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Value of Solar: Methodology & Program Design Considerations  
NREL Solar Technical Assistance Working Group  
February 12, 2015  
Meeting Transcript

*Joyce McLaren:* It looks like some people are still coming online, but we do have a lot of folks already on that accepted the call today. So, we'll get started here in about just a minute. I just wanted to make sure that you all realized that we are recording this meeting today. So let me know if you have any concerns. The recording will probably be as a link on the technical assistance website, but I will be sending that out later when we get that arranged.

Okay. We've started the recording and I want to welcome everybody. I won't go around and have everybody say who's on the line since we can see on the GoToMeeting who has joined. I just want to make everybody aware of the possibility of feedback, so if you can keep yourselves muted if you're not talking, that would be great. And so, today we have actually two people. I didn't introduce one of them in the invite. We have John Sterling from the Solar Electric Power Association, and he is an expert in a very wide variety of things solar. So, you'll hear quite a bit from him here in a minute. I also have Paul Denholm from NREL on the line, and Paul has done some work on looking at the methodologies that different folks have been trying to come up with for value of solar, and so I'm gonna let him definitely fill in on what's been going on in different areas – different calculation methodologies and comparing them, and whatever else he wants to share with you.

So, Paul, did you want to introduce yourself and tell them a little bit about your background with value of solar?

*Paul Denholm:* Sure. So, my name is Paul Denholm. I'm an analyst here at NREL, and I've been working on the value of solar methodologies for a while. Basically, we've just issued a report and it's publically available. Basically – *[Break in audio]* categories that have been – and basically take a look at some of the modeling tools and approaches that have been used for valuing DGPV. So, I'll leave it at that, and then we can talk more as the conference goes on.

*Joyce McLaren:* Sounds good. Thanks. Actually, I'll go ahead and say what states are on the line for Paul and John's benefit since they haven't been part of the working group before. It looks like we have Emma from Massachusetts, Holly from Minnesota – let's see, Ann – a couple people from Vermont, it looks like. We have Connecticut and Maryland on the line. Did I miss a state? I don't think

Missouri was able to join us today, but we did – so that's who's on the line for John and Paul's benefit. So John, would you like to introduce yourself and go through the slides that you've prepared? And then what we'll do after that is just kind of open it up for a discussion and questions, and everybody jump in if they want.

*John Sterling:*

Sure. Thanks much, Joyce. John Sterling with SEPA and senior director of research and advisory services here. Happy to speak to everybody today. I threw a bunch of material into the slide deck. I'm probably not gonna cover all of it in great detail. I thought that you'd be able to get your hands on this afterwards and could read up on some of the more detailed, wordy-looking slides that are more boring and we don't want to go through here.

Little overview of the organization just in case you're not familiar. We're a 501(c)(3), so we're education and research focused. We do not do any advocacy or *[Break in audio]* as an organization. We are membership based. We are right around 500 utilities that are members of SEPA and around 400 to 450 non-utilities – people in the solar vertical, other stakeholders in the industry; a lot of state commissions are members of SEPA as well. Our membership makes up about 94 percent of all installed solar in the United States. There we go.

Just from a name perspective, so you get a scope here, our membership spans not only the investor and utilities, but also municipals and cooperatives coast to coast. Like I mentioned, 94 percent of solar, which is essentially all the utilities who are doing solar in the US, are members of our organization. And then on a non-utility perspective, the \_\_\_ of the world, First Solar, Clean Power Finance, Black and Veatch, SMA, EEI, \_\_\_\_\_ are both members. And if you're interested in finding out whether or not your specific state agency is a member of SEPA, just reach out to me afterwards. We have free membership actually for commissions, and we may for other state energy offices, and so we can – if you're not a member, we can get you on board pretty easily to get your hands on the research that we do.

Some of our research is for our members, and others we partner with folks like Joyce and NREL on putting out papers related to solar and how utilities interact with it. We have a couple of conferences that go on every year including Solar Power International, which is a massive trade show – 15,000 people, 200,000 square feet of floor space. Everything soup to nuts involving solar.

So that's sort of who we are and what our scope is. My specific responsibility is on driving our research agenda at SEPA, as well as some of our one-on-one consulting work that we do for our members to help them analyze and look at solar.

So, Joyce asked me to come and talk a little bit about the movement and value of solar, what it is, where it came from, what kind of stacks up into the bars, the methodology, and then the program design piece. I'm gonna bounce back and forth a little bit with Paul Denholm. He's much more of an expert on all of the alternatives to methodology than I am.

BOS started several years ago. The first program was Austin Energy – first and only actual program that's been implemented. Austin Energy in Texas. But the idea is it's just an alternative to net metering. It's a transparent, repeatable process. It's similar to a \_\_\_\_\_, although it's not necessarily the same thing. Customers paying their full retail rate, and then being compensated through a bill credit mechanism at a separate rate that represents the value of their resource to the system.

This is something that can hopefully be updated relatively easily. You can establish incentives that go with it. It can be easily understood and facilitate transactions in a different manner than what we've seen historically with net metering.

So, there's a handful of things that are typically discussed. So, value of solar is sort of a bottom up approach to figuring out how to put a price point on this resource. You're identifying all of the discrete value propositions and value streams that this specific distributed resource can provide back to the grid. And so, you build these up one at a time, figure out how to calculate them, add them up together, and it comes up with a total compensation rate. The most common things discussed in this realm are things like avoided energy. Everyone agrees that these types of resources provide some energy values. Producing energy to get compensated for it. Generation capacity – defer all the ability to not need new generators at some point in the future on the system because you've got something that's being put in by the customer, whose typical generation streams all the way through transmission distribution impact, system losses, and more societal factors like environmental – having development issues.

I'll touch on these really quickly and kind of – this is where we'll start bouncing back and forth with Paul a little bit. So yeah, avoided energy. This is what the system's producing, what is it

deferring that you didn't have to generate at that same time because this resource was available. That typically also includes downstream to things like fixed and variable O&M, variable O&M. So you've got generators that aren't running, so you're saving the costs that you would've had to run those if they weren't on. Generation capacity deferrals, so that's the idea if you – at some point in time your utility's gonna be – short-resourced, then they need to build a new combustion turbine or combined cycle or something else. You put enough distributed resources in, you don't need to build that at the same point in time; it may push it out a few years into the future.

On the systems side, transmission distribution impacts – we like to see the net change in infrastructure. So if you have distributed resources like solar rooftop, you may be extending asset lives, deferring additions, resolving transmission or distribution system constraints that has a tangible value to the utility of the grid. Or, if you have a ton of resources that go into one specific location, you may cause distribution system upgrades that are required. And so, you look at both sides of the equation.

System losses, if you're generating at the load, at the customer's home, instead of a remote resource like as the traditionally centralized generation works, you're not having to deal with any of the transformation losses from central generation over transmission systems, stepped down to distribution, stepped down to the home. You don't have that same level of losses, and so you compensate back to them 'cause you're not generating as much energy as you otherwise would have.

On the societal side – this is where things get a little bit more interesting from a calculation perspective and from an approach. Environmental attributes – you're looking at the impacts that may otherwise occur, but the methods for this and I think Paul's gonna be able to jump into – I haven't seen consensus here on the right way to approach this category. Economic develop benefit – the idea there is that you're creating jobs by deploying solar, and that has some societal value; the question is whether or not you include that in the rate methodology or not. Disasters recovery, security enhancement impact – these are a little more nebulous, but the idea is that you can bring the system back online quicker after a natural disaster, or if you have many more distributor resources instead of central station generation, you may have less risk of the system going down overall. So those are what those are trying to address.

Really quickly, I think the easiest things to talk about first from a methodology perspective are: how to attack avoided energy and how to attack generation capacity deferral. Two big picture approaches that I've seen used. The first is what I call simple, but not very granular. It's looking at the marginal unit of field production, or the marginal unit that you would otherwise build. From an avoided energy perspective, this is like saying I'm probably not going to be generating from a combined cycle, so whatever the heat rate is of a combined cycle resource times a future gas curve, that's gonna be my avoided energy cost. Very simple approach, everybody can understand it, you can plug it into a spreadsheet and spit out an answer on the other end, and it's kind of a good approach to get a general understanding.

Much more detailed and complicated basis – you could go all the way through production cost modeling. We just saw a lot of utilities do their long-term resource planning. This is a full system dispatch of all resources against your electric load for a 20 year period on an hourly basis. It's literally a giant model that you turn on at night and the next day when you get back in the office, it may have finished running. But it's dispatching the entire system every hour of the day for a 20 year period. And not an easy thing to make transparent, but very, very detailed in what's happening on the system, what resources are being deferred hour to hour, much more granular picture into what the true avoided energy number is.

The same thing is true on the capacity deferral setting. You can take that idea of a marginal unit. What's the capital cost to build a combustion turbine, for example, and you use that to come up with a deferred value to put into the stack on a cents per kilowatt hour basis. Or, you can take that same resource planning mindset and look at capacity expansion models where you're forecasting all of the capital builds for the system over the next 20 years and determining how much cost it is to build out all the new resources you're gonna be using. Then you plug in a large number of distributed solar that causes you to need less generation to run the model again and see what the difference is in the revenue requirements, and that drives what your generation deferral is.

Again, two very different approaches. One, a little bit easier to understand, a little bit quick and dirty; whereas another one's much more complicated, much more detailed, essentially more accurate. You run into that issue of how transparent do you want to be? So, I'm gonna hop back really quickly. If I can get the mouse to work here.

Paul, this may be a good spot for you to kinda jump in and share some of your thoughts on methodologies.

*Paul Denholm:*

Well, I thought you did a really good job. I mean, one of the challenges is, of course, is the choice between simple and transparent, and the more accurate measures. One of the things that we've struggled with is trying to figure out what the right balance between them is. We here at NREL run a production called \_\_\_\_\_. And like John said, you know, they are – they do involve setting up a run and walking away, and getting the results the next day. But, it also involves spending your tens of thousands – if not hundreds of thousands up dollars a year just to be able to maintain the software, maintain the staff, and \_\_\_\_\_, things like that. So, there really does need to be a – I think a balance. And so that is one of the reasons why we've looked at things like the market based approach that have been used previously where people take historic market data and compare them to solar profiles. So, I would kinda defer to the audience if there's any questions, or John, if you wanna keep going, and we kinda get into the more details if people have specific questions. But, we're still looking for that right balance between simplicity, transparency, and maximum value. One of the problems, of course, is utilities always seem to kinda have the upper hand here. They do run these tools in-house, and they may be dismissive of the simpler approaches because they feel like we do have the sophisticated tools, so we should just use those, which leaves out kinda the stakeholders and the advocates and various other individual that don't have access to these tools.

So, one of the asymmetries here is not just in terms of the models themselves, but who has access to the models. Whereas one side often has the models, and the other side doesn't. So, there's all kinds of issues around the modeling and data requirements. I'll leave it at that and see if we have any follow-up questions.

*John Sterling:*

I think kind of to tap onto that point, I'm gonna hope forward back to this slide again, just looking at two issues. So, a couple of examples of how value of solar has been approached in some different jurisdictions. Austin Energy in Texas – they have used sort of that marginal approach and ability to look at the wholesale market. Same thing in Minnesota – looks at heat rate, looks at gas curve for the methodology that was established there, looks at marginal unit capacity for the generation deferral. Those two more granular approaches – and this is not something I think everybody's aware of, but TVA – Tennessee Valley Authority – spent last year with a stakeholder working group developing what

they called the DGIV, distributed generation immigrated value. Myself and one other person at SEPA acted as their facilitators for the whole stakeholder process. So while they haven't published their final methodology for public consumption, yeah, I can give you some clues as to what they all agreed on. The stakeholder working group just come to consensus on using the resource planning tools, the production cost model, and the capacity expansion model to calculate avoided energy, generation deferral, fixed and variable O&M, and a portion of environmental. And to Paul's point, you know, that is a process and an approach that the utility's very comfortable with, that is very detailed. It does take a lot of manpower, a lot of ours. It's something they're already doing on a resource planning perspective, and so they worked very diligently, talking to the working group. We've covered all of the different options for calculating these. Everyone kind of gravitated toward these more accurate approaches, but there was a lot of time spent showing the model results, walking through how the models treated things year by year, why dispatch was occurring in certain manners, walking through some anomalies that popped up. There were some years where you would see increased O&M and that had to do, I think, with the dispatches from pull units and some other things that happened \_\_\_\_\_ years in the system. But that is something that was looked at very heavily by a stakeholder group in the Southeast, and I believe TVA is just a couple of weeks away from publishing their methodology from that working group initiative and everybody will have a chance to really take a look at that.

So, we have seen it approached in a few different manners. I think the point is to figure out what level – who's running the program, who's establishing the methodology, what stakeholders are gonna be at the table, what are you trying to accomplish here? And, do you want to spend the time and initiative to go through that detailed process, and get everyone comfortable with the results and figure out how to make what used to be a black box, transparent. I think there's gonna be a different level of comfort for everybody involved in that, and so I don't think you're gonna see a one-size-fits-all across the country.

What I've got on the next slide is just what happened in Austin. So, they did a study several years back, and they came up with a value of something like 12.8 cents. It included fuel O&M, capacity, transmission distribution savings, and environmental value and losses. And then, they redid the study – they reset the arrays. They have a process where I think once a year, they can go in and update the numbers. So they did it at the end of 2013 for

application starting in 2014. The number dropped to 10.7 cents. And that just reflects the fact that when you're running these models and you're looking at these future periods, the future hasn't happened yet, and so we don't know day-to-day what natural gas is gonna do. Everybody has a natural gas curve that gets updated on a routine basis. The gas curve, I think, changed in this instance here, and so the number changed. I think distribution value was set as zero in the 2013 study, and so that changed. There was a handful of things that moved around – losses went down as well. And so, this is an iterative process. The important thing is to figure what your methodology's gonna be, establish the ground rules, and figure out how you're gonna be applying that going forward. We're gonna talk about that for sure in the next portion of this which is really focused on the program design aspect.

So, the point of the program design here is: this isn't – you don't come up with a value of solar methodology and spit a number out, and then walk home. That's kind of half the job. The other half is to figure out how you'd translate that into a transaction for customers and to make sure you're causing transactions in the first place.

Value solar in general, you're looking to recognize both the costs and benefits on the grid to make sure you're being transparent, that you've got compensation across the board, and your *[Break in audio]* costs in an appropriate manner.

What happens though, when you compare that against what the cost of the \_\_\_\_\_ system is. So when a customer has the ability to put solar on their rooftop, they're doing an economic analysis. They've got some value proposition on the cost side, and so we're representing that on the slide as LCOE. The levelized cost of energy from the PB system. So if you come up with a VOS methodology, an array, and it is less than the cost to deploy the system, you're not causing transactions, no matter how pure or how good your methodology is, how great everybody feels about it, it's not high enough to offset the cost of the system. Solar's not getting installed.

But SEPA and NREL have been working on a report that should be coming out hopefully soon – Joyce will know a little bit better than I do. We looked at identifying some different theoretical markets that could exist. One is that market where the VOS rate isn't higher than the cost to deploy the system, so you have to find some way to incentivize that gap to sustain a solar market. On the other end of the spectrum, the VOS rate can be above what it costs to



deploy solar. And in that case, the market is self-sustained. Systems are gonna go in because it's an economic choice to make. There's a middle ground to it – transitional market where it's very close and it's almost system-dependent based on the customer's deployment. And so you've gotta be aware that as you're looking to pull this program together, adopt a value of solar rate. But you have to understand: what's the cost? What market are you gonna be in? What program design levers do you need to start pulling so that you can make sure you create a solar market today, and transition to a point where you \_\_\_\_\_ in the future.

So, we identified a handful of considerations that exist in that program design framework – from installation details, rate options, incentives, administrative issues. I've got slides on each one of these that I'm gonna avoid going into detail on. You'll have the slides and be able to read up on them, and then our report will come out pretty soon. You can read \_\_\_\_\_. But in general, what we're looking at is: who's eligible for the program? Is it residential only? Are you allowing small commercial to participate? Are there specific PB technologies that you are or are not gonna support? Are there interconnection requirements that you're gonna put in in front of or behind the meter, for example? Are you gonna require smart inverters? How are you gonna handle meter? From a rate perspective, do you have a different rate for residential versus small commercial if they're both allowed to participate? Would you update the rate? How frequently is that update going to occur? If you do update, then the change in the future, does it only change for the customers who just signed up? I think we've got some feedback. Does somebody have a question, or? *[Feedback]*

*Joyce McLaren:* Can someone mute their phone? I can't tell who it is. *[Feedback]*  
Hello. Can somebody on the line mute their phone? *[Feedback]*  
Excuse me, can somebody on the phone mute their phone?  
Somebody's talking, and we can hear you. *[Feedback]*

*John Sterling:* Thanks Joyce. So, I think where I was on this slide was talking about adjustments over time. So, the idea there is I think there's a bit of a different approach in a couple of different jurisdictions in Austin and Minnesota. In Austin, when they update their rate, it changes for whoever's on it, whether or not you just installed your system or did a year or two ago. And in Minnesota, I believe it's vintaged. So you're changing it – when the rate changes, people who installed before that date are still locked into what they signed up for. It's the future participants who are getting the new rate. But you guys decide what's the right approach, and you know,

what's the risk of locking in a number of things change significantly, versus the risk to the customer of not knowing what their transaction price is gonna look like. Locational differences and time of performance – I mean, do you want to articulate that there's parts of the distribution grid that could use generation on it and provide extra incentive there and other parts of the grid where you don't want systems to go on because it may cause upgrades that are gonna cost something.

So you can look at these locational options. From an incentive perspective, again, this is the idea that: do you need one to begin with? Are you putting an incentive in to cause transactions? And if you are, is that an upfront incentive? Is it an ongoing, cents per kilowatt hour? How do you know when you need to step out of that incentive over time? And again, from an administrative perspective, stakeholder engagement I think is really the key one here. When you're looking at these program designs, who do you need to bring to the table? Who are you talking to about the methodology about the program, about the long-term objectives, and who's really gonna be administering this on an ongoing basis? Joyce, I'll turn it over to you if you wanna add anything else on the program design front.

*Joyce McLaren:*

No. I won't add anything at this point. I think maybe we should just open it up for questions and discussion so that folks can sort of touch on the points that are most important to them. I'm not sure – can everyone unmute themselves now that I've muted all, or do I need to unmute everyone? I'll go ahead and unmute. *[Feedback]* So, can everyone individually unmute yourself? Can someone maybe – the chat, if that's not possible?

*Question:*

\_\_\_\_\_. This is Shelley from Connecticut. That seemed to work. I had a question about the CVA project. I was wondering, John, if you had a sense, after all of that was said and done, how much value the more complex models provided, and whether in the future you think that utilities and other stakeholders will start having enough confidence in simplified versions?

*John Sterling:*

You know, I think it's gonna – I think it's interesting. One of the things that was really interesting to me about that process was seeing the intricacies and the interplays between the different types of resources on the system. So what \_\_\_ looked at doing was they had their businesses as usual runs that were going on anyway because they have an integrated resource planning process. Then they looked at that again – large levels of solar at zero coast, zero dispatch to see what the reduced revenue requirements would be

and what that would drive from a value perspective. And you got to see hour to hour what would happen with – between the coal plants and the combined cycles, and the combustion turbines, and the solar, and what was dispatching when – at least on a monthly and yearly basis. I think of it, right, as an interesting insights for the stakeholders into what's going on on the grid from a big picture perspective. Now, to the point of whether or not people are gonna get comfortable with that approach, I think it kinda depends on who's driving the program. Is the utility driving this, or is the state group driving it? Because it's – who's got the ownership? I have the calculations different in each case. I would say if you're looking at the more simplified approach, I would recommend looking closer at a fuel blend instead of relying purely on natural gas as the marginal resource. Because, \_\_\_\_\_ the marginal resource often. It is not always the marginal resource in every case. So, if you want to at least kind of find another level of granularity in between, you can look at what the resource mix is, and the percentage of which resource it typically produces, and then blend those costs.

*Question:* Great. Thank you.

*Joyce McLaren:* So, I have a question from Kyle that just came in. How does the value of solar work with performance-based rate making, and have these two policies been implemented together anywhere?

*John Sterling:* I'll tell you what. I may have to have another cup of coffee to think that one through. I don't believe they have been blended together before, and I guess with performance-based rate making, you're referring to the RIO model. I guess I'd – I'd probably have to punt a little bit, take some time to think through how those two would work together. You know, from a broad perspective, if you're using this value of solar to drive a certain amount of customer adoption or distributed resources or renewable activity, you know, that's a lever in the toolbox from a RIO perspective. And you have to understand what the different incentives are and requirements are there. So, I guess it would – to make the long story short, the answer is: it depends.

*Joyce McLaren:* Any other questions or comments? Paul, did you have any other thoughts you wanted to add based on what we've just gone over? All right.

*Question:* This is Shelley again. I do have another thing that I was wondering about. Have you heard anything about how

stakeholders are happy or not with the Austin and Minnesota implementation?

*John Sterling:*

So, I'm going off of some memory here 'cause I haven't touched base with Austin Energy in a few months, but initially, I think it was a very positive rollout when they first launched the program. I believe that the value proposition was actually above their rates, and so it was a good deal to move over to this. They were also – they were providing the 12.8 cents, but they also had enough front incentive associated with it. Now, when they went to modify the rate, and the way they were structured, it would apply to everyone, I think that did get some push-back, because if you think about when the customers decided to adopt solar, they were basing that on some level of economic analysis. Well, here's what it's gonna cost me to put the system in; here's what I'm gonna get back from Austin. So this is my payback period. When that rate moves around, it makes that payback calculation a little bit more difficult. In Minnesota, the methodology got approved, but I don't believe was adopted for a specific value of solar program. I know there was talks about it for community garden works, but I don't believe it got deployed specifically for a VOS program job.

*Question:*

Thank you. That's very interesting.

*John Sterling:*

It looks like there's another question here, Joyce.

*Joyce McLaren:*

Yeah. So, it looks like TJ asked whether the value of solar runs into issues or perceived issues with the \_\_\_\_\_ requirements to purchase energy to void a cost. Have you heard of any? I haven't heard of that before.

*John Sterling:*

No. You know, I haven't. The idea there – I don't know how many customers on their rooftop want to try and go through a QF process with – anyway, and declare themselves a QF. But, for the most part, the value of solar would probably be above the avoided cost rate in most states. Now, not every state. Each state can calculate voided cost under \_\_\_\_\_ based on their own rules. And so, I've seen very, very different approaches. North Carolina's is different than Arizona, for example. So, I haven't seen that pop up yet. Now, if someone did a value of solar program for large industrials, or heavy industry where the system sizes were large enough that you would – someone is making that decision: do I want to be a QF or do I want to go behind the meter and do something with this program? I can see that conversation occurring, but I don't think any value of solar print-ups today have

been targeted at that customer class. It was probably just residential and maybe small commercial.

*Joyce McLaren:* Other thoughts or comments? Where will the TBA study be published?

*John Sterling:* That is a good question. They had a draft that went only to their working group and got comments back from that working group right at the – right in early to mid-January, and they've been working on integrating all of the different comments. The working group was made up of both, their local power companies, which are cooperators and meanings; but also, environmental advocates, local solar developers, and one national lab, and a couple of state agencies. So – diligently, I'm getting those comments incorporated, and I anticipate the working group's gonna see that one more time in the next week or two, and then it'll be published. So, I don't have a firm date for you, but my gut tells me it's probably gonna be in early March.

*Joyce McLaren:* And reminds me that John mentioned that I might know a little more about the NREL SEPA paper on valued filler – program design. It will be coming out in the next couple of weeks. And the link should be live hopefully in the next two weeks, and I will send that out to everyone when it is available. I'll also send the slides from today out, and I'm sure that if you have any questions that come to mind later, that John and Paul both would probably be happy to address those individually. I'm hoping I'm not speaking out of line there, John.

*John Sterling:* No, I'm always happy to help; in fact, I think in the slides, I have my contact information. Anyone's free to reach back out. I pulled up a capstone slide here just to kinda drive home the point when you're looking at the value of solar, it's more than just the methodology. You're going through a very rigorous process to decide what are the benefits and what are the costs that are gonna make up all the value strings? How are you gonna plug them together? What are the calculation approaches? What are the inputs? What's the output gonna look like? And really firm down the methodology. But then you have to go through the program design phase. You have to figure out all the different levers you want to be pulling, that you want to be making sure you look at the costs for the customer to understand what the market's gonna look like, and you know what that projected market is over a few years, so you can build in advance a transition plan.

You know where you're gonna be going long-term. If you don't want to do this and then two years from now, go back and say, whoo, we've gotta do this all over again. This doesn't work – a new, you know, the way the world's changed over the last two years. You want it to be flexible enough that you've got something that can exist for the long-term. I did put in here a couple of references. We did a net metering primer a few years back that includes a lot of just key terms of rate making principles. Rocky Mountain Institute did a meta-study on a lot of different benefit cost studies which are very similar to these in nature to the value of solar approach. So, they give you just kind of a breath of ideas. State of Minnesota had a very nice document on their final methodology. I don't have Paul's paper. We'll link in here. Joyce can get that to everyone. I didn't have a chance to pull that into my slides. And then, we will have our program design paper available soon as well.

*Joyce McLaren:*

Great, thanks. Are there any last comments or questions before we end the call for today? All right. Well, thanks everybody for joining, and as I said, I'll send out the slides from today and definitely the value of solar design paper when that comes out. And, that's it for today.

*[End of Audio]*