# BEFORE THE PUBLIC SERVICE COMMISSION

Civil No. 17-035-61

## PUBLIC HEARING

## DAY 4

October 02, 2020

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BEFORE THE PUBLIC SERVICE COMMISSION

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| Application of Rocky Mountain Power to Establish Export Credits for Customer Generated Electricity | Civil No. 17-035-61 |

PHASE II VIRTUAL PUBLIC HEARING, DAY 4

TAKEN THROUGH ADVANCED REPORTING SOLUTIONS

Taken on October 2, 2020

9:00 a.m. to 1:12 p.m.

Reported by: Michelle Mallonee, RPR, CCR

APPEARANCES

FOR ROCKY MOUNTAIN POWER:

EMILY WEGENER, ESQ.
JACOB A. MCDERMOTT, ESQ.
PACIFICORP
1407 West North Temple, #320
Salt Lake City, Utah 84116
(801) 220-4526
emily.wegener@pacificorp.com
jacob.mcdermott@pacificorp.com

FOR THE DIVISION OF PUBLIC UTILITIES:

JUSTIN C. JETTER, ESQ.
UTAH ATTORNEY GENERAL'S OFFICE
160 East 300 South, 5th Floor
Salt Lake City, Utah 84114
(801) 366-0260
jjetter@agutah.gov

FOR THE OFFICE OF CONSUMER SERVICES:

STEVEN W. SNARR, ESQ.
UTAH ATTORNEY GENERAL'S OFFICE
160 East 300 South, 5th Floor
Salt Lake City, Utah 84114
(801) 366-0260
stevensnarr@agutah.gov

FOR VOTE SOLAR:

JENNIFER SELENDY, ESQ.
PHILIPPE Z. SELENDY, ESQ.
JOSHUA S. MARGOLIN, ESQ.
LAUREN ZIMMERMAN, ESQ.
SHELBY ROKITO, ESQ.
SPENCER GOTTLIEB, ESQ.
SELENDY & GAY PLLC
1290 Avenue of the Americas
New York, New York 10104
(212) 390-9000
jselendy@selendygay.com
pselendy@selendygay.com
jmargolin@selendygay.com
lzimmerman@selendygay.com
srokito@selendygay.com
sgottlieb@selendygay.com

FOR UTAH CLEAN ENERGY:

HUNTER H. HOLMAN, ESQ.
UTAH CLEAN ENERGY
1014 2nd Avenue
Salt Lake City, Utah 84103
(801) 244-9227
hunter@utahcleanenergy.org

FOR VIVINT SOLAR, INC.:

STEPHEN F. MECHAM, ESQ.
STEPHEN F. MECHAM LAW, PLLC
10 West 100 South, Suite 323
Salt Lake City, Utah 84101
(385) 222-1618
sfmecham@gmail.com

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I N D E X

P R O C E E D I N G S

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CHAIRMAN LEVAR: We'll go on the record this morning.

It is Friday, October 2, 2020. We are here for the fourth day of Utah Public Service Commission Phase II hearing in Docket 17-35-61, for the application of Rocky Mountain Power to establish export credits for customer generated electricity.

And we'll go to Vote Solar now for your next witness.

MS. ROKITO: Good morning, Chair Levar.

Vote Solar calls Dr. Michael Milligan as its next witness.

CHAIRMAN LEVAR: Good morning, Mr. Milligan.

THE WITNESS: Good morning.

CHAIRMAN LEVAR: Do you swear to tell the truth?

THE WITNESS: I do.

CHAIRMAN LEVAR: Okay.

Go ahead -- Ms. Rokito, right?

MS. ROKITO: Sure. Yes, for the record, it's Shelby Rokito on behalf of Vote Solar.

CHAIRMAN LEVAR: Thank you.

MICHAEL MILLIGAN,

was called as a witness, and having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. ROKITO:

**Q. Please state your full name and business address for the record.**

A. My name is Michael Milligan. My address is 9584 West 89th Avenue, Westminster, Colorado.

**Q. Dr. Milligan, have you reviewed and analyzed the testimony submitted by the other parties to this case?**

A. Yes, I have.

**Q. And have you prepared direct, rebuttal, and surrebuttal testimony in this case?**

A. Yes.

**Q. Do you have any changes to offer to any of that testimony?**

A. No.

**Q. If you were asked the same questions included in your written testimony here today, would you give the same answers?**

A. Yes.

MS. ROKITO: Mr. Chairman, Vote Solar moves for

the acceptance of the testimony of Dr. Michael Milligan into the record in this proceeding.

CHAIRMAN LEVAR: If anyone objects to that motion, please unmute yourself and indicate your objection.

I'm not seeing or hearing any objections, so the motion is granted.

Ms. Rokito, you can go ahead.

**Q. (BY MS. ROKITO:) Dr. Milligan, have you prepared a summary of your testimony that you would like to present to the Commission?**

A. Yes.

**Q. Please go ahead and present your summary.**

A. Thank you. Good morning, Commissioners.

My name is Michael Milligan, and I'm principal at Milligan Grid Solutions, an independent power system consulting firm. I specialize in the integration of renewable energy into the power grid. I have over 30 years of experience in renewable energy research and the power system industry.

I appreciate the opportunity to testify on behalf of Vote Solar today to briefly summarize my opinions in this matter.

CG exports offer value in many forms, including the form of avoided energy costs and avoided generation

capacity costs. These values can be quantified and must be accounted for in the export credit rate to their fullest extent to ensure that CG customers receive just and reasonable compensation for the value they provide.

My calculation of avoided energy costs utilizes PacifiCorp's official forward price curve for 2021 through 2040 and for each of the relevant trading hubs.

The OFPC, which the Company has said is the best representation of future market prices, is the best available method for calculating avoided energy costs. It is forward-looking and accounts for future changes to the grid.

The Company has presented two approaches for calculating avoided energy costs in this proceeding. One rests on the soon-to-be-outdated GRID model that is shaped using historical EIM prices, while the other rests solely on that historical pricing data. Neither reflects the state of the future grid.

Perhaps recognizing some of the shortcomings of its GRID model, the Company has indicated that it plans to retire the GRID model by 2021.

However, the Company continues to recommend using backward-looking EIM prices to calculate avoided energy costs instead of its own OFPC, which is the best information we have right now about future energy

pricing.

In addition to avoided energy costs, CG exports offer material benefits in the form of avoided generation capacity costs. This value can and must be quantified and included in the export credit rate. When CG energy is exported during time of the system peak, the Company requires less capacity to serve its demand. This value is not rendered null simply because CG customers do not sign a contract with the utility.

Regardless of any so-called firm commitment on the part of CG customers, they are beholden to the Company in every way. They cannot sell their excess energy to any other utility or in any other market. Contract or not, all excess exports are sent back to the grid. For the vast majority of CG customers, this is not a short-term arrangement. Behind-the-meter technology has an operating life of 20 or more years, meaning that when a customer makes a long-term investment in CG solar, they are also making a long-term commitment to deliver exports to the Company.

By failing to include capacity contribution in the proposed export credit rate, the Company unduly diminishes the value of CG solar, depriving CG customers of the full value of their contribution.

The Company's proposal to use integration cost

to adjust the CG avoided cost calculation downward without a reliable method for calculating integration cost improperly diminishes the value of CG solar. Including these costs in the export rate, particularly where the Company has put forth no evidence to show CG solar imposes integration cost, unjustifiably treats CG differently than non CG resources and undercompensates them for the value they provide to the grid.

A just and reasonable export rate should not stifle CG growth nor should it create a scenario where CG customers are subsiding non CG customers by providing substantial uncompensated value to the grid.

Encouraging investment in energy-efficient resources like CG solar requires appropriately calculating the costs and the benefits of exported CG solar using the best available data, recognizing that the capacity contribution of CG solar is material and quantifiable, and excluding from the calculus those costs for which we have no basis to include.

Beginning with avoided energy costs, the Company is able to reduce its delivery requirement to customers based on CG exports. As I mentioned, in my calculation I rely on the OFPC, which is a forward-looking price developed by PacifiCorp, RMP's parent company, that accounts for anticipated future changes to the grid.

In developing the OFPC, PacifiCorp accounted for planned developments in the western interconnection, including planned additions and retirement. The OFPC accounts not only for the changing resource mix, but also for changes to neighboring systems which could also impact prices. The Company has recognized that the methodologies to develop the OFPC produces the best representation of future market prices.

Instead of using its own OFPC to perform the avoided energy cost calculation, the Company has elected to use either a soon-to-be retired GRID model or historical EIM prices alone.

Because, by the Company's own admission, the GRID model's results are insufficiently granular to determine an export credit, the Company has applied a shaping algorithm using historical EIM pricing. Historical pricing data bears little relationship to future prices on which the avoided energy cost and RMP's shaping leads it to assign avoided cost, or hours when solar power is not generating, such as nighttime hours.

GRID is also flawed because it assumes that all IRP resources, including those that are yet to be built, will be developed and deployed ahead of the already installed CG. This unduly reduces the value of CG solar.

So, too, does the fact that natural gas plants

in the GRID model, which is an economic dispatch model, locked into a commitment schedule, even if there's a change in solar energy export levels. All these issues damage the integrity of GRID's so-called economic optimization.

As an alternative to the GRID model, the Company proposes an avoided energy calculation using historical EIM prices alone and states that this approach would offer greater transparency than the GRID model. This, too, suffers from the fact that the EIM prices are necessarily historical and do not account for future coal plant retirements, increasing renewables, changes in demand, changes in gas prices, changes in the transmission network, changing reserve margins, gas pipeline tariffs, or any other anticipated technological advances and market evolution.

The Company criticizes my method of utilizing market prices to allocate the avoided energy cost of CG exports because they attribute the use of market prices -- pardon me -- because they attribute the use of market prices to value energy with the physical ability to export to external markets and because there's a significant risk premium attached to the OFPC that makes it an inappropriate price benchmark.

In response, I note that, (A), RMP proposes the

use of EIM pricing as an alternative to the grid method of valuing CG exports. Although I object to the use of historical pricing to estimate future value, in principle, RMP and Vote Solar and most of the other parties in this proceeding endorse the use of market pricing to value CG export avoided energy cost.

The risk premium that RMP focuses on is, on average, about 7 percent of the OFPC. Accounting for this would require a minor adjustment to my avoided energy cost. However, the data provided by RMP to calculate the risk premium appears to be significantly flawed.

It is my recommendation that the Commission approve a calculation of avoided energy costs that is based on forward-looking prices developed and used by PacifiCorp itself rather than a calculation based upon backward-looking price data or a GRID model that depends on manual manipulations, flawed inputs, and problematic assumptions.

Turning to avoided capacity costs. If CG exports are to be justly and reasonably compensated in this proceeding, the Company must also account for CG solar's capacity value. Every party here today has conceded that the capacity value of distributed solar is non zero. CG exports that are produced during times of

system peak decrease the amount of capacity the Company requires to serve its demand.

I have quantified avoided generation capacity, and this value should be factored into the export rate.

While testifying in this docket on September 30th, the Office of Consumer Services' witness Mr. Hayet recommends an avoided capacity cost that he represented was based upon some combination of Vote Solar's value and Vivint Solar's value.

I do not support or particularly understand Mr. Hayet's methodology, which was not set forth in any of his filed testimony. However, I do support the OCS decision to quantify avoided capacity value.

The argument has been made in this proceeding that CG exports should not be credited at all for avoided capacity because it is non-firm because there is no contractual obligation existing on the part of the CG customers to deliver to the grid. But this argument ignores the crucial fact that CG customers are not only captive customers of the Company, but they are also captive producers. Regardless of any legally-binding obligation to deliver energy, every single kilowatt hour of CG export is necessarily sent back to the grid for the Company to resell at full cost.

During peak or near peak periods, every kilowatt

of CG capacity that is online will reduce RMP's need for generating capacity. And there is no disagreement with RMP on this point. There is no other market and no other utility for CG customers to sell their excess energy to. And this arrangement is not short-lived. When CG customers invest in behind-the-meter technology, they make, in most cases, a 20- or 30-year commitment. Thus, the argument that CG's capacity contribution should be wholly discounted because of its non-firm nature simply doesn't square with reality.

It has also been argued that the variable nature of CG solar means that it cannot offer value in the form of capacity contribution. But that argument is not valid. The Company already calculates avoided capacity costs for other variable energy resources like wind and utility scale solar. The same fundamental algorithms can be used to determine the capacity value of CG energy.

Moreover, as I describe in my testimony, the variable nature of CG energy can be accounted for in the mathematics of resource capacity value. Aggregating all CG customers' exports, as I have done, results in a realistic calculation that takes into account the variability of CG as a resource.

The Company has criticized my valuation purportedly because it does not consider the declining

capacity contribution of solar as its penetration increases on the grid, but that is simply not true.

My approach does recognize that the capacity value of the next added resource declines as the utility adds more resources to its system, and this decline in capacity value occurs even over the top load hours that are utilized in my algorithm.

In contrast, the Company's loss of load probability method, which comes from the 2019 IRP, adds CG energy last, even after IRP resources that have yet to be built, thereby unduly reducing the capacity value of CG solar.

RMP's main criticism of my estimate of avoided capacity cost is this, and I quote: "Most importantly, Dr. Milligan disregards the impact of the Company's current resource portfolio and its optimized expansion plan on the risk of loss load events."

However, in PacifiCorp's 2021 IRP, Public Meetings, the Company reverses course and states that, and I quote, "Interactions of the portfolio, including solar with wind and energy storage, are complex." And they continue: Solar capacity contribution was previously evaluated as a function of a single variable: Solar capacity. Instead, a multi-various solution should be pursued so that solar capacity contribution is

calculated, and I quote again, "as a function of the characteristics of all other resources." These statements by the Company support my arguments.

To encourage CG adoption to ensure that CG customers are appropriately compensated for the value they provide and to prevent a scenario where CG energy actually subsidizes non CG resources, the export credit rate must assign value to avoided generation capacity contribution.

Before I move on to address the Company's proposed integration cost, I should note that my analysis of avoided energy cost and avoided capacity cost focused only on the value that CG exports contribute. However, behind-the-meter production and consumption of CG solar also offer substantial benefits in these areas, although they are uncompensated in this proceeding. And these benefits, too, will be lost if the Commission adopts an unreasonable export credit rate.

The final point I want to address pertains to the Company's proposed integration cost. The proposal to deduct cost of integration from CG's value should be rejected for several reasons. First, the Company has not provided evidence in this proceeding showing that CG solar imposes integration cost on the grid. RMP cites PacifiCorp's flexible reserve study as part of its 2019

IRP to support its proposal. But this study does not specifically address what costs, if any, RMP incurs as a result of CG resources.

RMP shows that the variability of CG exports is higher than utility scale PV on a percentage basis. From this, IRP implies that integration costs for CG are therefore comparable, if not higher, than utility scale PV. But this implication is demonstrably false.

Second, there's no generally-accepted method for calculating integration cost. This makes the analysis inherently subjective, and it will remain so unless and until a peer-reviewed method can be developed and the same metric applied to all resources in a nondiscriminatory fashion.

Third, in deducting integration cost from the export rate, the Company fails to account for the fact that wind and solar resources can provide many of the grid services for which they are supposedly assessed integration cost.

Smart inverters have capabilities that can offset the integration cost for which the Company is proposing to charge CG customers. CG exports should be compensated, not penalized, for the essential grid services they provide.

Finally the Company's deduction of integration

cost singles out CG solar and wind and solar energy from other resources. Conventional resources, whether gas, coal, or nuclear, do not incur the same assessment in spite of the fact they may also impose the integration cost, sometimes even in excess of those imposed by renewable resources.

Such discriminatory treatment of CG solar is inconsistent with principles of performance-based compensation, power market design, and is, frankly, unfair.

For these reasons I would urge the Commission to reject the Company's proposal to include integration costs to the export rate. To ensure the export rate is just and reasonable, I recommend that the Commission adopt Vote Solar's proposed calculation for avoided energy, avoided capacity, and reject RMP's proposed integration cost, which is unsupported by the evidence.

Thank you.

**Q. Thank you, Dr. Milligan.**

MS. ROKITO: Vote Solar tenders Dr. Milligan for cross-examination.

CHAIRMAN LEVAR: Thank you, Ms. Rokito.

I'll go to Mr. Holman next.

Mr. Holman, do you have any questions for Dr. Milligan?

MR. HOLMAN: I have no questions. Thank you, Chair Levar.

CHAIRMAN LEVAR: Okay. Thank you.

Mr. Mecham, do you have any questions for this witness?

MR. MECHAM: I do not. Thank you.

CHAIRMAN LEVAR: I will go to Mr. Jetter next.

Do you have any questions for Dr. Milligan?

MR. JETTER: Thank you, Mr. Chairman. I do have just a few brief questions.

CROSS-EXAMINATION

BY MR. JETTER:

**Q. Good morning, Dr. Milligan.**

A. Good morning.

**Q. You would agree with me, wouldn't you, that if a capacity contributing resource is available and there's a variety of them on the market that when an electric utility like PacifiCorp seeks to acquire capacity, they should do it at the lowest cost available?**

**Would you agree with me?**

A. Generally, but you need to balance cost and benefits and look at the resources that are available on the grid.

**Q. Okay. And if there are two comparable resources**

**and one were cheaper than the other, it would be the prudent choice to choose the less-expensive alternative?**

A. All else being equal.

**Q. And you would say the same, all else equal for energy; is that correct?**

A. Generally, yes.

**Q. Okay. And you haven't -- well, I'll ask a more open question here.**

**Do you have any reason to believe that the energy from the utility scale PV panel is different from the energy from a rooftop solar panel?**

A. We've had a lot of discussions preceding about that. And yes, the behind-the-meter generation, such as CG solar, is put in by customers primarily to avoid their energy costs through the utility. I -- you know, they both use the sun to get their power. I don't think that they have too much else in common.

**Q. Okay. They would typically use the same type of PV panel, wouldn't they?**

A. They could.

**Q. And they could use the same inverter technology?**

A. Roughly. I mean, it's scaled quite differently.

**Q. That might be correct. And ultimately, a kilowatt hour of electricity exported by a rooftop solar system is roughly fungible with a kilowatt hour of energy**

**delivered from a utility scale solar; isn't that correct?**

A. No -- well, if you ignore a lot of the other differences in the technologies, yes. I mean, the distributed solar is locally generated. It doesn't need to be transmitted on the transmission system that will go to the neighbors.

Utility scale solar is delivered differently and goes through the transmission system. You may have transmission constraints, and you may not be able to deliver it. I mean, there's a lot of differences.

I mean, if you're talking about the energy as a fungible resource, then yeah, a kilowatt hour is a kilowatt hour. But kilowatt hours are not equivalent in different times and places on the grid.

**Q. Okay. And you think that the -- you could adjust for the location of that energy being imported to the grid, couldn't you?**

A. Perhaps.

**Q. And, in fact, Vote Solar's witnesses in this case have done that, haven't they?**

A. I don't understand your question.

**Q. The transmission line loss calculation that is submitted by Vote Solar in this docket accounts for that difference in location; does it not?**

A. Yes, to the extent that it calculates the

avoided transmission distribution costs, yes.

**Q. Okay. And you -- do you have any reason to believe that the output from a rooftop solar in terms of timing throughout the day is different from that of a utility scale solar facility?**

A. Not without studying it. I mean, they're going to be -- they both generate when the sun shines.

**Q. And the sun generally shines in Utah at about the same time throughout the state; is that accurate?**

A. I don't know. Perhaps. I mean generally, but you've got local cloud cover and things that would, you know, not -- you know, the solar isn't necessarily doing the same thing across the whole state at the same time.

**Q. Okay. And you would say that rooftop solar is fairly distributed throughout the state; is that accurate?**

A. Yes.

**Q. And you could have, for example, ten utility scale solar facilities distributed throughout the state that would offer a similar output profile; could you not?**

A. I don't know. I haven't studied that.

**Q. Okay. But you don't have a reason to believe that you couldn't do that, do you?**

A. Well, sure. You could build distributed utility scale solar, if that's a term.

But if you're asking me if the output profile is similar, I don't know. You've got -- in a utility scale solar facility, you've got concentrated panels, concentrated in the sense of geographically concentrated; whereas, with rooftop solar, it's spread over a larger area. And so you could imagine -- and I haven't studied this in detail -- but you could imagine cloud cover going across one of those utility scale PV plants, causing a larger fluctuation in output than the equivalent cloud would cause if it's moving over rooftops. But I haven't studied that.

So I don't think putting multiple utility scale PV plants around the state is going to be equivalent to rooftop solar.

**Q. And so would you agree with me that when the Company contracts for output from a utility scale solar facility, as part of that contract, they could include a performance guarantee that would either provide energy during those hours or require that facility to compensate the utility for its purchase to make up that lost energy?**

A. You know, I don't know what can be put in a contract. I guess you could do that.

**Q. Okay. And if you added, for example, a battery system of sufficient size, that could alleviate the issue with cloud cover, for example, for a period of time; is**

**that accurate?**

A. Potentially, yes.

**Q. Okay. I'd like to ask you, I guess, another question regarding a little bit different line of questioning here regarding smart inverters.**

**Do you know what percentage of customers are currently installing smart inverters?**

A. I don't.

**Q. Do you know if any of them are in Utah?**

A. Some are. I don't know specifically. These are -- primarily the newer inverters do have smart capability.

**Q. Okay. And so if that were the case that some subset of DG customers have smart inverters, and those inverters could provide value to the grid, would you suggest that that value be spread across all DG customers, or would you suggest that a new subset of DG customers be created to incentivize the use of those smart inverters?**

A. I'm generally in favor of performance-based rates or tariffs, so it would be reasonable to me to separate them. You know, there's always an administrative cost to do that. But it's more of a, kind of pay-for-performance type of approach.

**Q. Okay. Thank you. Those are the only questions**

**that I have. Thank you for your time, Dr. Milligan.**

A. Thank you.

CHAIRMAN LEVAR: Thank you, Mr. Jetter.

Mr. Snarr, do you have any questions for Dr. Milligan?

MR. SNARR: The OCS has no questions for Dr. Milligan.

CHAIRMAN LEVAR: Okay. Thank you, Mr. Snarr.

Ms. Wegener or Mr. McDermott, do either one of you have questions for Dr. Milligan?

MS. WEGENER: I just have very few questions.

CHAIRMAN LEVAR: Okay. Go ahead.

CROSS-EXAMINATION

BY MS. WEGENER:

**Q. Good morning, Dr. Milligan.**

A. Good morning.

**Q. You cite the Company employee Rick Link's (phonetic) testimony in an Idaho docket a couple of times, where he says, "The Company's OFPC is the best representation of future market prices and is appropriately used for the central forecast in the Company's economic analysis"; is that right?**

A. Yes.

**Q. Are you aware that the Company doesn't use the**

**OFPC on its own but rather applies it to a production cost model?**

A. Yes, more or less.

**Q. And it's actually the production cost model that is used for any assessment of resource economics?**

A. Right. But the model that's used to develop the OFPC is a broader market that's looking at how the RMP or the PacifiCorp system interacts with the rest of the West.

**Q. Okay. So the OFPC uses market prices, not PacifiCorp's cost of generation. It's just market prices that are paid on the market for energy; is that your understanding?**

A. Right. It's not identical but similar to the EIM prices. There is a difference, but those are both fundamentally market prices for electricity.

**Q. Would you agree that customer generation is more variable than market transaction prices?**

A. I have not studied that.

**Q. Okay. Would you also agree that the market transaction points are located pretty far away from Utah's concentrated service territory, where most of the customer generation would be?**

A. Yeah, I roughly know where they are.

**Q. Is there a relationship between the capacity**

**contribution of customer generation and the amount of solar on the system? And actually, I think you mentioned this in your summary, that you think there is; is that right?**

A. I'm sorry, could you repeat that?

**Q. A relationship between the capacity contribution of customer generation and the amount of solar -- the amount of total solar on the system?**

A. I said that, but I tend to agree more with PacifiCorp's statement in their 2021 IRP, that this is not a single variable. It's -- I mean, yes, to an extent, the more solar you have in the system the more the capacity contribution declines. But that's not a function purely of solar, it's a function of all the other resources. And PacifiCorp is doing a lot of work, and they're still in process doing this, which I think would actually improve what their view is of solar capacity value.

**Q. So, yes. But the amount of solar is one variable. The amount of solar on the system is one variable that affects the capacity contribution of solar?**

A. Yes. It's one variable, yes.

**Q. And is it -- is it true that your capacity contribution calculation, the one that we were talking about -- or that you were talking about in your summary,**

**you didn't account for utility scale solar, you only accounted for customer generated solar?**

A. Yes.

**Q. Okay. Thank you.**

MS. WEGENER: That's all the questions I have.

CHAIRMAN LEVAR: Thank you, Ms. Wegener.

Ms. Rokito, do you have any redirect questions for Dr. Milligan?

MS. ROKITO: Sorry. I was having trouble finding my mute button, but I do not. Thank you very much.

CHAIRMAN LEVAR: Thank you.

CROSS-EXAMINATION

BY CHAIRMAN LEVAR:

**Q. Dr. Milligan, thank you for being with us this morning. I have one or two questions, and then I'm going to go to the other two Commissioners.**

A. Okay. Thank you.

**Q. Mainly one question, but it may take a little explanation.**

**Do we need to have consistency between how we calculate avoided energy cost and how we calculate capacity contribution values? And let me explain what I mean by that.**

**If we calculate avoided energy using forward price curves, projected future prices, then shouldn't we also calculate capacity contribution values, considering future planned resources that will be added to the mix in the IRP?**

**On the other hand, if we calculate avoided energy cost using 1-year historical prices from the EIM with annual updates, would it, under that scenario, be appropriate to only consider existing resources as we calculate capacity contribution values?**

**And I'm sorry if that's a convoluted question. But any thoughts you have, I would appreciate them. Thank you.**

A. So I think I understand your question. So you're asking whether we should be consistent in the way we utilize either historical data or forward future data in calculating capacity or energy value?

I think yes. You know, the difficulty with doing, you know, using future data is, of course, there's always a probably good chance that you're wrong. But, you know, there is a 100 percent chance that you're wrong if you use historical data because last year is never going to repeat itself. You know, I'm not talking about pandemic times. But, you know, generally, the years don't repeat themselves. The weather is different.

Consumer behavior is different. And, of course, the generating mix is different.

But using something like effective load carrying capability or equivalent from capacity that PacifiCorp has used in their loss-of-load probability modeling, that method is good for establishing whether or not you have resource adequacy in the future. But it is not good, and I argue this in my surrebuttal testimony, it poses several difficulties in the way that you allocate the contribution of capacity to resources such as wind and solar, whether it's CG solar or utility scale solar.

So generally, yes, I think I agree with your, sort of your direction of saying if we're going to use future energy prices, we should use future grid portfolio capacity prices.

But we also have to be really careful of how we allocate the capacity contribution, particularly to wind and solar. And that's partly why my method uses an approach of choosing the top 10 percent load hours. So you take the year, basically rank the demand from high to low, pick out the top 10 percent 876 hours. Because in the future, I don't know exactly when my risks are going to occur.

And the modeling that RMP/PacifiCorp has done, it's actually very good modeling in their loss-of-load

probability modeling. But they assume that the risks in the future are going to be exactly like the risks in the past. And my method says, Look, I don't know exactly when that risk is going to occur. It's likely to be in the top 10 percent of load hours. And so I don't want to -- I don't want to artificially constrain the problem because, you know, the future is uncertain.

I'm sorry, I may not be making sense here. But I think I'm generally supporting the idea that sure, future energy and future capacity, or, you know, last year's capacity and last year's energy, although I prefer looking forward than looking backwards.

I'm not sure. Did I answer your question, Mr. Chairman?

**Q. Yes, you gave a thorough answer. I think you covered the issue.**

**You did raise one issue that I'd like to ask a follow-up. It's on a separate topic but still somewhat related.**

**Your statement that forward price curves carry a risk of being inaccurate, but historical prices are guaranteed to be inaccurate. Let me just follow up on that statement a little bit.**

**If we were looking to estimate next year's prices, just one year in isolation, what's more likely to**

**be closer to next year's prices, last year's EIM prices or the forward price curve?**

A. You know, I'm not sure if I could answer that. I think the forward price curve is not -- is not calculated with the EIM in mind. And so I guess in principle what I would do is create a more accurate modeling of the future that would sort of take a future EIM, basically, and say, okay, the next year the EIM is going to have these new participants and model the system to figure out what the prices are based on that EIM. That would be my first choice.

Using historical prices one year -- you know, one year ago for next year is -- I mean, typically the prices are a year old by the time the actual year starts. It's not as good, but, you know, I know that that happens sometimes. And if there's no other alternative, then you use historical prices.

But I do think it's better to look forward and do -- do the modeling and figure it out that way.

CHAIRMAN LEVAR: Thank you. I appreciate your answers to those questions.

I'll go to Commissioner Allen now.

Do you have any questions for Dr. Milligan?

COMMISSIONER ALLEN: Thank you. I have no questions.

CHAIRMAN LEVAR: Thank you, Commissioner.

Commissioner Clark, how about you?

COMMISSIONER CLARK: No further questions. Thank you.

CHAIRMAN LEVAR: Okay. Thank you for your testimony, this morning, Dr. Milligan.

THE WITNESS: Thank you.

CHAIRMAN LEVAR: And we'll go back to Vote Solar for your next witness.

MS. ROKITO: Thank you, Chair Levar.

Vote Solar calls Mr. Curt Volkmann as its next witness this morning.

THE WITNESS: Good morning.

CHAIRMAN LEVAR: Good morning, Mr. Volkmann.

Do you swear to tell the truth?

THE WITNESS: I do.

CHAIRMAN LEVAR: Okay. Thank you.

Go ahead, Ms. Rokito.

CURT VOLKMANN,

was called as a witness, and having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. ROKITO:

**Q. Please state your full name and business address for the record.**

A. My name is Curt Volkmann. My address is 132 Lake Vista Circle in Fontana, Wisconsin 53125.

**Q. Mr. Volkmann, have you reviewed and analyzed the testimony submitted by the other parties to this case?**

A. I have.

**Q. And have you prepared direct, rebuttal, and surrebuttal testimony in this case?**

A. Yes, I have.

**Q. Do you have any changes to offer to any of that testimony?**

A. I do have two minor clerical errors that I'd like to correct in my rebuttal testimony, specifically at Lines 246 and 458, where values should be 1.86 cents per kilowatt hour instead of 2.02 cents.

Those are my only corrections.

**Q. Thank you. If you were asked the same questions included in your written testimony here today, would you give the same answers?**

A. Yes, I would.

**Q. With the exception of the changes that you indicated?**

A. Yes. Thank you.

MS. ROKITO: Mr. Chairman, Vote Solar moves for the acceptance of the testimony of Mr. Curt Volkmann into the record in this proceeding.

CHAIRMAN LEVAR: Thank you.

If anyone objects to Ms. Rokito's motion, please unmute yourself and indicate your objection.

I'm not seeing or hearing any objection, so the motion is granted. Thank you.

You can go ahead.

**Q. (BY MS. ROKITO:) Mr. Volkmann, have you prepared a summary of your testimony that you would like to present to the Commission?**

A. Yes, I have.

**Q. Please go ahead and present your summary.**

A. Thank you.

Good morning, Chair Levar, Commissioner Allen, and Commissioner Clark. My name is Curt Volkmann, and I am the president and founder of New Energy Advisors, an independent consulting firm.

I have 35 years of experience in the utilities industry, primarily in electric distribution and transmission. I spent nine years at Pacific Gas & Electric in various transmission and distribution engineering roles, and 18 years at Accenture, where,

among other roles, I served as executive director in the North American utilities practice.

Thank you for allowing me to appear today on behalf of Vote Solar, and I appreciate the opportunity to briefly summarize my testimony.

A just and reasonable export credit rate must compensate CG customers for the value that exports provide in the form of avoided transmission and distribution, or T&D capacity costs.

The Company and the Division recommend excluding this value entirely from the export credit because T&D capital investment deferral is difficult to quantify. But the Company already credits energy efficiency programs for avoiding T&D capacity investments so it can do the calculation. Additionally, every single jurisdiction that has established a value of solar methodology includes credits for avoided T&D capacity.

There is robust and growing evidence that CG, despite its variability, materially reduces peak loads and the corresponding need for T&D capacity related capital investments.

RMP should not zero out such value. RMP should acknowledge this value, as it does with its energy efficiency programs, and include it in the export credit rate to ensure that CG customers are justly and

reasonably compensated.

The same is true of avoided line losses. As the Company has now conceded, the avoided line loss calculations must account for the full value of avoided losses, which means including avoided line transformer losses.

Although I don't agree with other aspects of Mr. MacNeil's corrected methodology, I recommend that the Commission adopt the Company's revised value of 9 percent for avoided energy losses due to CG exports. Although the Company has not included in its proposed export credit rate any costs for changes to its distribution system to accommodate CG, Company and Division witnesses discuss wear and tear of voltage-regulating equipment from CG variability.

I agree with Mr. Barker, as he repeated on Tuesday, that CG variability is only one of many factors that impact the operation of this equipment and that quantifying the impact solely from CG is extremely difficult, if not impossible. And it's appropriate to exclude any related cost in the export credit.

I would also like to address the Company's proposed metering fee. There is no question that charging Schedule 137 customers a $160 fee will result in the unfair treatment of CG customers. The Company

wouldn't ask non CG customers to incur the same cost for precisely the same meter upgrades or reprogramming, making the fee inherently discriminatory and unfair. I will explain each of these points in turn.

When CG customers serve their own load and export excess energy to the grid, it not only reduces system load but also alleviates the need for future capacity-related capital investments. The benefits that CG solar provides in the form of avoided or deferred T&D capacity are particularly important at times of local circuit peak demand.

As Mr. Meredith explained on Tuesday, CG output reduces demand during peak and near-peak periods and the amount of power that would otherwise be flowing on the transmission and primary distribution system decreases. This can delay or avoid the costs of upgrading T&D infrastructure.

Let's take a recent example. Southern California Edison, or SCE, proposed a T&D capacity upgrade project that was originally estimated to cost $154 million. After factoring in CG adoption and its load-reducing effects, SCE eliminated the need for a new substation, and that project now costs $90 million, representing a savings of $64 million.

RMP's failure to consider the tangible impacts

of CG adoption on the deferral or avoidance of capital expenditures unfairly undervalues CG solar. The Company argues it should not consider this value because it's too difficult to quantify. But as I explain in my testimony, utilities in other jurisdictions use methodologies to reliably calculate a solar resource's contribution to peak load reduction.

The Company already assigns value to avoided T&D capacity from load-reducing energy efficiency programs in its IRP. Mr. Barker on Tuesday stated that areas with no load growth have no T&D deferral value. But RMP's methodology for quantifying T&D deferral value from energy efficiency through the use of a utilization weighting explicitly accounts for the fact that some areas may have no load growth in excess capacity.

In Mr. Barker's rebuttal testimony, he offers the 90th South Substation project as an example of how CG cannot defer T&D investment. His back-of-the-napkin analysis, as he described it on Tuesday, is a simplistic example of what's commonly referred to as a "non-wires alternative" for a known specified project.

It's not surprising that solar alone could not defer the 90th South Substation upgrade because non-wires alternatives typically require some combination of solar and other distributed resources, such as storage or

demand response. But this is not what I'm recommending.

Chair Levar, I appreciated your questioning of Mr. Hayet Wednesday afternoon about the aggravated load-reducing impacts of CG. This is exactly the avoided T&D capacity value that I'm referring to, the deferral of future, unspecified capacity upgrades across RMP's system that are no longer needed due to shifts or decreases in load from CG. Every other jurisdiction I'm aware of that has established a methodology for quantifying the value of solar -- and these include California, New York, Oregon, Minnesota, and the city of Austin -- include a credit for avoided T&D capacity. In fact, RMP's sister company, Pacific Power, includes a component for T&D capacity deferral in its value of solar calculation.

There is no reason for the Company to not credit CG solar for the value it provides in the form of avoided T&D capacity costs. Dr. Yang has determined that this value, due to CG exports in RMP's service territory, amounts to at least 1.86 cents per kilowatt hour.

Although previously the Company argued that it should credit CG exports for only avoiding transmission and primary distribution losses, it has since revised its avoided line loss calculation to also account for the impact of avoided line transformer losses. This makes good sense. Again, I recommend that the Commission adopt

the Company's revised value of 9 percent for avoided energy losses due to CG exports.

Adequately compensating CG customers also necessitates some consideration of what costs should not be included in the export credit rate. And certainly, the Commission should not take into account those costs that the Company cannot prove.

The Company has appropriately excluded from the export credit rate any costs related to modifying the distribution system to accommodate CG or replacing equipment due to wear and tear from CG variability.

In my experience, distribution systems are capable of accommodating solar at much higher levels than RMP's existing CG penetration. At 1.7 percent penetration, CG does not impose a need for significant investment due to exports.

It's been a common rule of thumb in many states' interconnection rules that detailed studies of potential negative impacts from solar aren't required until penetrations exceed 15 percent of circuit peak load. There is no evidence in this proceeding to show that the Company is incurring significant distribution integration costs.

Furthermore, future technology advancements, such as smart inverters, will help the Company mitigate

any impacts from increasing CG penetrations in a cost-effective way. The Company does not fully recognize this.

Mr. MacNeil, in his testimony in cross-examination on Tuesday, fails to acknowledge that smart inverters can provide voltage regulation services by injecting or absorbing reactive power.

Mr. Barker's claim that determining the right smart inverter settings requires a "thorough investigation of each feeder" and "considerable analysis and upfront costs" is an exaggeration.

Many states, including Hawaii, California, Minnesota, and Illinois, have adopted default voltage regulation smart inverter settings without analyzing every feeder.

The final point I will make is by proposing to charge Schedule 137 customers a $160 metering fee, the Company is proposing to treat CG customers differently than non CG customers who do not have to pay any fee for meter upgrades, new meters, or meter reprogramming.

As Mr. Meredith acknowledged on Tuesday, AMI meters are capable of measuring bidirectional power flow after reprogramming the meter remotely. No field visit is required.

The Company is proposing to charge all

customers, including Schedule 137 customers, to cover the costs of deploying AMI meters through base rates. But the Company is also proposing to charge all new Schedule 137 customers an additional $160 metering fee, even if they already have an AMI meter. I can think of no reasonable justification for these discriminatory proposals.

To conclude my opening remarks, I believe a just and reasonable export credit rate must take into account the value CG provides in the form of deferred or avoided T&D capacity costs. As the Company has now conceded, it should take into account the full value of avoided line losses, including the value of avoided line transformer losses. The Company has appropriately excluded any wear and tear costs from the export credit rate, and there is no evidence to suggest it is incurring these costs at the current CG penetration level.

Finally, because the proposed metering fee arbitrarily singles out CG customers without justification, the Commission should reduce it from $160 to zero.

Thank you. This concludes my opening statement.

**Q. Thank you, Mr. Volkmann.**

MS. ROKITO: Vote Solar tenders Mr. Volkmann for cross-examination.

CHAIRMAN LEVAR: Thank you, Ms. Rokito.
I'll go to Mr. Holman next.
Do you have any questions for Mr. Volkmann?
MR. HOLMAN: I don't. Thank you, Chair Levar.
CHAIRMAN LEVAR: Okay. Thank you.
Mr. Mecham, do you have any questions?
MR. MECHAM: I don't either. Thank you, Mr. Chair.
CHAIRMAN LEVAR: Okay. Thank you.
I'll go to Mr. Snarr next.
Do you have any questions for Mr. Volkmann?
MR. SNARR: Just one, I think, or a couple here.

CROSS-EXAMINATION

BY MR. SNARR:

**Q. Good morning, Mr. Volkmann. How are you?**

A. Good. I'm fine, thank you.

**Q. You've testified related to the avoided transmission distribution capacity costs. And to begin with in your testimony, you indicate, and I think OCS agrees, that there's a value, a non zero capacity value that can be associated with T&D costs; is that correct?**

A. That's correct, yes.

**Q. I'd like to just give you a hypothet and get your reaction because of the difficulty in figuring out**

**exactly how to value T&D costs.**

**Let's suppose you lived on a cul-de-sac where one of your neighbors had installed solar panels, and where your power utility relied upon your neighbor's solar generation to supply transmission distribution capacity to deliver power throughout the cul-de-sac.**

**If your neighbor's solar panels got damaged by high-powered winds, would you be satisfied with the power company telling you that they wouldn't be able to deliver firm energy service to you because the as-available transmission distribution facilities were inadequate to meet the needs of your cul-de-sac?**

A. As I tried to clarify in my opening statement, there are at least two ways that CG distributed solar and other distributed resources can provide value to the distribution grid. One in the form of what's referred to as a "non-wires alternative," and this is the substitution, if you will, of a distributed resource for a conventional utility infrastructure investment, like a new transformer, a new circuit, reconductoring a circuit, et cetera.

Those non-wires alternatives are evaluated on a project-by-project basis to determine if the DER -- again, distributed energy resources, or combinations of portfolios of DER can adequately and reliable satisfy the

grid need, whether, in your case, it's serving the neighbors in the cul-de-sac or whatever. That's one type of analysis. But that's not what we're referring to.

We're talking about aggregated impact of CG across the various planning areas, across the various substations that, over time, can defer unspecified capacity projects, T&D capacity projects.

And this methodology that I recommend in my testimony is the same methodology that the Company uses for crediting energy efficiency programs for that same unspecified, load-reducing effect over time.

**Q. So if we're not looking at kind of the one-for-one capacity replacement in a particular cul-de-sac, you're suggesting that there is at least some value that can be attributed when you look in the aggregate of all the CG that is coming on.**

**Is that basically what you said?**

A. That's correct, yes.

**Q. All right. And the challenge is to figure out how to quantify that second level of CG penetration as it might affect the transmission and distribution systems; is that right?**

A. It often is. I was delighted through discovery last year to learn that the Company has developed a methodology for crediting energy efficiency programs for

this same effect. I reviewed their methodology. I reviewed the planned capital projects over, I believe it was a 5-year period that they included in the calculation. I determined that those were reasonable projects. I determined that the costs of those projects were reasonable.

And therefore, my recommendation, and I believe my affirmative testimony was that we use that same methodology, those same projects that the Company applies for energy efficiency, for the impact of CG. That's not always the case at every utility. That's why I say I was delighted when I saw that the Company had already established a methodology.

**Q. Thank you for your answers. I have no other questions.**

A. Thank you.

CHAIRMAN LEVAR: Thank you, Mr. Snarr.

I'll go to Mr. Jetter next.

Do you have any questions for Mr. Volkmann?

MR. JETTER: Just a very few brief questions.

CROSS-EXAMINATION

BY MR. JETTER:

**Q. Good morning, Mr. Volkmann.**

A. Good morning.

**Q. The adjustments that you've made, or the values you've calculated for transmission line loss as well as the capacity adjustments, those represent the adjustments you'd make to -- you're making those adjustments to essentially try to reach an equivalent value between a different type of generation not distributed and the distributed generation; is that accurate?**

A. No. The approach I took from the analysis was at the request of Vote Solar to quantify specific value elements of customer generation. And I focused on distribution capacity and avoided line losses and distribution generation costs. I did in no way attempt to compare that with another form of solar resource.

**Q. And those are values compared to what might otherwise happen with the utility's service to customers; is that accurate, then?**

A. Again, I did not make any comparison of CG to another type of resource. I focused on the value elements that I just described of customer generation.

**Q. And those must be of value compared to something, are they not?**

A. Again, no. I did not compare the value elements that I calculated for customer generation with any other resource.

**Q. Okay. And so how would you go about calculating**

**transmission capacity if you don't consider the cost of the transmission system as it otherwise would be?**

A. Again, my focus was on the distribution capacity component. Dr. Yang developed a methodology. I think he used what he calls the "current tariff approach" for determining the avoided transmission capacity. And you'll have to ask him about that after me.

**Q. Okay. Well, let's talk about the distribution capacity, then.**

**You're comparing -- you're creating a value with the basis of Rocky Mountain Power's current and/or future distribution costs; is that correct?**

A. The value is based largely on their planned distribution capacity additions over the next 5 years. And again, I'm pretty sure it was a 5-year look.

**Q. Okay.**

A. Cost of those projects, the incremental megawatts of distribution capacity added, and that's kind of the foundational elements that go into the calculation, again, for both what I did and for the Company's energy efficiency programs.

**Q. Okay. And the baseline for those studies would assume the utility provides electric service without the DG resources that we're talking about here; is that correct?**

A. Can you repeat your question?

**Q. The baseline value for those studies that you're calculating a savings as compared to would rest on an assumption for the baseline that the Company would serve customers with its traditional generation resources or whatever else the Company had planned to use to serve those customers?**

A. The projects that were used in the calculation of distribution deferral value for both energy efficiency and CG are based on distribution load forecasts. And, I mean, this basically is the planners, the engineers, saying, Here's what we forecast load to be over the next 3 to 5 years. Here's where we determine that there may be deficiencies or insufficient capacity; therefore, we need to plan a capacity upgrade. And again, that can be a new substation. It can be a new feeder. That's the project list, or that's how the project list is determined.

**Q. Okay.**

A. I'm not intimately familiar with the Company's load forecasting, distribution load forecasting methodology. Through discovery, we did ask some questions about it, and my understanding is that they do, in fact, incorporate solar, utility scale and some level of CG, in the load forecast. So I don't think I agree

with your question.

**Q. Okay. So the Company's forecast for those various transmission -- excuse me, distribution upgrades that might occur in the future, those planned distribution upgrades are based on the assumption of service from the utility with its traditional generation fleet; is that accurate?**

A. I followed you until the very end with the "traditional generation fleet."

**Q. With generation resources that would not include distributed generation.**

A. I think I just answered that.

That list of projects is based on the load forecast in each of the planning areas. And based on my limited understanding of how the Company does distribution load forecasting, I do believe they factor in current and forecasted CG, I believe.

**Q. Okay. And I guess let me -- maybe let me try to ask this a different way.**

**The reduction in the cost of those or the necessity of the distribution system upgrades is the result of using CG, whether for load reduction or for exports, as compared to using an off-site generation?**

A. I'm not sure I follow your question. Can you repeat it, please?

**Q. Sure. The value that you've calculated for the benefits to the distribution cost is based on the difference in load and/or exports generated by the CG customers as compared to serving customers in the distribution system with off-site generation?**

A. Again, the underlying data that went into the calculations which, as I explained earlier, is this list of projects, list of distribution capacity projects, is based on the load forecast.

That load forecast, I understand, includes a mix of both CG and utility scale solar. Again, I'm not intimately familiar with the Company's load forecasting process, so I don't think there's any type of a comparison that you're describing. So I think I disagree with that premise.

**Q. Okay. Let me back up to a higher level, then.**

**What is the value of CG in reducing distribution costs?**

A. We -- the combined effect of T&D was 1.86 cents per kilowatt hour, and I believe the distribution element of that -- I can check my testimony, but it was in the 0.56 cents, and the transmission was in the 1.3 cents, as I recall. If you want me to look it up, I can.

**Q. No. No. That's fine.**

**And how does DG provide that incremental**

**savings?**

A. Again, it's the aggregate impact of geographically-disbursed CG that, over time, has a load-reducing and a peak load-reducing effect that ultimately can result in avoided or eliminate distribution capacity costs.

In my rebuttal testimony, I give a recent example in Southern California Edison, where every year they do their load forecast, much like RMP does. And in years prior, they had identified a need for what they call their "Circle City Substation." And, as I said in my opening statement, it was originally close to $150 million, as I recall.

When they redid their load forecast, they changed their methodology for accounting for the impact of distributed solar. And the load forecast in that area was significantly lower than it had been the year before, which made them rethink the entire project. And they directly attribute that load-reducing impact to distributed generation.

And, again, when they redid their forecast, they reassessed the project plan and eliminated the need for the substation, resulting in significant capital savings.

So that's the impact that we're talking about here. And there are probably lots of ways to quantify

it. But again, when I saw that the Company had developed a methodology for quantifying a very similar impact from energy efficiency in its IRP, I evaluated it, looked at the projects, and determined that that was a good way to also value the impact from CG.

**Q. Okay. So let me follow up on that.**

**The load-reducing impact is a load-reduced reduction and resulting in, I guess, generation, transmission service reduction from what otherwise would have been required had there not been CG; is that accurate?**

A. Yes, I believe I agree with that.

**Q. Okay. And that's the same principle underlying your calculation of at least the distribution savings; is that correct?**

A. Yes.

**Q. Okay. Those are all of my questions. Thank you for your time, Mr. Volkmann.**

A. Thank you.

CHAIRMAN LEVAR: Thank you, Mr. Jetter.

I'll go to Ms. Wegener next.

Do you have any questions for Mr. Volkmann?

MS. WEGENER: Yes, I do. Thank you. I've got two mute buttons here, so I don't know when I'm off mute sometimes.

CROSS-EXAMINATION

BY MS. WEGENER:

**Q. Good morning, Mr. Volkmann.**

A. Good morning.

**Q. I want to start out with your reference to Mr. Barker's 90th South Substation example.**

A. Okay.

**Q. And you said in your summary that he didn't properly account for the fact that in order to defer T&D investments, more than just customer generation would be required; is that right, like batteries and DSM?**

A. I characterized that example that he provided as an example, a simplistic example of an analysis considering non-wires alternatives. And that, again, is where you explicitly consider how distributed energy resources could substitute for conventional utility infrastructure investments, in this case, that substation.

**Q. Okay. So (inaudible) --**

A. I'm sorry?

**Q. I was just going to say, so it sounds like in that 90th South example when you're talking about taking into account customer generation, that customer generation alone wasn't sufficient to defer that upgrade. Would you agree with that?**

A. The way he looked at it, it -- he determined it was insufficient. And the point I was trying to make was that it didn't surprise me. Because when you're looking at a specific project, a specified planned project in evaluating it as a non-wires alternative, almost always solar alone is insufficient to reduce the peak sufficiently.

What I'm referring to, and I tried to be clear in my opening statement, is the broader aggregate effect of distributed generation -- customer generation across the various planning areas over time that has a load-reducing effect that can, at some points, result in the deferral or avoidance of a capital project, not just the individual project analysis that he described in his testimony.

**Q. Okay. Thank you. The gist of your testimony is that customer generation can defer the transmission- and distribution-related investments, and in the future, the Company may be able to defer those.**

**But it requires a sufficient amount of CG penetration for that deferral to occur, doesn't it?**

A. Potentially. It also depends on how the Company factors the impact of CG in its load forecasts. I previously explained that's really kind of a key foundational capability in doing what we're talking about

here, is being much more sophisticated in load and DER forecasting.

If the Company improves -- again, I'm not intimately familiar with how it does it today, forecasting today -- but if, as its capabilities become more sophisticated, it can factor in these impacts much more explicitly that could result in capital savings, as I've described.

**Q. Okay. So it might be able to figure out if there's a possibility that capital savings could possibly occur if the forecasts were improved?**

A. Potentially, yes.

**Q. Okay. But right now, I mean, you could probably say that a single panel, a single rooftop panel wouldn't defer any capital investments, right?**

A. On the distribution system?

**Q. Umm-hmm.**

A. A single CG panel deferring a distribution?

I could think of a scenario where it might.

**Q. Is it a pretty far-fetched scenario?**

A. No, not necessarily. I describe in detail in my testimony the impact of smart inverters to regulate voltage. And I can envision a scenario where the Company, because of CG adoption in a certain area, is sensing there might be some high voltage problems. And

by requiring customers to activate certain settings on their inverter, those types of problems can be addressed without the need for the utility to put in a voltage regulator or a capacity --

**Q. Okay. So --**

A. -- piece of equipment. So I --

**Q. -- if the customer generator has a smart inverter, if there are a sufficient number of people in an area with customer generation with a small inverter, then that's when you might be able to defer that distribution-related investment?**

A. That's the scenario I'm describing, yes.

**Q. Okay. But it sounds like that might be more than one rooftop solar panel because you need a few in the area for that scenario; is that right?**

A. Potentially, yes.

**Q. Okay. Have you been able to calculate the point at which customer generation installations would be able to provide a T&D deferral?**

A. No.

**Q. If you can't calculate -- sorry.**

**You agree with the Company that we should not include the impact to our system for increased variability due to the exports, right?**

A. The distribution integration costs, is that what

you're referring to?

**Q. So the extra taps on the system that result from the exports, so like the extra use of the equipment because there's exported electricity. Just the wear and tear. We didn't include it -- we didn't include it, and you agree that we shouldn't include that as a deduction to the amount of export credit, right?**

A. I agree, because there's no evidence in the record that there are costs associated with that at your current penetration levels.

**Q. Okay. And I think you said it's because there's no costs incurred now.**

**But it sounds like you also just said to me that there's no costs incurred for T&D deferral now, either; is that right?**

A. I don't believe I said that, no.

**Q. You talked about an example in California of an avoided investment as a result of customer generation, right?**

A. Yes.

**Q. Would you say there was more customer generation -- more penetration of customer generation in California than in Utah?**

A. Yes.

**Q. You say that the solar profile in California**

**could be different and could align differently with production than in Utah?**

A. It's possible in the case of Southern California Edison. They actually have eight regional profiles to take into account different -- they've got a pretty large service territory, and there's different levels of insulation, and temperature, cloud cover, et cetera. So they've broken their service territory into eight regions for quantifying the impact of solar. One of those might be similar to RMP's service territory. I can't say.

**Q. Okay. And you're not sure which one would have been at issue in the example that you cited earlier, the Circle City Substation, right?**

A. Which region?

**Q. Yeah, and whether it was similar to Utah.**

A. Oh, I don't know that.

**Q. Okay. In your testimony, you state that the grid can accommodate a 1.7 percent penetration level of CG, right?**

A. I said in my experience, I do a lot of work in distribution, and that's a comfortable level of penetration in many of the utilities that I've looked at for accommodating CG without the need for significant investment.

**Q. Okay. Does that assume a uniform penetration**

**where the customer generation is distributed uniformly across the service territory?**

A. Not necessarily.

**Q. Have you looked at whether particular areas with high penetration could -- could cause voltage variability?**

A. In RMP's service territory?

**Q. Anywhere.**

A. I am familiar with utilities that have concentrated high penetrations of customer generation that do have to make investments --

**Q. Okay.**

A. -- to address that.

**Q. You talk a lot about smart inverters and how they could help regulate voltage and decrease capital investments, right?**

A. Yes.

**Q. But there's no evidence that there's a sufficient number of smart inverters in the Utah market right now to defer any capital investment, right?**

A. It would surprise me if there are any. I explained in my testimony that the technical standard that defines the new inverter capabilities was recently finalized. The testing standard that supports that was recently approved, and inverter manufacturers outside of

California and Hawaii and other parts of the world that are already using these are now in the process of certifying their equipment to the new testing standard.

Given that, based on what I'm told, smart -- a broad range of smart inverters may be available in Utah this quarter, sometime early next year. So it would surprise me if you have any smart inverters in your service territory at this point, which was my --

**Q. Okay. Um --**

A. -- (inaudible) that the Company update its interconnection standards, you know, do the legwork and the thinking now as to what those required settings are going to be. Get those in place in your Policy 138, your interconnection standard, such that when those inverters become available, you can immediately start taking advantage of them.

**Q. Okay. Thank you.**

MS. WEGENER: That's all the questions I have.

THE WITNESS: Thank you.

CHAIRMAN LEVAR: Thank you, Ms. Wegener.

Why don't we take a 15-minute break, and then we'll come back and see if Ms. Rokito has any redirect for Mr. Volkmann.

(A break was taken from 10:19 a.m. to 10:35 a.m.)

CHAIRMAN LEVAR: We're ready to start again.

Ms. Rokito, do you have any redirect for Mr. Volkmann?

MS. ROKITO: I do. Thank you.

REDIRECT EXAMINATION

BY MS. ROKITO:

**Q. Mr. Volkmann, in your analysis of the value of CG generated power, did you look only at the component of CG power that is exported to the grid?**

A. Yes, I did.

**Q. Would there be additional benefits if you looked also at the component of CG power that is consumed behind the meter?**

A. Yes.

**Q. Thank you.**

MS. ROKITO: I have nothing further.

CHAIRMAN LEVAR: Thank you, Ms. Rokito.

Let me just ask: If any party has an interest in recross based on those questions, please indicate to me. Take a moment and unmute yourself.

Okay. I'm not seeing anyone with any recross questions, so I will go to Commissioner Clark.

Commissioner Clark, do you have any questions for Mr. Volkmann?

COMMISSIONER CLARK: Yes.

CROSS-EXAMINATION

BY COMMISSIONER CLARK:

**Q. I have a question related to the benefits that you just referred to associated with consumption behind the meter.**

**In your mind, are those fairly compensated by the retail rate, in effect, credit, or by the full offset of the cost of consumption -- I mean, of the savings that occur at the full retail rate in relation to that generation that's consumed?**

A. I've not analyzed it in any detail. But that form of compensation in the form of the retail rate has been considered to be a fair compensation in other jurisdictions. But I've not analyzed it specifically in RMP service territory.

**Q. Thank you.**

COMMISSIONER CLARK: That concludes my questions.

THE WITNESS: Thank you.

CHAIRMAN LEVAR: Thank you, Commissioner.

Commissioner Allen, do you have any questions for Mr. Volkmann?

COMMISSIONER ALLEN: I have a clarifying question. I wanted to make sure that I heard something that he said correctly.

CROSS-EXAMINATION

BY COMMISSIONER ALLEN:

**Q. Mr. Volkmann, as you were beginning your summary, did you say that all other jurisdictions, regulatory jurisdictions that are considering CG have included transmission and distribution in their tariff, in their rate?**

A. All other jurisdictions that I'm familiar with that have an established Commission-approved methodology for valuing the contribution of solar include an avoided T&D capacity contribution element.

**Q. And do you have an idea how many that is, what number that is that you're familiar with?**

A. I rattled them off in my opening. I'm referring to California, Minnesota, city of Austin, New York. I've got to find my notes here.

Yeah, California, New York, Oregon, Minnesota, and the city of Austin are the ones I'm familiar with. There may be more, but those are the ones that I'm familiar with.

**Q. Okay. Great. Well, I wanted to make sure I heard you correctly. And, of course, I understand that I work for the State of Utah and for the Utah Commission. But it was an interesting piece of information. So thank you.**

A. Thank you.

CHAIRMAN LEVAR: Thank you, Commissioner Allen.

I don't have any additional questions for you, Mr. Volkmann. So thank you for your testimony this morning.

THE WITNESS: Thank you.

CHAIRMAN LEVAR: And we'll go back to Vote Solar for your next witness.

MR. GOTTLIEB: Thank you, Chairman. This is Spencer Gottlieb.

Vote Solar calls Dr. Spencer Yang as its next witness.

CHAIRMAN LEVAR: Good morning, Dr. Yang. Can you hear me?

THE WITNESS: I can hear you, Chair. Can you hear me and see me?

CHAIRMAN LEVAR: Yes, I can hear and see you.

THE WITNESS: Excellent.

CHAIRMAN LEVAR: Thank you.

Do you swear to tell the truth?

THE WITNESS: Yes.

COMMISSIONER CLARK: Okay. Thank you.

Mr. Gottlieb, go ahead.

MR. GOTTLIEB: Thank you, Chairman.

SPENCER YANG,

was called as a witness, and having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. GOTTLIEB:

**Q. Please state your full name and business address for the record.**

A. My name is Spencer Yang. And my business address is 2001 K Street, Washington, DC 20006.

**Q. Have you reviewed and analyzed the testimony submitted by the other parties to this case?**

A. Yes, I did.

**Q. Have you prepared affirmative and surrebuttal testimony in this case?**

A. Yes, I have.

**Q. Do you have any changes to offer to any of that testimony?**

A. No.

**Q. If you were asked the same questions included in your written testimony here today, would you give the same answers?**

A. Yes.

MR. GOTTLIEB: Mr. Chairman, Vote Solar moves

for the acceptance of the testimony of Dr. Yang into the record in this proceeding.

CHAIRMAN LEVAR: If anyone objects to that motion, please unmute yourself and indicate your objection.

I'm not seeing or hearing any objections, so the motion is granted. Thank you.

**Q. (BY MR. GOTTLIEB:) Dr. Yang, have you prepared a summary of your testimony that you would like to present to the Commission?**

A. Yes.

**Q. Thank you. Please proceed.**

A. Thank you.

Good morning, Chair Levar and Commissioners. Thank you for allowing me to testify on this important matter. My name is Spencer Yang, and I am a principal with Bates White, an economic consulting firm. I'm testifying on behalf of Vote Solar today.

After reviewing the testimony and analysis made in this matter, I find that RMP has incorrectly assigned zero value for avoided T&D benefits provided by CG exports. Utilities like RMP plan their T&D system to reliably meet their peak demands. By reducing peak demand and system losses, CG exports help RMP to defer or avoid additional investment in T&D assets. Each of these

benefits is demonstrable and quantifiable as evidenced by my analyses and many others'.

After conducting my analysis, I concluded that the value of avoided transmission costs from CG exports is 1.34 cents per kilowatt hour, and the avoided distinguishing value is 0.52 cents per kilowatt hour for a total 1.86 cents per kilowatt hour.

Because RMP will enjoy these cost savings from CG exports, these values should be included in any just and reasonable export credit rate. Today, I'll explain each of these benefits and how I calculated them.

RMP has claimed that CG exports may defer capital investments in the short term but could never eliminate necessary investments to maintain a safe and reliable grid. However, it is evident that CG exports are fully consumed by the neighbors of CG exports, and thus eliminate RMP's commensurate need to generate, transmit, and deliver power from the centralized power plants which are typically located far from the point of consumption.

Moreover, it is logical to conclude that if CG exports can avoid T&D investment in the short term, it can avoid even larger T&D investment in the long term over its entire lifetime, thanks to the solar industry's continuing innovations, deployment of complementary

technologies, and relentless cost reductions through competition.

For example, complementary technologies like battery storage will increase the value of CG exports because CG customers can control their timing and amount of exports to reduce more peak loads, and thus increase the capacity value associated with CG exports.

Furthermore, it is important to note that these cost savings accrue automatically because CG exports act as negative load by providing valuable energy to the nearest neighbors and thus avoiding the RMP's need for incremental T&D investments to serve their customers.

Given this automatic reduction of peak loads by CG exports, I conclude that RMP lacks any support to ignore the value of CG exports in avoiding T&D costs. And the Commission should include my conservative estimate of 1.86 cents per kilowatt hour for avoided T&D capacity costs into the just and reasonable export credit rate.

Talking about T&D capacity costs, the T&D capacity benefits of CG exports in RMP service territory represent the avoided or delayed costs of maintaining and upgrading infrastructure related to the transmission and distribution of electricity across the grid.

By reducing peak demand and system losses, CG

exports can help RMP defer or avoid additional investment in T&D assets.

To determine deferred or avoided T&D investment, two key inputs are needed. No. 1, the effective load carrying capacity, or ELCC, associated with CG exports; and No. 2, RMP's T&D capacity costs.

ELCC associated with CG exports refers to the capacity contribution that CG exports make in reducing the peak loads on the transmission and distribution system that drives the utilities to incur T&D capacity costs. For example, if the ELCC is 30 percent, 1 kilowatt of CG exports can avoid 0.3 kilowatt of the utilities own T&D capacity investments. Avoided T&D capacity costs are the product of the ELCC and the RMP's T&D capacity costs.

To quantify avoided transmission capacity costs, the CG solar -- it is important to note that CG solar provides important and quantifiable value in the form of avoided transmission costs by reducing system demand during the peak times. Avoiding transmission capacity costs are the costs that utilities and ratepayers can save from avoided or postponed transmission infrastructure upgrades.

When non CG customers consume their neighbor's CG exports, RMP's obligation to supply power to that

location using its transmission network is diminished, thereby reducing transmission congestion and constraints, transmission losses, and the need for additional transmission capacity.

There are many valid methods to calculate the avoided T&D costs. I calculated transmission capacity costs using the specific costs from transmission rate to serve its native load customers as a proxy for avoided transmission costs. The basis logic behind this method is that reduced peak loss on the transmission system would commensurately reduce RMP's need for incremental T&D investments to reliably service native load customers.

This method has been used in many studies to quantify the avoided transmission costs, and other witnesses in this docket find that my approach is reasonable.

Specifically, I determined the annual avoided transmission rate attributable to CG exports by multiplying PacifiCorp's current form transmission rate of $32.74 per kilowatt year, and the effective CG export capacity of about 28 percent calculated by Dr. Milligan.

My analysis produced an annual avoided transmission cost of 1.23 cents per kilowatt hour, excluding line losses, or 1.34 cents per kilowatt hour,

inclusive of line losses.

RMP argues that not all transmission costs are avoidable. However, I did not assume that all transmission costs included in PacifiCorp's form OATT transmission rate are avoidable. By multiplying Dr. Milligan's CG exports capacity contribution factor and PacifiCorp's OATT form transmission rate, I only allocated a fraction of transmission costs that PacifiCorp would otherwise have to incur before CG exports.

OCS asserts that it is not appropriate to use PacifiCorp's OATT transmission rate for the avoided transmission capacity costs because there is no liquid market for form transmission capacity. However, PacifiCorp does not have to post incremental additional capacity for sale to other transmission customers to monetize the benefit from reduced peak loads. Rather, the benefits accrue automatically because CG exports to the grid at peak times automatically reduce PacifiCorp's peak load, thus avoiding and deferring the need for its incremental transmission investment.

I can find no viable reason for RMP's assignment of zero value to the avoided transmission capacity costs associated with CG exports.

Moving to avoided distribution capacity costs.

To determine RMP's distinguishing investments that are deferrable by CG exports, I relied on Mr. Volkmann's calculations. He calculated the amount of RMP's deferrable distribution investments in Utah is $123 per kilowatt. To annualize this investment amount, I adopted a carrying charge PacifiCorp used in its marginal cost of service study. I adopted PacifiCorp's 10.79 percent carrying charge rate, which is in line with typical carrying charge factor assumptions, to calculate annual per unit distribution costs of $13.24 per kilowatt year.

As I did with avoided transmission value, I calculate the annual avoided distribution rate attributable to CG exports by multiplying the annual per unit distribution costs of 13.24 per kilowatt year, and Dr. Milligan's calculated effective CG export capacity of 28 percent. I then calculate the total avoided distribution costs per year using the RMP-specific annual amount of the CG exports calculated by Dr. Lee, another Vote Solar witness. This analysis produced a levelized annual avoided distribution cost of 0.5 cents per kilowatt hour or 0.52 cents per kilowatt hour, inclusive of line losses.

RMP, on the other hand, has included zero value for these benefits in its proposed ECR.

In terms of T&D line losses, the value of

avoided T&D line losses attributable to CG exports is real and quantifiable. Solar energy produced by CG customers in excess of their own use is automatically exported to the grid and physically consumed by their neighbors. When CG customers' neighbors utilize exported solar energy, line losses on the upstream portions of the distribution system and the entirety of the high voltage transmission system are avoided. Notably, RMP sells that exported solar energy to the CG customers' neighbors at the full retail rate of about 10 cents per kilowatt hour.

Mr. Volkmann calculated both transmission and distribution line loss factors for CG exports, and I adopted his calculation.

These calculations yielded a 0.11 cents per kilowatt hour value for avoided transmission line losses, and a 0.02 cents per kilowatt hour value for avoided distribution line losses attributable to CG exports.

Given their real and quantifiable value, the value of avoided line loses associated with CG exports should be included in any just and reasonable ECR. RMP, again, however, has provided zero value for these avoided T&D losses on its system.

To summarize, RMP plans its T&D capacity investments to meet the peak system demands. There is no question that the reduction in customer demand resulting

from CG exports will decrease the need for PacifiCorp's investment in new transmission and distribution assets, regardless of whether or not CG exports are firm or non-firm in nature.

For reasons explained in my testimony and opening statement today, I recommend the Commission to include avoided T&D capacity costs as part of any just and reasonable export credit rate.

I thank the Commission for its time, and I'm ready for questions.

**Q. Thank you, Dr. Yang.**

MR. GOTTLIEB: Vote Solar tenders Dr. Yang for cross-examination.

CHAIRMAN LEVAR: Thank you, Mr. Gottlieb.

I'll go to Mr. Holman first.

Do you have any questions for this witness?

MR. HOLMAN: I do not. Thank you, Mr. Chair.

CHAIRMAN LEVAR: Okay. Thank you.

Mr. Mecham, do you have any questions for Dr. Yang?

MR. MECHAM: Thank you, Mr. Chair. I do not, either.

CHAIRMAN LEVAR: Thank you.

I'll go to Mr. Jetter next.

Do you have any questions for Dr. Yang?

MR. JETTER: I have no questions. Thank you, Mr. Chair.

CHAIRMAN LEVAR: Thank you.

Mr. Snarr, how about you?

MR. SNARR: The OCS has no questions of Dr. Yang.

CHAIRMAN LEVAR: Okay. Thank you.

Ms. Wegener?

MS. WEGENER: I do have just a few questions.

CHAIRMAN LEVAR: Okay. Go ahead.

CROSS-EXAMINATION

BY MS. WEGENER:

**Q. Good morning, Dr. Yang.**

A. Good morning.

**Q. I believe you used Dr. Milligan's avoided generation capacity contributions to calculate your avoided distribution capacity; is that right?**

A. That's correct, both avoided transmission and distribution capacity costs.

**Q. Okay. Do you know, is it true that residential and small commercial customers have distribution peaks that are different from the system peaks?**

A. It could be different. At issue is how different it is. And in my assertive testimony, opening

testimony, I actually compare the system peak with coincident distribution peak. I don't remember the figures, but it's reported in my testimony.

And by reviewing that material and data, I concluded that there's a significant overlap between the system peak and the distribution peak; therefore, it's reasonable to use the ELCC value that Dr. Milligan calculated for generation capacity.

**Q. So you wouldn't say that the distribut- -- that there are differences -- excuse me.**

**But there are differences between the distribution peak and the total system peak?**

A. Yes.

**Q. And you justified using the same number because there's overlap?**

A. There's a significant overlap, yes.

**Q. Would the differences be that the distribution system peaks later in the afternoon? Is that what the difference is? Even with that overlap, the distribution peak is later in the afternoon?**

A. Can we look at the figures that you're referring to and talk about it?

**Q. We can. I'm actually not 100 percent sure which figure I'm talking about because it was just something that was referred to yesterday in testimony, so.**

A. I see. It's Figure 2, Line 130 of my affirmative testimony.

So this -- are you there?

**Q. Yes, I'm there.**

A. Okay. So this figure illustrates that for summer months, May through September, there's a significant overlap with system peak and distribution coincident peaks. That's the top chart.

The bottom chart, in the winter months, there's significant overlap in the afternoon, let's say starting from like 5:00 through 7:00 or even 8:00.

**Q. Okay. And it looks like there isn't a peak in the distribution at the same time as the system peak in the morning in that winter chart; is that right?**

A. Yes. The sun is not shining very much those times, 7:00 a.m. to 11:00 a.m. Sun is peaking around like noon to 5:00 or 6:00.

**Q. Is it possible that that lack of coincident peak could make the distribution capacity contribution lower than the system -- than the generation capacity contribution?**

A. It could go either way because I didn't quantify the distribution effective load-carrying capacity. And depending on -- there are many variables to determine the ELCC, as Dr. Milligan testified in this proceeding. And

unless you actually calculated whether the ELCC for distribution, distribution is higher or lower is undetermined. Definitely, this is a one factor, and this factor will tend to decrease the ELCC for the distribution.

**Q. Okay. So this particular factor may decrease the capacity contribution, but there may be other factors --**

A. That's correct.

**Q. -- that aren't taken --**

A. Yes.

**Q. Okay. Thank you, Dr. Yang.**

MS. WEGENER: I have no further questions.

CHAIRMAN LEVAR: Thank you, Ms. Wegener.

Mr. Gottlieb, do you have any redirect?

MR. GOTTLIEB: I have no redirect. Thank you, Mr. Chairman.

CHAIRMAN LEVAR: Okay. Thank you.

I will go to Commissioner Allen next.

Do you have any questions for Dr. Yang?

COMMISSIONER ALLEN: Thank you, Chair. I have no questions. Thank you.

CHAIRMAN LEVAR: Thank you, Commissioner.

How about Commissioner Clark? Do you have any questions for this witness?

COMMISSIONER CLARK: I have no questions.

Thank you, Dr. Yang.

CHAIRMAN LEVAR: Okay. Thank you.

And I don't think I have any, either. So thank you for your testimony this morning.

THE WITNESS: Thank you.

CHAIRMAN LEVAR: And we'll go to Vote Solar for your next witness.

MR. SELENDY: Good morning, Chair Levar.

Vote Solar calls Dr. Albert Lee as its next witness.

CHAIRMAN LEVAR: Good morning, Dr. Lee.

THE WITNESS: Good morning, Chairman.

CHAIRMAN LEVAR: Thank you.

Do you swear to tell the truth?

THE WITNESS: I do.

CHAIRMAN LEVAR: Okay. Thank you.

Mr. Selendy, go ahead.

MR. SELENDY: Thank you, Chair.

ALBERT LEE,

was called as a witness, and having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. SELENDY:

**Q. Dr. Lee, would you please state your full name and business address for the record.**

A. I am Albert Lee. My address is 601 New Jersey Avenue NW, Suite 400, Washington, DC 20001.

**Q. And Dr. Lee, have you reviewed and analyzed the testimony submitted by the other parties to this case?**

A. Yes, I have.

**Q. And have you prepared direct, rebuttal, and surrebuttal testimony of your own?**

A. Yes, I have.

**Q. Do you have any changes to offer to any of your testimony?**

A. No, I don't.

**Q. If you were asked the same questions included in your written testimony here today, would you give the same answers?**

A. Yes.

MR. SELENDY: Mr. Chairman, Vote Solar moves for the acceptance of the testimony of Dr. Albert Lee into the record of this proceeding.

CHAIRMAN LEVAR: Thank you.

If anyone objects to that motion, please unmute yourself and indicate your objection.

I'm not seeing or hearing any objections, so the motion is granted. Thank you.

MR. SELENDY: Thank you.

**Q. (BY MR. SELENDY:) Dr. Lee, would you like to present a summary of your testimony to the Commission?**

A. Yes, I would. Thank you.

Good morning, Commissioners. Thank you for allowing me to testify on this matter.

My name is Albert Lee. I am the founding partner and lead economist at Summit Consulting. I submitted written and live testimony during Phase I of this proceeding in April 2018, and I submitted written affirmative, rebuttal, and surrebuttal testimony for this Phase II. I am, once again, testifying on behalf of Vote Solar.

In Phase I of this proceeding, I submitted a testimony based on my review of the design of Rocky Mountain Power's proposed load research study. As I explained then, RMP's sampling methodology was statistically flawed, and this Commission ordered RMP to correct certain of these flaws.

The first part of my testimony today will be a brief refresher on the flaws with RMP's LRS. Specifically, I would explain that the sample excluded a sizable portion of the population of interest, was

improperly drawn using multiple designs, and was too small to reach prescribed level of precision.

The second portion of my testimony will address the load research study that I conducted on behalf of Vote Solar as well as the serious flaws in RMP and DPU's analyses in their direct, rebuttal, and surrebuttal reports. Specifically, DPU witness, Mr. Davis, relies on the flawed RMP study and also makes fundamental computational errors, rendering his analysis unreliable.

The third portion of my testimony will show that RMP's proposed export rates result in only small credit relative to the costs borne by the customer. Even assuming RMP's highest peak export rate being applied for all exports, CG customers would be paying for the privilege of exporting the energy back to the grid for more than 3 years before they earned export credits equal to the fees RMP proposes.

In Phase I of this proceeding, RMP witness, Mr. Elder, designed a load research study for the purpose of determining the full requirement of CG customers, which is production plus delivery minus exports. I found that Mr. Elder's sample design had several fatal defects in his attempt to meet the stated purpose of the study.

First, the production sample was not drawn from the population of interest, which would include -- which

would be all customer generators. Instead, it was drawn from a subset, namely, about 140 customers drawn exclusively from Schedule 135 customers, which includes the original 36 customers.

As a result, full requirement estimates from the sample could not be extrapolated to the full population, which also includes Schedule 136 customers.

The Commission agreed that RMP's sample design did not "conform to standard statistical practices" and ordered RMP to select a new sample that "either gives each member of the class an equal chance of being selected or each member of separate strata an equal chance of being selected." RMP did not make these changes due to the omission of not allowing Schedule 136 customers to be included in the sample.

Second, the sample was drawn using different sample designs. Mr. Elder selected certain participants based on energy build but selected other participants based on nameplate capacity. As a result, standard extrapolation formulas fails to account for this difference, and no alternatives were provided.

Third, several factors indicated that RMP's sample size was too small to achieve Mr. Elder's stated precision of plus or minus 10 percent and 95 percent confidence. Although Mr. Davis did not calculate

confidence intervals for RMP's study, my calculation shows that the sample fails to achieve the statutorily-prescribed precision requirement.

With the Commission's purpose for the LRS and Mr. Elder's design in mind, I oversaw the design and implementation of Vote Solar's load research study. Although I understand that my findings play a role in shaping policy and that Vote Solar's other experts relied on them in forming their opinions, I approach my work objectively based on fundamental principles of statistics.

First, I identified characteristics that influence the production and exports of CG customers. Then I directed the collection of relevant customers in a way that gave all CG customers the possibility of being included.

RMP also provided its own data to Vote Solar, including monthly export data for 2015 through 2019, for more 30,000 unique customers. RMP likewise provided the data they collected for RMP's load research study.

I then calculated statewide estimates for exports and production of CG. Because production is largely a function of weather and time, it is possible to estimate the production for the entire population of installed capacity.

To determine the statistical relationship between generation, nameplate capacity, and other location data, I developed a regression model to estimate solar production based on the 2019 data. My regression model demonstrates how much of a CG customer's solar production was affected by variables like weather and cloud coverage.

I then applied the relevant data to predict productions for the nearly 38,000 CG customers whose data were not collected as part of the Vote Solar study and whose data were not collected as part of the RMP study.

Similarly, I developed regression models for customers without export information. Using these regression models, I was able to calculate statewide exports and production statistics for the entire universe of RMP's CG customers.

There are several key differences between the data gathered by RMP and Vote Solar. Unlike RMP, Vote Solar collected data from Schedule 135 and 136 customers, and Vote Solar calculated not just exports but also production statistics.

The measure of how strong a relationship is in a regression model is called an "R-squared value." Mr. Davis criticizes the R-squared value in my regression as being relatively low, even though that it was above

0.6. Mr. Davis is incorrect. An R-squared value of 0.6 to 0.7 is not a low indicator of model explanatory power.

I have developed and reviewed many regression models, studies, analyses, and critiques in my 20-year career. And the R-square in these models are high R-square statistics for this type of study.

Moreover, R-squared is a single gauge of a model's fit, and my models are highly statistically significant, meaning that they contain important predictors and explain both the production and export data patterns.

Mr. Davis also asserts that my study must be flawed because DPU found a small number of instances where exports equal production.

But in any large database, a small number of outliers and data anomalies are always expected. And significantly, the raw data received from RMP contained -- showed analogous data anomalies, like showing certain time periods when exports were greater than production and solar exports in production at night when there is no sun.

The small percentage of such issues in Vote Solar's base data is expected and has no material impact on Vote Solar's conclusions.

Turning to RMP's proposal. Mr. MacNeil was

tasked with calculating an export credit rate for RMP's customers. Notably, he entirely abandoned Mr. Elder's studies and used only RMP's provided export data.

As I have explained, this impacted the reliability of RMP's export estimates because they failed to account for how much CG customers are producing. In fact, Mr. MacNeil appears not to have considered production at all, which could lead to an export rate so low that it renders future CG installations uneconomical.

RMP's proposed ECR schedule contained rates that differ by month of the year and hours of the day. RMP proposes an average ECR of 1.53 or 2.22 cents per kilowatt hour split into seasonally-adjusted, time-varying peak and off-peak rates.

I used this proposed ECR framework and my estimates of total exports for each day and hour in 2019 to determine the expected exports and credits per customer that would accrue over a year under RMP's rate. My data shows that in 2019, the average CG customer exporting under RMP's rate would have received an average of $94 in credits.

Assuming that all exports were at peak rates, an entirely counterfactual assumption, the credits received would raise to an average of $158 annually. Yet, RMP also proposes fees on customer generators to enroll in

the CG program of $310. At an average of $94 in annual credits, it would take more than 3 years of customers to start accruing credits in excess of these fees. Even assuming export credits of $158 annually, a customer would need to export for nearly 2 years. Meanwhile, RMP would collect $1,833 annually from selling these exports to other customers each year.

The result is that RMP proposed an export credit so low that customers are effectively paying to export electricity, even when ignoring the cost of installing their solar systems. In essence, RMP proposes a rate that may end future CG installations and sacrifices the benefit from all CG production, not just CG exports.

Mr. Davis concludes in his testimony that RMP's LRS clearly shows that solar customers currently export a small amount of energy during the Utah peak and non-peak hours. His findings are unreliable for several reasons, starting with the fact that there was no correction of the statistically flawed -- statistical flaws in the RMP sample.

Ignoring the Commission's instruction, Mr. Davis compounded those flaws with his own computational errors. First, Mr. Davis analyzed the data supplied by Mr. Elder, which, as I described, did not include the entire population of interest. Rather than accounting for this

discrepancy, Mr. Davis justifies his use of Mr. Elder's sample data by arguing that there are no discernible differences between Schedule 135 and 136 customers. Specifically, he says that he is unaware of any evidence that suggests that Schedule 135 customer exports are materially different from Schedule 136 exports. This is incorrect.

I compared the excluded Schedule 136 population to include a Schedule 135 population and found that the average nameplate capacity, which is what Mr. Elder himself used in designing his study, varied significantly between Schedule 135 and 136 customers.

For Schedule 135 customers, average nameplate capacity was 6.4 kilowatts. For Schedule 136 customers, however, it was 6.9 kilowatts.

That difference is statistically significant and has a large impact on Mr. Davis's analysis because Schedule 136 systems have more capacity. They are more likely to produce more electricity and return more energy to the grid. Excluding them in the sample biases production estimates downward.

Nor is it logical for RMP or DPU to exclude production data from Schedule 136 customers since that subset continues to be a larger and larger portion of RMP's CG customer base. The number of Schedule 136

customers grew significantly over 2019. In January of that year, there were 3,211 Schedule 136 customers, or approximately 8.3 percent of CG connections. By December of 2019, there were 7,858 Schedule 136 customers, or approximately 20.2 percent. Today, that figure is presumably even higher.

Second, Mr. Davis made a computational error that significantly skewed his export total estimate. He calculated sampling weights incorrectly.

Sampling weights are important because, as the name suggests, they are used to weight various sample outputs to extrapolate to the larger population. According to Mr. Davis's work papers, the sampling weights were calculated by dividing the number of customers of the respective strata, or subgroup, by the total number of customers in the population.

For Stratum 1 of Schedule 135 residential customers, for example, he divided 6,364 by 29,183 to reach a sampling weight of 0.22. But that's not a sampling weight at all. It is simply the percentage of the entire population size that Stratum 1 makes up.

What he should have done was to divide each stratum's population size by the sample size, or in the case of Stratum 1, divide 6,364 by 10. This shows that each sample customer from Stratum 1 represents 634

customers in that stratum. That is the correct sampling weight which, by definition, can never be less than 1.

These errors mean that when DPU extrapolates RMP's sample to represent the entire customer generation pool, DPU understates the export total by a factor of 25 to 1. Notably, even after I raised these errors in my testimony, Mr. Davis did not correct or amend his sampling weights. He did not even address his error in his surrebuttal; instead, deferred to DPU witness, Dr. Abdulle, who says he is unable to verify my work papers, completely ignoring that Mr. Davis's sampling weights are drawn from his work papers in his report. And DPU simply accepted RMP's representation that the LRS sample met the stated precision level. My calculations, however, show that it did not.

In summary, my opinion is that Mr. MacNeil's proposed ECR rate is inefficient, potentially uneconomical, and that might stop the growth of CG installation and exports. RMP's load research study should not be credited because its sampling methodology was flawed.

Vote Solar's load research study is sound and adheres to basic norms of statistical analysis, and it should be credited.

Mr. Davis's analysis of RMP load research

studies makes fundamental computational errors and draws incorrect conclusions based on these computational errors.

This concludes my summary of my opinion for this matter. I thank the Commission for its time in listening to my testimony. I am ready for questions.

**Q. Thank you, Dr. Lee.**

MR. SELENDY: Chairman Levar, Vote Solar tenders Dr. Lee for cross-examination at this time.

CHAIRMAN LEVAR: Thank you.

Mr. Holman, do you have any questions for Dr. Lee?

MR. HOLMAN: I have no questions for Dr. Lee. Thank you, Mr. Chairman.

CHAIRMAN LEVAR: Thank you.

Mr. Mecham, do you have any questions?

MR. MECHAM: Nor do I, Mr. Chairman. Thank you.

CHAIRMAN LEVAR: Okay. Thank you.

Mr. Jetter?

MR. JETTER: Hi. Good afternoon -- I guess it's good morning, Dr. Lee.

I do have a few questions, Mr. Chair.

CHAIRMAN LEVAR: Okay. Go ahead.

CROSS-EXAMINATION

BY MR. JETTER:

**Q. You spent quite a bit of time in your summary and testimony discussing the differences in the modeling and conclusions on the exported energy, both volumes and timing.**

**Have you compared the final results of your analysis with that from Rocky Mountain Power and from Division witness Mr. Davis?**

A. Could you define "final results"?

**Q. So let's say the calculated total exports in kilowatt hours on an annual basis.**

A. From Mr. Davis's rebuttal testimony, affirmative, or surrebuttal?

**Q. So, for example, I believe it's in DPU Exhibit 1.3, Davis surrebuttal. So that would be Mr. Davis's surrebuttal attached Exhibit 1.3.**

A. Give me a minute so that I can look it up.

**Q. And I'd like to caution you at this time that that number is confidential, and so what I'm just going to ask you is to compare that to your total export calculation and tell me if it's higher or lower.**

A. Sure. Thank you for that caution.

If I remember Mr. Davis's surrebuttal testimony, he offered a number that is higher than my estimate. But

you did not ask, but I want to let you know that that calculation was incorrect.

**Q. Okay. And I'm just trying to make it clear on the record that -- whether Mr. Davis's calculation was correct or not is really not part of this question.**

**I'm just asking: Is his conclusion he reached, result in his analysis, a higher estimated export number of kilowatt hours per year?**

A. Based on my recollection, he reported a higher export total estimate.

**Q. Okay. And I guess following up on that question, is it also correct that Rocky Mountain Power's reported number was very close to yours but slightly lower; is that accurate?**

A. Yes. Rocky Mountain Power reported a number that is close to my estimate.

**Q. Okay. And so despite potential flaws in how the parties reached those numbers, the DPU came up with a higher number, Rocky Mountain Power came up with a little bit lower number, and they were all relatively similar in magnitude?**

A. Let me say that the number that Rocky Mountain Power offers is closer to mine, and Mr. Davis's number in his surrebuttal testimony is further apart.

**Q. Okay. His is more like 10 percent or something**

**or more higher than yours?**

A. I will take your math. I think that sounds like the right ballpark.

**Q. I'm not estimating that or calculating that, that's just a rough guess to stay out of confidential material here.**

**I'd like to change lines of questioning here just a little bit, so bear with me. You've discussed the fees that are included in the proposal by Rocky Mountain Power.**

**Are you aware that various jurisdictions also charge fees for permitting and other various, I guess, building permits, that type of thing for installing solar?**

A. That's not my area of expertise. It's not part of my assignment to research whether or not other jurisdictions charge fees.

**Q. And I guess I will not ask you any further questions given that.**

**Would you agree with me that selling electricity as a service with 24-hour reliability voltage support and things like phase balancing is a different product or service than the commodity of electric energy?**

MR. SELENDY: Excuse me. Chair Levar, I would like to object that this falls outside the scope of the

report submitted by Dr. Lee.

MR. JETTER: May I respond, Mr. Chair?

CHAIRMAN LEVAR: Respond and identify where you believe it falls within it.

MR. JETTER: I think this falls squarely within Dr. Lee's opening statement where he described Rocky Mountain Power as selling the same thing that they are paying. I believe he calculated it as around $158 per year for $1,333. And I'd like to know whether they're selling the same thing or not.

CHAIRMAN LEVAR: Mr. Selendy, do you dispute the statement from the summary, or do you --

MR. SELENDY: I didn't hear a quotation, but it sounds like Mr. Jetter is talking about a comparison of a rate and is using that to talk about a variety of other factors on the system.

If Dr. Lee is able to respond to the question, I don't object. But the line is obviously outside the scope of the subject matter that's presented by Dr. Lee.

MR. JETTER: If you'd like to strike that from his opening statement, I'd be happy to do that.

Alternatively, if it is the testimony of Dr. Lee that Rocky Mountain Power is selling an equivalent product being between an export credit and a kilowatt hour of residential retail service, I think I have a

right to discuss that with him and ask some questions along that line.

CHAIRMAN LEVAR: With all the discussion I've heard, I think I'm going to allow the question to continue at this point.

MR. JETTER: Okay.

CHAIRMAN LEVAR: Go ahead and ask your question.

**Q. (BY MR. JETTER:) Maybe I'll lay a little more foundation here.**

**Is it accurate that you said in your opening statement that Rocky Mountain Power is providing $158 per year or $94 per year, or somewhere in that range, of credits for the export for an average customer?**

A. Yes.

**Q. And you also said that they are selling that for $1,833 at the average residential retail rate; is that correct?**

A. What I was referring to in my opening statement is my calculation that if they were to sell the same amount of electricity, that would be the revenue that they generated.

**Q. Okay. And would you agree with me that what they are selling is not the same as the commodity of electronic generation?**

A. I don't have an opinion about that. I'm only

comparing the quantity, the revenues that a CG customer would have received, and then the -- of the same quantity of electricity if RMP were to sell them, that would be the revenue that it would have generated.

**Q. Okay. Thank you for that clarification.**

**And would you agree with me, then, if Rocky Mountain Power were to purchase electric generation from another source for 2 cents per kilowatt hour, they would also sell the same energy for a residential retail rate under their service for $1,833?**

A. I have not done that calculation. It's beyond my scope of this particular assignment.

**Q. Okay. Those are all of my questions. Thank you, Dr. Lee, for your time.**

A. Thank you, Mr. Jetter.

CHAIRMAN LEVAR: Thank you.

I'll go to Mr. Snarr next.

Do you have any questions for Dr. Lee?

MR. SNARR: The OCS has no questions for Dr. Lee.

CHAIRMAN LEVAR: Okay. Thank you.

Ms. Wegener, do you have any questions for Dr. Lee?

MS. WEGENER: Yes, I do. Just a few.

CROSS-EXAMINATION

BY MS. WEGENER:

**Q. Good morning, Dr. Lee -- although if you're in New York, it's good afternoon.**

A. Good morning.

**Q. You said that Mr. MacNeil's data is not reliable because it only accounts for exports, right?**

A. Can you repeat that question, please?

**Q. Yes. Mr. MacNeil's data from the 136 customers is less reliable because it doesn't -- because it only accounts for exports, not the entire consumption?**

A. What I meant to say there is Mr. MacNeil did not take production into consideration.

**Q. Right. Isn't it true this proceeding is about the value of the exports, though, not about the value of the total production?**

A. Well, not from a statistical perspective because, as I mentioned before, I got involved in this case in Phase I. It was very clear in Phase I the objective is to calculate full requirement, which involves both export production, as well as deliveries.

**Q. Can you explain to me your understanding of the difference between the 135 and 136 customers?**

A. Well, I'm not a regulatory expert, so I can only briefly give you what I understood.

I believe that the 135 -- Schedule 135 customers were referred to as "grandfathered" customers. And 136 customers, they were the transition customers.

**Q. So the 136 customers as a group installed solar later than the 135 customers; is that fair?**

A. I believe that that's the case.

**Q. Would you say that it's logical that more recent installations under 136 are more indicative of what future installations will look like than the 135 installations?**

A. That could be, but I'm not in the position to second guess what was the original intent of RMP's LRS, which was subsequently approved and blessed by this Commission.

**Q. To get your samples for your load research study, participants had to go to the -- or participants first received a mailer, right, from Rocky Mountain Power?**

A. That is correct.

**Q. And then they had to go to the Company's website and opt into the study; is that right?**

A. That is correct.

**Q. Is it possible that only customers who were particularly enthusiastic about solar would have the motivation to go to the website and opt into the study?**

A. It could be, but I don't know how that particular fact, if it were to be the case, would influence the reliability of my calculation.

**Q. Okay. So you can't say whether enthusiastic customers may have larger systems?**

A. If it were, then they are accounted for in my regression.

**Q. Okay. And if they had a different use profile -- perhaps enthusiastic customers are more cognizant of aligning their use and production -- would your study account for that?**

A. Yes. As a theoretical matter, it could. But also as an empirical matter, it turns out that the underlying implications of your question, you know, did not come to pass. Like, in other words, empirically, you know, we have evidence to show that, you know, what you have just described did not occur.

**Q. Okay. Did all of the opt-in customers, the folks that went to the website and opted into the study, did they all have an equal chance of being selected for your study?**

A. Can you repeat that question, please?

**Q. Yes. So let me give a little bit of background.**

**I think you said in your summary that it's important for a study to have participants who have an**

**equal chance of being selected. It makes the study more reliable, if that's the case. And I'm wondering if, for your study, if each person who opted in on the Company's website had an equal chance of being selected?**

A. So they need not to be -- have an equal chance. So if I were to use a design-based approach, like what Mr. Elder has originally envisioned, then the members of having an equal chance to be selected is very important.

But stylistically and methodologically, I used a model base approach. The model base approach is appropriate for a study where the underlying chance of participation is not known. But using a regression model, I would be able to appropriately account for their differences in characteristics.

So your question, frankly, does not apply to the method that I have adopted for Vote Solar.

**Q. Okay. So for Mr. Elder's analysis, it was important that each participant had an equal chance of being selected for the study. But your study, because of the other methods that you selected, it's not important.**

**Each participant doesn't need an equal chance of being selected?**

A. That's right.

**Q. So would you agree with me that each person who -- who opted in did not have an equal chance of being**

**selected for your study?**

A. In fact, I do not know explicitly what the chances are because I need not to have that piece of statistics for me to conduct my analysis. So whether or not they're equal chance or not is something that I cannot say. But I would further say that it is unnecessary for me to know, given the methods that I adopted.

**Q. Isn't it true that if a person opted in on the website but the inverter that they used was manufactured by a specific manufacturer, that you couldn't get the data from that participant?**

A. Sigh that again? I'm sorry.

**Q. So if a customer chose to participate in the study but their inverter was from, I think, SMA that you weren't able to get data from their system. That's right, isn't it?**

A. That could be.

**Q. And is it possible that the fact that a participant has an inverter, an SMA inverter, could relate to other characteristics that could influence your study?**

A. I guess as a theoretical matter, that could be. But again, empirically, that concern did not really bear out. R-squared statistics is a good way to judge that.

**Q. And regression only takes into account factors that you decide to account for, right?**

A. Can you repeat your question?

**Q. I might not be stating it well.**

**But regression only accounts for factors that are included in the regression analysis, right?**

A. Strictly speaking, I would not agree with that statement.

**Q. Did you collect any data to account for the different inverter manufacturers in your regression analysis?**

A. Ask one more time, please?

**Q. Did you collect any data on the effect of the inverter manufacturer that you could use to account for the different manufacturers through your regression analysis?**

A. I did not because I don't know how that would be relevant.

**Q. Okay. So you determined that the manufacturer of the inverter wouldn't be relevant to the data that you were getting, and so you didn't account for that in your regression analysis?**

A. I did not determine that. The literature determines that. Moreover, Mr. Elder, in his 2018 testimony, gave a litany of factors about the mechanical

process of data production and data exports. Inverter was not on that list. So that's No. 1.

And No. 2 is R-squared, the percentage of output variabilities being explained by the model is very high. And because of that -- let's just take your argument, grant your argument for a moment, and say that inverter matters. My R-square shows that it can only matter to a very limited extent. So, empirically, it does not matter.

**Q. Isn't it possible that the inverter could matter for reasons other than the output data that it provides for you?**

A. I don't understand that question.

**Q. Well, say, for instance, that one neighborhood has a high level of CG penetration from one particular installer, and that installer uses SMA inverters. And it's located maybe in the middle of the state. And that's where the solar installer sent their summer sales fleet, and so it's all Vivint in that area. It's right in Provo, the hometown of Vivint. And there's a lot of Vivint rooftop solar there. And they use a particular manufacturer for their inverter.**

**But up north, perhaps there's a variety of installers, and so there isn't the same concentration of SMA inverters for that installation.**

**Is that something that could affect the data that you get concerning production?**

A. Well, I guess that it could, but it did not then. Because, you know, we talked very, very much about how close my estimation is to RMP's estimation. The fact that they are so close -- RMP, presumably, has the universe, and I have to do my own estimation -- I compare how close those two numbers are. Even in your hypothetical it could be true. Apparently, it's not true enough to change my opinion about the reliability of the model.

**Q. Okay. So you rely on your model because it's close to RMP's census of the entire population of 136?**

A. No, I relied on my model because it is good science. It is good statistics.

**Q. Okay. Thank you.**

**You mentioned that your results are similar to Rocky Mountain Power's results.**

**What is the margin of error for your study?**

MR. SELENDY: Just a clarification, if I may. When you said the "results," Ms. Wegener, what exactly are you referring to?

MS. WEGENER: When I say the results, I mean the export -- the information about the production, the production data that came out of both studies.

THE WITNESS: Could you please ask your question again, please?

**Q. (BY MS. WEGENER:) Yes, if I can remember it, I will ask it again.**

**Why don't I just ask: What is the margin of error for your study?**

A. There's not really one handy statistics that I can actually describe it to you. But I do believe that is either -- in my rebuttal testimony, I reported that during peak hours, the exports -- precision statistics is well within -- on average -- is well within the statutorily precision requirement. And I want to say it is actually, you know, plus or minus 5 percent of the export total. Again, it is in my rebuttal testimony, I believe.

**Q. Would you say that the difference between the export totals in Rocky Mountain Power's census of 136 customers and in your load research study is within the margin of error for your study?**

A. Say that once more?

**Q. Would you say that the export credits -- or the export production, the exported energy in Rocky Mountain Power's census of 136 customers is -- and the difference between that and the results of your study is within the margin of error in your study?**

A. I fear that I don't completely understand that question.

**Q. Let me see if I can ask it a little better.**

**On Line 186 of your testimony. And there's confidential information here, so I don't want to talk about specifics.**

A. Which testimony?

**Q. Excuse me. Of your surrebuttal. So surrebuttal testimony, Line 186 is where I'm at.**

A. I'm there.

**Q. Okay. So that has the margin of error for your export model; is that right? I'm not going to have you read it because it's confidential.**

**But it has the margin of error, right?**

A. That's correct.

**Q. And then down on the previous page, in Footnote 20, you say that your estimated totals in Exhibit 1 of your rebuttal report are within another percentage, a different percentage that is also confidential, of the Company's exports; is that right?**

A. That's correct.

**Q. So would you say that the estimated totals provided by the Company are within the margin of error for your studies?**

A. Well, that number cannot be used that way. So,

among other things, the margin of error that I have shown in Line 186 pertains to production only at peak hours. And that's an average.

In Footnote 20, you are referring to a number that is a total of the entire year. And so, you know, one of them didn't really -- cannot compare to another. In other words, 186 refers to an hourly production, and then Footnote 20 refers to the total.

**Q. Okay. But you would say that the results of your study were substantially similar to the results of Rocky Mountain Power's census of Schedule 136 customers; is that right?**

A. My export totals are close to what RMP reported, yes.

**Q. Okay. Thank you.**

MS. WEGENER: That's all the questions I have.

CHAIRMAN LEVAR: Thank you, Ms. Wegener.

Mr. Selendy, do you have any redirect for Dr. Lee?

MR. SELENDY: I do, Mr. Chairman. Thank you.

REDIRECT EXAMINATION

BY MR. SELENDY:

**Q. Very briefly, I have two questions for you, Dr. Lee.**

**First, you were asked by Ms. Wegener about whether each participant had an equal chance of inclusion in the sample.**

**Do you recall that question?**

A. I do.

**Q. Are your extrapolations fairly representative of the sampled population?**

A. Yes.

**Q. And would you explain why, please.**

A. It is because I used a regression model. And so as the -- so No. 1, going back to the process. When we sent out letters to the entire population of 38,000 RMP customers, they all have some chance to reply and to participate. So that's No. 1.

And No. 2 is, among those who actually provided us information, we also have other characteristics of these customers. And by leveraging these characteristics, we developed a regression model. And so for those people who did not explicitly participate in our study, we likewise leveraged their characteristics in order to perform that calculation.

In that regard, you know, the Vote Solar load research study is representative of the RMP CG customer population.

**Q. Thank you. Now, Ms. Wegener also asked you**

**about possible variations that might be attributable to different inverters that are used by consumers. And you referred to the R-squared value.**

**Why does the R-squared value show that this hypothetical concern does not actually present problems?**

A. Right. So an R-squared essentially is a measure of the explanatory power of the model as it is currently constituted. So R-squared is bounded between zero percent when the model is not providing a whole lot of explanatory power, to a model that has 100 percent R-squared that explains all the possible variations.

The model at very high R-squares, that is to say that it leaves the difference between 100 percent and that .7 to be relatively low, and that is to the extent that these inverters might have a meaningful impact on the estimates, it is actually bounded -- bounded, you know, to be lower than 30 percent. So that is one theoretical understanding.

The other understanding is much more empirical; and that is, when I compare my estimates, export estimates to the actual number -- the truth, presumably -- we are very, very close to each other. That empirical number tells me that if there were any differences about these inverters, they really cannot move the needle.

**Q. Thank you, Dr. Lee.**

MR. SELENDY: Mr. Chairman, I have no further questions.

CHAIRMAN LEVAR: Thank you, Mr. Selendy.

I'll just ask: If any of the parties have any recross based on Mr. Selendy's questions, please unmute yourself and indicate to me that you have some questions.

I'm not seeing anyone with recross, so I'll go to Commissioner Clark.

Do you have any questions for Dr. Lee?

COMMISSIONER CLARK: No questions. Thank you very much.

CHAIRMAN LEVAR: Thank you, Commissioner Clark.

Commissioner Allen?

COMMISSIONER ALLEN: I do have one question.

CROSS-EXAMINATION

BY COMMISSIONER ALLEN:

**Q. And thank you, by the way.**

**And thank you, Mr. Lee, for your help today.**

**When you started your summary or your discussion, I believe you said that the difference in the export factor was 25 to 1. But yet later during cross-examination, there seemed to be some discussion that indicated that the numbers were not that far apart.**

**Are we talking about apples and oranges? Did I misunderstand that? Or could you help clarify that, please?**

A. Commissioner Allen, thank you very much for that question to clarify the record.

There are sets of numbers, you know, that is being passed around. And one has to listen very, very carefully in terms of which number is which.

So Mr. Davis, on behalf of the Division, used RMP's LRS for his projection. And his projection, unfortunately, used the wrong weights. And if we were to rely on his projection, then we have the 25 to 1 calculation.

If I may, you know, for the record, show you in my rebuttal testimony, and I understand that some of these numbers, you know, could be confidential.

Maybe just for edification, Commissioner, if you take a look at my rebuttal testimony in Table 1, page 16, you would get a sense of appreciation of that understatement.

So that was Mr. Davis's calculation as presented in his affirmative.

Then later on, RMP provided a different set of numbers that had nothing to do with Mr. Davis's calculation. Those numbers are the total exports. So,

Mr. Davis set aside, RMP provided the total export number. And when I compare my estimates to that set of total exports, that's when we get very close.

**Q. Okay. Great that's actually very helpful. Thank you.**

CHAIRMAN LEVAR: Thank you, Commissioner Allen.

And Dr. Lee, I don't have any further questions for you. So thank you for your testimony today.

THE WITNESS: Thank you, Mr. Chairman.

CHAIRMAN LEVAR: Mr. Selendy, is there anything else from Vote Solar at this point?

MR. SELENDY: That concludes the presentation of witnesses by Vote Solar. Thank you, sir.

CHAIRMAN LEVAR: Okay. Well, I think that concludes all of our witnesses.

Let me raise this issue: (inaudible) to holding closing arguments Tuesday afternoon, starting at 1:00 p.m.

Any objection to that? And I'm asking this to everyone.

MR. JETTER: My schedule is pretty wide open, so I would be happy to do it then.

MR. HOLMAN: That works for Utah Clean Energy as well, Chairman Levar.

MR. MECHAM: It also works for Vivint Solar.

Thank you.

MR. SNARR: And on behalf of OCS, we could do that.

MS. WEGENER: That works for the Company as well.

But I would like to say we have one short line of questioning on rebuttal for the afternoon today.

CHAIRMAN LEVAR: Oh, you're asking to present a rebuttal witness?

MS. WEGENER: Yes, I am.

CHAIRMAN LEVAR: Okay. Do you want to lay any groundwork for that, or would you rather just discuss it after a break?

MS. WEGENER: I can discuss it after a break. But I can say briefly that it really is to the capacity, the amount of capacity contribution that should be accounted for in the rate. And it's the Company's position that there should not be a capacity contribution.

There is data in Mr. MacNeil's testimony for a calculation that can be applied to other data that's already in testimony to come up with what his 4 percent number that he -- he testified that if there's any capacity contribution, that number should be 4 percent. But it's not a straightforward math problem. It's got

models and stuff involved.

And so I just want to put Mr. MacNeil back on to do the math for everyone to see what that would be if you took his 4 percent number from his surrebuttal and applied it with other data in this case.

CHAIRMAN LEVAR: Okay. Thank you. I think that's helpful to give everyone that background on your request. And I think we will then address that issue after a break.

I'm not hearing any objections to planning oral arguments at 1:00 p.m. Mountain Daylight Time on Tuesday, so I think we'll plan on that.

And we will break for one hour and then return to address Ms. Wegener's request. Thank you.

(A break was taken from 12:02 p.m. to 1:01 p.m.)

CHAIRMAN LEVAR: Okay. Welcome back, everyone. I think we're ready to begin and go on the record.

Ms. Wegener, do you have anything you want to add to your request before we go to other parties for their positions?

MS. WEGENER: Just that our proposed rebuttal is very limited, and it's a result of the updated OCS calculation that they provided just at the outset of this proceeding.

CHAIRMAN LEVAR: Okay. Thank you.

Mr. Jetter, do you have a position on this request?

MR. JETTER: I don't have a position either way.

CHAIRMAN LEVAR: Okay. Thank you.

Mr. Snarr? I may have started not quite an hour after we broke. It doesn't seem that we have Mr. Snarr on the call. So maybe I didn't check the list to see that everyone was connected before we started.

Mr. Snarr, is that you who just joined?

Okay. I think I started maybe a minute or two too early. So Ms. Wegener, why don't you repeat what you said one more time. I asked if you had anything to add to your request. You made a brief statement. Why don't you repeat that, and then I'll start going to the parties for any positions. Thank you.

MS. WEGENER: Okay. I believe I said that our request for rebuttal is very limited and is justified by the OCS's adjustments to their expert credit proposal that was made at the outset of the proceeding.

CHAIRMAN LEVAR: Okay. Thank you.

And Mr. Jetter, I can't remember if you said you had no objection or no position.

MR. JETTER: I have no position. I guess that includes I have no objection.

CHAIRMAN LEVAR: Sure.

MR. JETTER: Yeah. I guess we're probably indifferent.

CHAIRMAN LEVAR: Okay. Thank you, Mr. Jetter.

Mr. Snarr, do you have any objection to the request?

MR. SNARR: No. No objection.

CHAIRMAN LEVAR: Mr. Selendy?

MR. SELENDY: Thank you, Mr. Chairman.

We do object to the introduction of new testimony. I will note that Mr. MacNeil addressed the issues of capacity contribution at Lines 289 to 868 of his rebuttal and also Lines 526 to 598 of his surrebuttal. There was every opportunity to address the matter further in cross-examination of the OCS witness, which RMP's counsel elected to decline to do.

We now face a situation where all other experts have concluded their testimony, and we submit it would be prejudicial for newly-introduced testimony by Mr. MacNeil, particularly, as I say, after RMP's counsel declined to examine the OCS witness on that subject. So we do object.

CHAIRMAN LEVAR: And let me just ask one follow-up question.

Is there any process or opportunity that could be offered to Vote Solar that would cure the objection?

MR. SELENDY: I don't know what the -- I'm sorry. Thank you. I don't know exactly what testimony is to be proffered since we have just the very short description by Ms. Wegener. But if you were to overrule our objection, we would like an opportunity to discuss whatever testimony comes in with our own experts and to consider whether it's appropriate to present further rebuttal testimony of our own. And that could be done, for example, on Monday morning or potentially Tuesday morning at the convenience of the Commission.

CHAIRMAN LEVAR: Okay. Thank you, Mr. Selendy.

Mr. Holman, do you have any objection to the request?

MR. HOLMAN: Thank you, Chair Levar.

I would object to the request on similar grounds to what Mr. Selendy just outlined. Mr. MacNeil spoke about the Company's position on capacity values and capacity contribution in his testimony and his rebuttal testimony and his surrebuttal testimony. And again, the Company had an opportunity to solicit additional information from MacNeil during the hearing this week.

So with regard to additional testimony from Mr. MacNeil on issues outside the scope of OCS's new proposal in Mr. Hayet's settlement -- or excuse me, hearing statement, I think Mr. MacNeil's had ample

opportunity to provide whatever information he would like to provide to the Commission and to supplement his position for the record.

With regard to the information that the Office proposed in Mr. Hayet's hearing statement, I would say something similar to -- something along the lines of what Mr. Selendy just said. It doesn't seem particularly fair to create this new paradigm where witnesses get to come back under the -- it seems somewhat similar to me to the conversation we had at the beginning of the hearing about reopening cross-examination to an extent.

If one party is allowed to reopen cross-examination, it presents an issue: Do others get to reopen cross-examination? And it becomes somewhat circular. The parties have already had their opportunity, so I would continue to object on those grounds.

CHAIRMAN LEVAR: Thank you, Mr. Holman.

Mr. Mecham?

MR. MECHAM: I also object. We object both from Vivint Solar's standpoint as well as the Association's standpoint for the reasons stated by both Mr. Holman and Mr. Selendy.

I actually do see this as different than allowing people to go back on cross because the hearing

was alive and everybody had a shot at it. This, all the witnesses have now testified. If we have witnesses come back, how many more bites at the apple does each other party get? I think this could go on for quite some time; and therefore, we object.

CHAIRMAN LEVAR: Okay. Thank you, Mr. Mecham.

Ms. Wegener, do you have anything to add to your motion? I'll give you the last word.

MS. WEGENER: Yeah. I would just like to note that rebuttal is not a procedurally irregular thing to request. It's our application, and our request is very limited.

I do believe our rebuttal would be helpful to the Commission. We're hoping to address a question that came up after our case that relates to this issue and also to the OCS proposal. And I think it would be helpful to the Commission. And I'd ask that we can present this limited testimony.

THE HEARING OFFICER: Okay. Thank you.

And we appreciate the interest to be helpful and make sure calculations are accurate.

I think, considering the objections -- and I'll see if the other two Commissioners want to weigh in on this -- I'm inclined to deny the request. One of the most salient points that's been made is that Rocky

Mountain Power did not cross-examine Mr. Hayet on this issue. So that gives me some trouble in allowing this rebuttal witness over the objections of those parties.

Commissioner Clark or Commissioner Allen, any thoughts from either of you, or anything you want to ask anyone or add? I'm not hearing any.

Oh, go ahead, Commissioner.

COMMISSIONER CLARK: I want to speak just so that there's no uncertainty about my view of this. And so to be brief, I generally favor the Commission gaining access to as much information as it can in making its decisions. But in the circumstances presented here, I believe Rocky Mountain Power has had an ample opportunity to address this, and that at this stage, it would be -- I would vote against permitting further presentation from the Company.

COMMISSIONER ALLEN: I concur with my colleagues. And I'm always open to trying to get as much information as possible, but procedurally, I find myself in agreement with the people -- with the Chair's decision. So thank you.

CHAIRMAN LEVAR: Okay. And with that, we're denying the request for a rebuttal witness.

I will note to the extent the issues are mathematical rather than substantive, it never bothers us

if anyone corrects our math during the reconsideration period. That is something that's built into the administrative procedures, where if we have a calculation error -- we do our best not to. And we have our own experts in the staff that will be evaluating all the testimony. But there is that opportunity for correction of math if there is something in our order to that effect.

With that, unless there's anything further from anyone else, we're going to plan on closing arguments Tuesday at 1:00 p.m. Mountain Daylight Time.

Our intention is that the order of the cross-examination would be -- I mean the order of the closing statements would be similar to the order of cross-examination. The order will be Rocky Mountain Power, the Division of Public Utilities, the Office of Consumer Services, Vote Solar, Utah Clean Energy, and Vivint Solar.

Is there any objection to that order for closing statements on Tuesday afternoon?

MR. SELENDY: No objection. Thank you.

CHAIRMAN LEVAR: Okay. Thank you. I'm not hearing from anyone else.

So if any of you want to join us for eight hours Monday afternoon and evening, you're welcome to. There's

certainly no expectation of that.

Mr. Jetter, do you want to add something?

MR. JETTER: No. I had just, I think, turned my video and mute off, and it took a little bit of delay. I was just going to say there was no objection to your order of closing statements.

CHAIRMAN LEVAR: Okay.

MR. JETTER: I apologize for interrupting.

CHAIRMAN LEVAR: No problem.

And as we said yesterday, we do not intend to judge anyone's evidence based on how much time you spend summarizing it, but we also recognize that some parties have a lot more evidence to summarize than others. So we're going to allow up to 30 minutes apiece for closing arguments.

And with that, we'll see any of you who want to join us Monday. For that one, again, there's no expectation. Other than that, we will be in recess from the evidentiary hearing until 1:00 p.m. on Tuesday. Thank you.

(The matter adjourned at 1:12 p.m.)

CERTIFICATE

State of Utah )
ss.
County of Salt Lake )

I, Michelle Mallonee, a Registered Professional Reporter in and for the State of Utah, do hereby certify:

That the proceedings of said matter was reported by me in stenotype and thereafter transcribed into typewritten form;

That the same constitutes a true and correct transcription of said proceedings so taken and transcribed;

I further certify that I am not of kin or otherwise associated with any of the parties of said cause of action, and that I am not interested in the event thereof.

WITNESS MY HAND at Salt Lake City, Utah, this 15th day of October, 2020.

Michelle Mallonee, RPR, CCR
Utah CCR #267114-7801
Expires May 31, 2022

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