is drilling down into what our PV market looks like here and what the trends have been recently. The main takeaway is that we're seeing lots and lots of growth. As of July we had 46 megawatts. We had added 16 megawatts in just two quarters and 1,300 customers. And on top of that on the bottom chart we have a lot in the pipeline. We're basically on track to double installed capacity in 2014. We're expecting about over 60 megawatts total.

Those are some quick highlights on the left side and there are for the first time some large megawatt plus systems that were coming in, mostly driven by incentive dollars. I'll touch on that later, talking about the smart grid project I mentioned earlier. And then on the residential side to start to focus on that, we're seeing a really big jump in the number of systems. At the end of 2013 we had a really big rush driven by incentives but it just never tapered off.

And most of that residential growth is happening in Staten Island which is actually our least populated borough but it does have the largest concentration of single family homes than most of New York City. If you see the red circles I'm kind of pulling out some highlights from the residential – just the growth in residential systems has been in Staten Island and in Westchester. So that's Brooklyn, Bronx, Manhattan, Queens, Staten Island, and Westchester.

Those are the rows indicating the installations in each borough. And then just on the bottom that's the pipeline. Residential continues to grow particularly in Staten Island and Westchester. And as of July we had 36 megawatts in the queue. And I imagine right now that's even larger.

**Slide 21:** The next slide – This chart basically says the same thing it just visualizes the numbers up in those tables. And it also includes some data on CHP. It just visually demonstrates the very, very sharp growth curve that we're seeing and that we don't really expect that to tail off.

**Slide 22:** And on the next slide I just want to touch for a moment on the drivers. I expect that the drivers we're seeing are very similar to what's happening in other markets. Most of this growth is driven by policy. New York in addition to Westchester right now has a very aggressive statewide program called New York Sun. Our governor has committed \$1 billion to solar over the next ten years and with the statewide goal about 3,000 megawatts. So there are some really big targets. And to meet those targets our statewide rebate program for residential has been recently redesigned to a megawatt block program, kind of similar to the California programs.

And since January there's been 14 megawatts in applications in our service territory alone. So that's going to keep going. The volume of applications is not going to slow down. And then hand in hand with the dollars that are being put towards solar in New York State that has led to a real uptick in really aggressive marketing from third party PPA and solar lease companies just flat out door to door, phone calls marketing. And that has really driven a lot of the residential market in particular.

In addition last year New York State adopted a standard statewide permit for systems under 12 kW that really only apply to our service territory in Westchester. But that's made things easier in New York State. That's helped the residential market move along. The end result, just to continue beating this dead horse is that the volume of residential is going up and it's not slowing down. We have lots of customer interest. The number of residential systems doubled in the last year. And three-quarters of the systems that have gone in were under 12 kW. In terms of the number of projects that's really having an impact on what we're looking at.

**Slide 23:** And if you go to the next slide obviously SunShot, Rooftop Solar Challenge; this is all about balance of system costs. Cost has been impacted in New York State as it has across the rest of the country. PV prices have dropped and this is a statewide average from NYSERDA data. But residential averages are down to under \$5.00 a watt. But you can see that orange bar; the balance of system components has stayed fairly stable. So we've been looking at how

we can reduce the time and cost of our little wedge of that orange bar for interconnection for our customers.

That will not only benefit them but it will improve our own internal handling of management and process. As part of the Rooftop Solar Challenge which is one part of the SunShot program Con Edison is partnering with New York City and the City University of New York to work with a lot of other partners and agencies and streamline that process where we can and take that barrier away from solar.

**Slide 24:**

If you'll move onto the next slide. Given the growth and volume of residential PV that seemed a natural place to start. In addition despite the time I spent talking about network grids residential PVs, these small systems, generally aren't a technical concern for us. And the interconnections that come in is basically an administrative task at this point of just making sure that the paperwork's been filled out correctly, that people have the right forms, that they've put in the right customer name, the account number, etc. We're trying to look at a way to streamline all that and improve the quality of applications and make it easier for us and the customer. The fast track concept; I like to think about it as an equivalent to the prescreening TSA line at the airport.

If you meet certain criteria and are a known quantity you can go through the line faster basically. On the left side those are the basics of the concept, just that we would have proven qualified installers who we know and we trust to do good work. That's some criteria around kind of vanilla small scale system that we're looking for and that we know can just be interconnected without a problem, making sure that obviously it's an online process and something that can be adapted from our existing tools, and really just have it be you upload your required documents, you enter your information, you hit submit, and you can get a same day approval to go and build your system.

Obviously we'll need some kind of audits and spot checks and that will be an important component of the program. And then on the right to implement what we're doing is to work on what are those design components? What are the criteria for those installers? How do we judge their experience or length of time working in our market? What exactly are the parameters for those systems? What's the size?

Are there any other things we need to consider? What kind of standard information sets do we need to require from the installers?

Is there a way we can generate a standard three line diagram? How do we make it just as easy as possible while getting the information that we need? And then how do we reform our own systems and online portals to track these projects and make the process fairly easy? I'll talk about where we are in this project on the next slide.

**Slide 25:**

Our target launch right now is to have something out on the ground in the first quarter of 2015. We're in the design process right now. We've been talking to a lot of partners like CUNY and our other agencies involved in the solar process. We've drafted criteria for installers and for the systems. We think we're pretty well set there. And we're trying to strike a balance between ensuring that we have knowledgeable installers and also making this available to a large group of contractors so it's not an exclusionary program.

We've also drafted screens for users for our project center. That's where we take all applications in now. We can probably make that even faster. And we're really right now in the weeds on how to come up with a standard "three-line" diagram. How do you have something that can work for a wide variety of projects that are each being put in on different buildings? That's the biggest challenge we're facing right now. So I'm having lots of conversations with engineering.

And on the back end we're looking at updates to our own project management systems to make sure we have accurate reports. And that is really important because Con Edison is required to do quarterly reports to our PSC on interconnection application. That's a really important component. It's to help streamline that reporting process as well. On the right I've listed some issues that we're continually aware of and definitely open to feedback from people on the phone if you've had experience with similar programs and other utilities.

How do we have this universal application that can work for a wide variety of systems or even if we're asking for information that can then be used with the Department of Buildings just to take one more step out of the process? We also have to internally ensure adequate resources for program management, for quality assurance. And obviously we need a lot of installer input just to make sure it actually is a useful and helpful system for them and that it makes their lives easier.

In general we think this will be very beneficial for our customers. It will improve the quality of applications that we're getting into

our system and just will reduce the internal resources that we need for this process. I'll definitely have updates as our program launches and would welcome any feedback on the nitty-gritty details of this program. And then as I wrap up I'll go to the next slide.

**Slide 26:**

I did just completely switch gears. I put a few slides together with some notes on large scale PV. One of the goals of this fast track program is to review – sorry is to reduce the review time that we need for these small systems so that we have more internal resources to look at these large scale systems which the number of these are also growing and these do pose significant technical complexities that we need to work through. That's one of the drivers of the fast track program.

The smart-grid pilot that I mentioned earlier; that is something that will actually allow export on an isolated network across a network protector. That's something that's never been done before. I have a little more information on that. We also have coming to the state a lot more funding coming to large scale systems. In anticipation of that we have another project with CUNY, NREL and NYSERDA to prescreen technical issues for buildings with large scale PV potential – kind of a mapping exercise to help installers get an upfront look at potential complications, potential costs, just to provide more transparency to the industry and to our customers.

**Slide 27:**

On the next slide I've provided just some more detail just 'cause we like to talk about it. It's pretty exciting. This is one of the smart grid pilot projects, the first one that was actually completed. We have about three more done and several more in the pipeline. Most of these are in the outer boroughs on warehouse type buildings that have a lot of roof space but can have minimal load on the weekends or during down times when the business isn't running.

So, on the right this is one of those buildings. The roof can support 1.6 megawatts of solar, however on the weekends the building was less than 450 kW. That means significant export on a nice sunny Saturday but this building was an isolated network which previously wouldn't have allowed export over those network protectors. What we came up with was to lighten the sensitivity on those network protectors to allow some export to allow up to 50 percent of that transformer rating to allow that to come back out. Then we added in SCADA and anti-islanding equipment to allow us some remote control of those inverters so we can trip them off if the export does get too high.

**Slide 28:** And so on the next slide just to wrap up and to bring this kind of back to where we started today to the context of what Rocky Mountain is looking at this is all a small piece of what's happening inside a larger movement of the REV proceedings and adjusting to a new market place for utilities and DER. We're also looking at resiliency and that's really just an excuse to try to use that picture up there on the right.

Looking at micro grids, trying to plan for contingency of an Indian Point shutdown which would take away a lot of the – some of the capacity of our system and also looking at targeted load reduction in areas that have large growth or shifts in demand. That's that last bullet: Brownsville load. That's one of our networks where the load has significantly grown and shifted to a certain part of the day with the demographic change. And we're trying to address capacity issues there.

So there's a lot going on with this interconnection fast track program. We're trying to address a small piece of it and also just thinking about large scale and policy impacts across the board this year and ten years down the road. With that I'll close. On the next slide I have my contact information.

**Slide 29:** Thanks again to NREL for setting this up and thank you all for your time and your attention. I'll be very happy to take questions.

*[Speaker: Kristen Ardani]*

Great. Thank you so much Alison for a very informative presentation. In terms of some of the questions that have come in from the participants on the line there have been a few questions around New York and specific to the fast track interconnection process. Where do you see or where does your team see there being some of the biggest cost reduction opportunities with the fast track process? Maybe for example what are the main cost adders? Is it disconnect switches? Is it the actual forms and the processing? Where is there the biggest opportunity to actually reduce cost?

*[Speaker: Alison Kling]*

That's a great question and this mostly will be a reduction in the time that it takes for us to turn around an approval. I think if you can somehow quantify those days – We are – We do follow our state interconnection requirement. So right now we're required to give an approval of a system within ten days or so. So instead of

ten days that would cut that down to one day. I don't know how to exactly quantify that level of time.

It would be the same application but just a much shorter timeframe to maybe giving some more certainty or freeing up time so they don't have to keep following up and asking where things are. They just have it and are ready to go.

*[Speaker: Kristen Ardani]*

And then is that – 'Cause right now a lot of the application processing is already happening online correct?

*[Speaker: Alison Kling]*

Yes.

*[Speaker: Kristen Ardani]*

So is that just going to be making online applications even faster? Or is it going to be actually reducing the number of forms that installers need to fill out? 'Cause it seems like in New York if you already have online processing how could it get faster?

*[Speaker: Alison Kling]*

Well it will really be just – Right now it's more of an administrative task, just checking the boxes making sure that all their – they filled out the right information and they have uploaded all their documents. Did they check the right boxes? So this will be – If there's a group of installers who have done good work who we know submit – put up quality installations and have experience in our service area, territory, and on our building stock kind of allowing them to be approved pretty much automatically without that review that does take up to ten days.

That involves someone from our Energy Services Group actually sitting down and looking at it and checking it over. This would be something that requires unloadable information up front and then you hit submit and automatically it turns around and you can go. So it's really that making sure everything is submitted and then cutting down that time from ten days or so to an immediate approval to go build – from our perspective.

*[Speaker: Kristen Ardani]*

Great.

*[Speaker: Alison Kling]*

Did that answer the question?

*[Speaker: Kristen Ardani]*

Yeah absolutely. Let's see here what other questions do we have? There is a question on the statewide permit that you mentioned. Someone asked – You mentioned that it's specific to Westchester County or was it just a statewide permit developed based on Westchester County's permit?

*[Speaker: Alison Kling]*

Oh right. So that was a statewide and I should just be very clear that that's for a Department of Buildings permit. So that's a parallel process to the utilities. That was a statewide model permit that NYSERDA adopted. It was based on something that had been done in Long Island a few years ago. And then municipalities were given an incentive if they adopted that permit. And so the goal was that going to different municipalities across the state you would have the same permit applications.

You wouldn't have – You know you go to Albany and you have to fill out something different in Poughkeepsie or whatever it was. So I know some municipalities in Westchester County have adopted that form. And New York City has not. New York City has got its own code and everything it has to adhere to. Right now that permit is really only being used in Westchester but it's one more factor that makes residential PV a little easier and helps drive the market.

*[Speaker: Kristen Ardani]*

Okay. That makes sense. There are actually quite a few questions around – And maybe this is too far in the weeds given that you're still in the design phase of this fast track process. There are a few questions around specifics on the established criteria for the systems that would be eligible. I know that you mentioned it's systems that are 12 kW and under. But what are some examples of some of the other criteria that would make – We know that the installer would be eligible if they have a proven track record. But the system level – what kinds of specs on these systems would make it eligible for fast track?

*[Speaker: Alison Kling]*

We're trying to not put too much criteria on the systems, making sure that it's residential rooftop, 12 kW. There are a few other wrinkles we're thinking about that I haven't finalized yet. But that's pretty much what we're thinking about. We don't want to put too much on there so that it becomes too specific for systems.

There might be a few small additions but that's pretty much where we are.

And I think another point on my side; you know that 12 kW number lines up with the state permit and it also catches a very high percentage of the number of applications that we're getting come in. So hopefully if this automated process can lighten the load on those that'll free up a lot of time and resources for us and for our customers.

*[Speaker: Kristen Ardani]*

Right. There's a question here about the quarterly reporting that you mentioned that the utilities in New York do on a quarterly basis to the PUC or the POC there. And you mentioned that there's an opportunity to kind of streamline that reporting. How does the quarterly reporting requirements in New York; does that relate to this interconnection fast track process at all? Do they overlap or intertwine in any way?

*[Speaker: Alison Kling]*

They don't really intertwine officially. That's reporting that the utilities have to do every quarter just on how they're meeting the number of applications and how they're meeting the SIR timeline for interconnection. So we have to report on a whole number of questions about how many systems have come in, how long does it take? What's the status of each one? With this fast track we're trying to also look at our internal systems and see how we can streamline that process and make sure the boxes are all automatically checked so it's just a simple pulling that information out into a report.

*[Speaker: Kristen Ardani]*

I see. So it's more about kind of leveraging the information that you're getting through the online processes through fast track to help with the PUC requirements for the quarterly reports that you guys have to do.

*[Speaker: Alison Kling]*

I couldn't have said that better myself. *[laughter]*

*[Speaker: Kristen Ardani]*

I see. Okay let me see what other questions have come in. Someone was asking is the NYSERDA – And I don't know if I would know this off the top of my head if I we representing but that NYSERDA graph that you showed earlier that had the year over year cost – color coded cost tag. Was that specific – an

analysis that's specific to New York or were those your costs for the U.S.?

*[Speaker: Alison Kling]*

That was New York and that's a tool. I mean that's a great tool. That was for residential systems in New York. It's on NYSERDA's web site. Anyone can go and pull – They post all their data. It's called PowerClerk and you can pull all data or look at it on a map. That was for New York residential systems – statewide not just in our territory.

*[Speaker: Kristen Ardani]*

Great, thank you. At this point there are no new additional questions that have been asked. Maybe we'll use one last opportunity for folks on the line. If you do have a question you can virtually raise your hand or you can add it to the Q&A box at the bottom. We'll give it maybe a few minutes for folks to ask any lingering burning questions and then if there are no additional questions at that time we can always end the webinar a little bit early.

I just want to give folks the opportunity to either use the Q&A box or you can virtually raise your hand with the raise your hand button. We'll maybe just give it a little bit. Okay. Well I would say at this point if folks do end up having additional questions and they want to follow up on any particular item from today's meeting you can e-mail me or you can e-mail the speakers. The webinar slides are going to be posted on the web site. And moving forward in terms of some of our DGIC activities we are going to be looking at some of the data reporting requirements and looking at how different reporting requirements –

And this is specific to the quarterly reports that we were talking about earlier. Just how those reporting requirements differ across states and looking at what could be done there in terms of getting the kind of information that utilities have readily available but that could also be very useful and impactful in terms of a public format and kind of data transparency in general. That's a project that we're considering taking up for next year. So I'd be curious to hear folks' thoughts on that.

We do have one last question which is with respect to actually wind power generation – and this is for Mark and Virginia – is RMI doing an equivalent amount of work towards wind power or is a lot of the work in the electricity group focused on solar. And if

you do have any examples of work being done on wind if you could talk a little bit about that.

*[Speaker: Virginia Lacy]*

Sure. We have not – In the distributed space we have been focused more on the solar side only because of the growth of the market late. But on the wind side if it's in the distributed capacity I'm not as familiar with some of the work that's been done. Mark do you have anything – Does anything come to mind right now along those lines?

*[Speaker: Mark Dyson]*

No.

*[Speaker: Virginia Lacy]*

Okay. There's something kind of in the back of my head right now. I will admit it's emerging. If I can think of it I'm happy to pass along that information to you guys if I can track down what specific study I recently feel like I heard about. But we have not been doing a whole lot ourselves.

*[Speaker: Kristen Ardani]*

Okay. And also an additional question for RMI; one person asked if you can give just a few more specifics about the EDGE model's capabilities and kind of specifically who would be able to use it and what it would be specifically designed to do?

*[Speaker: Virginia Lacy]*

Yeah. No that's a great question. I'm happy to elaborate. The overall idea behind the EDGE model was trying actually to create a tool that would be – Sorry? Oh sorry I think we just got feedback. To create a tool that would actually answer some of the questions that I went through earlier in the call and that Mark has actually been talking about in some of the systematic overview that we've been conducting to understand the landscape.

But what we've been seeing thus far is a lot of tools that enable planning on the bulk power side that don't do quite a lot or have a key understanding of how the distribution side impacts the bulk power side on one hand. And then on the other too it's kind of connecting the dots about what the overall economic impact could be if we start to think about distributed resources growing on a system and they aren't planned for. What could that mean from an economic implication standpoint for the utility for example?

What we were doing is combining a couple of different internal tools along with every excellent open DSS tool to better understand the distribution side from a more technical side and then roll that up to understand what the overall implications are. In terms of who would use it the idea here is actually to enable it to be a publically available tool. Granted public is – I don't know that there are going to be a lot of folks out on the street that would be interested in using a MAPLAB-based tool on planning but it would be available for others to be able to kind of get implications and overall insights.

So right now we do have codes. It is available for download. We're testing some various pieces out. And we'll continue to look for opportunities to continue to refine it. But it is meant to be an open source tool building on every open DSS, open source tool.

*[Speaker: Kristen Ardani]*

**Slide 30:**

Great. Thank you so much Virginia and Mark and Alison for your presentations today and to everyone who dialed in and participated for your thoughtful questions. I encourage all of you to check back with the web site and look at some of our archived meetings from the year. We're in a current stage right now of planning projects for next year. And so everyone who has signed up for the DGIC materials or has enlisted formally in the group will be receiving an elicitation of input from me directly.

You should be getting that to your e-mail boxes. I basically have a few key – two to three questions – around what kinds of projects you'd like to see the DGIC take up next year, and getting recommendations that way from the group. So that should be sent out to folks within the next week – one and a half weeks or so. I really appreciate everyone's feedback in advance who is able to provide that. And again I just want to thank everyone and we can probably wrap for today. There are no more questions.

Thank you again.

*[End of Audio]*