

*[Speaker: Kristen Ardani]*

**Cover Slide:** Thank you everyone for joining us today for the DG Interconnection Collaborative. My name is Kristen Ardani, I'm an analyst here at NREL and the lead facilitator of the DGIC. We are fortunate today to have speakers Joel Dickinson of Salt River Project. We are going to discuss distributed PV interconnection screening procedures.

**Slide 2:** I would like to introduce Joel Dickinson. Joel works at (SRP) Solar Initiatives Group where he provides engineering support for the Salt River Project Solar Incentive Program. He has a bachelor's degree in chemical engineering from Arizona State University and is a registered professional engineer in the State of Arizona. And with that, I would like to turn it over to Joel.

*[Speaker: Joel Dickinson]*

**Slide 3:** Thank you. This is Joel here. I also would like to introduce a couple of my co-workers. I have David Crowell. He's a senior – or excuse me – a principal analyst in the transmission generation operations group. So he's the one that reviews the applications to interconnect to our transmission system.

I have Michelle McNeal. She's a senior customer analyst and has been doing the interconnections forever and a day, including in inverter based and spinning motors. So she's forgotten more about this than I know. She's here to help me out.

And then Max Berger is our sustainability strategist. So he's the single point of contact at SRP if a customer decides they want to interconnect to our grid and helps usher the application through.

**Slide 4:** Salt River Project is a water and electric utility. We're over 100 years old. And when we built this dam and we put a generator in it we became an electric utility. We're vertically integrated meaning we own transmission distribution and generation. We are the third largest public utility in the United States. And our service territory – It's nice for us because it really is comprised of half of the valley that Phoenix sits in. So it makes it a little bit more compact for us. We're a summer peaking utility which means that typically at 5:00 PM on some Thursday afternoon in July or August we'll hit our peak.

**Slide 5:** SRP started our solar program in 2004. We are not – I mentioned earlier we're a public utility. We're not an investor-owned utility so we're not regulated by the Arizona Corporation Commission. Our programs are voluntary. And we like to keep up with our

neighbors across the street. So we have a solar program and our board has decided that 20 percent of our energy sales will come from renewable generation by 2020. Next please.

**Slide 6:**

Here's a snapshot of our solar program to give you an idea how many customers we have that are doing solar. As I mentioned on my previous slide we have about 1,000,000 meters out there. About 10,000 of those 1,000,000 meters are solar electric customers. And we have about 8,000 solar water heating customers. Again since we're a non-profit we can't leverage the federal tax credit. We give incentives to our customers in exchange for renewable energy credits and then they can leverage the federal tax credits.

Most of our commercial customers have been early adopters that were corporations with a green mandate. Think of baking chips with the sun or making computer chips and that kind of thing. I've got about 110 megawatts on the bottom there. That does not include about 40 megawatts of solar that we directly have a PPA with a couple of plants.

**Slide 7:**

This gives you an idea of how our solar installations have changed over time. And you can see, if you look closely, that in 2009 when the Energy Policy Act was changed and the \$2,000.00 cap was removed we started seeing more commercial installations. And then you can also see that when Arizona started the leasing – allowing leasing in 2010 we've really started seeing a jump in our program. And now in 2014 we're actually seeing residential vendors going door to door and marketing that way. And we're seeing mostly a large percentage are leases. Next slide please.

**Slide 8:**

This leads me to the top of interconnections – why we're here today. We've been doing interconnections for quite some time as I mentioned previously. And our interconnection procedures are really in place to avoid adverse effects to SRP. We want customers and quality of service – customers, equipment, and quality of service to be maintained. Behind the meter is a load customer. They're by far the most common way we see people interconnect.

And in Arizona we don't allow non-utilities to sell energy to our customers. So vendors are mostly doing leases out there as opposed to PPAs. And another thing to note is we don't do virtual net metering. It's created some billing complications for us. I'll talk about that later. So recently too I'll talk about how we've been

seeing a growth in what we call the interconnector customers. These are large industrial customers with a dedicated substation that may install just a small system. But since they are from our viewpoint taking energy from the transmission system they go through our transmission process. Next slide please.

**Slide 9:**

Due to the incentive program limitations we only net meter systems under 300 kW. So go figure; we have a bunch of 300 kW systems installed. And I'll have an example of that later. Then we also have bumped up our requirement for remote disconnects. We're up to 1 megawatt now. Again we have a lot of projects that are just under 1 megawatt. But due to our wholesale pricing and our retail pricing we just don't see a whole lot of commercial – large commercial customers or solar systems in our territory.

Let's go to the – And I mentioned – I want to mention here the transmission system. You can interconnect to our transmission system and take our wholesale buy back rider. Or you can negotiate a PPA with SRP, or act as a merchant plant and wheel through our grid. Next slide please.

**Slide 10:**

The solar program – This is the kV and below – primarily behind the meter. We've been using an online application service for quite some time – four to five years. And more recently, within the last two years or so, we've added the ability to generate an interconnection agreement online as well. That really has streamlined that process. Max, who's with us today, typically reviews the application within three days. And we are seeing three projects go from application to commissioning typically within six to nine months. Next slide please.

**Slide 11:**

Here is a flowchart. And I apologize that this is kind of busy but I thought it was something that would help kind of lay out how we're going through our process. I won't belabor the whole thing 'cause you can look at it here. But the first box has an online application and that's where the interconnection agreement and the application are handled. And those are generated by a power cord interconnect. And as also we were mentioning about two boxes down through the first diamond – the decision diamond – we have a dedicated department that does our solar design reviews.

That was really a hang up for us in the past. It was hard to get the solar applications in the cue for review. And we were always getting second bills of down power line and busted transformers – go figure. But it's been really nice now that we have this group of folks that are looking at solar designs and not just the drawings all

day long. And they're actually doing the field inspections for us too which has helped some of the lessons learned that we've got.

Typically since we have that dedicated group we get residential projects commissioned from application to commissioning within a month in some cases. Of course some of those may have already been built before we see the app but again commercial applications – Max is looking at them within three days. And then lessons learned here to load customers behind the meter.

We've had some large – we call it our E61 rate but it's our lowest commercial rate. And if a customer is right on the cusp of qualifying for that lowest commercial rate with their load and then they install a solar system we have seen that where that bumps them into a higher rate. So they actually may not save money by installing the solar system. That's not something that they enjoy hearing from us. Next slide please.

**Slide 12:**

Also while the bulk of our applications are behind the meter we do have a few commercial jobs that are connected to our distribution systems. So we consider our distribution system the 12 kV and below and then the transmission is the 69 kV and above. And so the 12 kV and under is kind of an area that we don't have a lot of action in. And it's really a function of our program. We do allow non-profits to enter into PPAs but we do a three-party PPA because we don't allow the sale of energy to our customers in Arizona.

But this is also a good example of a lessons learned. We've had a few early customers coming in saying they wanted to interconnect to a transformer on our distribution system or one example that's even better is that they had a load center and a transformer drawn on the plans. And we thought that that was existing. And so when we went out to set the meters we realized that the customer or the solar vendor had installed for the customer a brand new transformer.

So it became really a billing issue where now we're having to hand bill and reconcile two different accounts. While it may have been technically feasible it's a good example of where you really want to get buy in from all the groups that are involved. In this case it was something that we got push back from billing. So we are – Unless there's an extenuating circumstance we are not allowing people to install directly to our distribution system if it's just for the convenience, unless of course they have entered into a utility agreement of some other sort. Next slide please.

**Slide 13:** Now we have the transmission interconnection procedure. If the generator is 20 megawatts or less the process is similar to the 12 kV and under. But it's driven by our transmission planning group instead of our distribution planning group. This is where David Crowell comes in. And if the project is 2 megawatts or less we may have fast track the study. Instead of a 2 to 3 month study that we require and a \$1,000.00 deposit to get that study kicked off it can go through quicker than that.

After the study the customer is told how much it's going to cost to upgrade the equipment. And at that point they can decide whether they want to move forward or not. This has been an interesting area for us lately because we have a number of large commercial customers that have a dedicated substation. As far as SRP is concerned we're seeing them at 60 kV. And they may say, "Hey we want to come in and install a little 50 kW covered parking thing in front of our cafeteria."

But we required a full blown study going through our process because they're interconnected from our view at the transmission level. It can create – and really we came to that conclusion after we decided that if the customer by chance were to go dark our transmission system could really see a back feed from that solar system. Let's see here – and yeah at the bottom of the interconnection agreements it's always kind of interesting when you have a large commercial customer with a room full of attorneys and SRP with a room full of attorneys and trying to get an IA out of those folks can be painful. Next slide please.

**Slide 14:** Examples of some customer solar plants. We have a large beverage manufacturer on the left. And they came in a number – I guess it was about 2008 where they installed a 500 kW system. That's the darker system on the top. At that time we had to figure out how are we going to interconnect a customer that has their own sub? And how are we going to meter? What do the connection agreements look like? That was really our first go at that. And then they came back just last year and added to that system so they're 2 megawatts total now.

And then the customer on the right is an example of where because of our net metering rules they figured out how to play the system. And they installed two 300 kW systems. They did one system one year and actually waited for our fiscal year to change, which wasn't that many months later and then installed the second 300 kW system. Next slide please.

**Slide 15:** And then copper crossing is another good example for us. This is a 20 megawatt facility where a vendor came in and negotiated a PPA with SRP. And they elected to interconnect at the 12 kV level. They're feeding one of our substations that's actually on the edge of our service territory. We thought it would be in the middle – Well not in the middle but in a bunch of neighborhoods by now. But with the downturn in the economy that hasn't happened.

This is a good example of where we've really been interested in what's happening to power quality and monitoring those kinds of things when you have a larger plant feeding a substation that doesn't have much load. Next slide please.

**Slide 16:** In conclusion, I think as we evolve and grow our solar portfolio we're having to evolve as a utility as well to stay ahead of these unforeseen issues. We do not have high wholesale rates in Arizona. So we just haven't seen a proliferation of merchant plants or plants interconnecting to our grid just to sell into the grid.

Most of the time they're working with customers and negotiating a price ahead of time or with SRP. But we are continually working on our process just to make sure that we're not an impediment to project development. And at the same time we're also interested in protecting the interest of our customers' power quality reliability and all those things that we're concerned about as a utility.

**Slide 17:** That is my last slide. We're open to a few questions here.

*[Speaker: Kristen Ardani]*

Great. Thank you so much Joel for that very informative presentation. One question that came in while you were talking relates to I guess sort of the dropout rates or cancellation rates of projects that your teams experienced. Do you have any type of anecdotal information or data around potential customers interested in interconnecting but don't necessarily move through the cue – all the way through to commissioning?

Are there any kind of percentages or rough estimates of how prevalent or common it is to start the interconnection process but then later not – I mean I guess you did mention that maybe upon learning about the study requirements or costs a customer has a decision point whether to proceed or not. Do we know how common it is to drop out of the interconnection queue?

*[Speaker: Joel Dickinson]*

Yeah so that's a good question. Initially when our incentives were higher – What are we \$.05 now?

*[Speaker: Max Berger]*

Yeah we're at \$.05 a lot.

*[Speaker: Joel Dickinson]*

We're at \$.05 a lot now. When we were attacking more like \$3.00 or \$2.00 a lot we had people that would really come in and put in imaginary projects just to keep their place in the queue. And so I should say the queue being our incentive queue. But now most of the projects that Max sees; they're real projects. They go all the way through our process. Now if you're talking the transmission queue that's where David Crowell comes in and I should let him speak to that.

*[Speaker: David Crowell]*

Sure. Thanks Joel. From a transmission perspective and the queue typically we see an influx of projects and potential projects, interconnections requests when there is a potential peak \_\_\_ available. But at SRP looking – our resource planning group looking to procure solar then you're going to get an influx of interconnection requests and then ultimately whoever wins that project at the end of the day is going to get the PPA and then the rest of the queue will kind of – and the rest of the interconnectors will drop out at that point. We see that at the transmission interconnection level as well as our distribution interconnection queue as well.

*[Speaker: Kristen Ardani]*

Great, thank you. Another question came in related to the type of software that's used for the interconnection impact studies. Are you able to share a little bit with the group around the kinds of software that's used for the study?

*[Speaker: Joel Dickinson]*

I think the application side that Max is involved in has been fairly well-automated by the Clean – PowerClerk® software. I should let Max speak to this. He's whispering in my ear. So that has streamlined the application process and also it helped us generate the interconnection agreements automatically. As far as the queue for transmission I'll let David speak to that. Or not queue but for the design review for transmission.

*[Speaker: David Crowell]*

Yeah, I mean typically we're – our transmission planning engineers are going to be running the system impact studies. And they're going to be using GE software, PSLF models and inputs, to look at the power flow. They'll look at – As Joel pointed out we'll look at the power flow, the stability, and then we'll short circuit. In addition we may have issues with harmonics so we'll do special studies and those we'll ship off to potentially a third-party contractor that's a specialist in those areas.

*[Speaker: Kristen Ardani]*

Great. And actually maybe just following up on the harmonic issues that you mentioned a question came in looking in particular at larger size projects, say in the 20-25 megawatt range are harmonic issues prevalent? And how as a utility are you grappling with those? And what kind of harmonic issues have you experienced?

*[Speaker: Joel Dickinson]*

Well yeah so I would say that since we haven't had a lot of large generators on our distribution group we haven't seen lot yet. I think that there may have been some issues with the example I gave you of the copper crossing because it's interconnected to a sub that doesn't have a lot of load on it yet. We also at this time are working with EPRI, the Electric Power Research Institute to try to better understand how we can utilize advanced inverter functionality to help mitigate power quality and power factor and those kinds of issues.

We're still just in research stage and looking for places to install inverters and that kind of thing.

*[Speaker: Kristen Ardani]*

This question is related to net metering structures for residential for SRP. If there are plans to extend the net metering wider to other customers in a post-incentive world, or a non-incentive world. And I think this question is really speaking to the fact that the net metering rider will be frozen for new participation once SRP's incentives reach their maximum.

And that's specific to the residential. That is the residential is expected to reach the capacity soon – the maximum capacity for the incentive. So more to the point are there plans to extend the net metering rider to other customers?

*[Speaker: Joel Dickinson]*

This is Joel. Yeah that's a fun question. If I had the concrete answer I'd be making a lot more money than I'm making now. I think they're a little bit unrelated actually. Our net metering rider isn't predicated on the presence of incentives. So as I understand it right now when incentives – if incentives – are frozen we would continue to have the net metering rider. Now I don't know you know how long that will be in place.

Like I say I would have a crystal ball and would be making a lot more money if I could say that that was going to happen indefinitely. That's the short answer. I would say as we look through the windshield right now I'm not seeing a change to that in the near future. Hopefully that helps. It's probably an Arizona contractor.

*[Speaker: Kristen Ardani]*

**Slide 18:** Right. Okay. Great, thank you. Well I right now want to take the opportunity to thank all of our speakers and participants today. The information that you shared has been very, very helpful. I'd also like to note that this presentation has been recorded and that all of the slides will be made available on the DGIC web site. And I should also mention that on our next meeting on September 24<sup>th</sup> we'll be following up on the topic of interconnection but as it relates to strategic resource planning.

And we're going to highlight a couple SunShot projects. And we'll have speakers Allison Kling from Con Edison and Virginia Lacy of the Rocky Mountain Institute. So do register for that. There you see the link there at the bottom of the screen.

We can provide a write-up of all the questions. And we'll also post those on the web site. So the slides, and the questions, and the recording will be made available probably within the next week to two weeks as soon as we can get it posted. And I encourage everyone to register for our next meeting. And again thank you for everyone who dialed in and who spoke today. Appreciate it.

*[End of Audio]*