Selendy & Gay PLLC
Jennifer M. Selendy
Philippe Z. Selendy
Joshua S. Margolin
Margaret M. Siller
1290 Avenue of the Americas
New York, NY 10104
212-390-9000
jselendy@selendygay.com
pselendy@selendygay.com
jmargolin@selendygay.com
msiller@selendygay.com

Attorneys for Vote Solar

BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Matter of the Application of Rocky Mountain Power to Establish Export Credits for Customer Generated Electricity	**Docket No. 17-035-61 Phase 2**

REBUTTAL TESTIMONY OF ALBERT J. LEE, PH.D.

ON BEHALF OF

VOTE SOLAR

July 15, 2020

TABLE OF CONTENTS

List of Tables

List of Figures

I. INTRODUCTION

Q. Please state your name, business address, and title.

A. My name is Albert J. Lee. My business address is 601 New Jersey Avenue NW, Suite 400, Washington, DC 20001. I am the Founding Partner and Economist at Summit Consulting, LLC.

Q. On whose behalf are you testifying?

A. I am submitting this rebuttal testimony on behalf of Vote Solar.

Q. Please summarize your education and professional background for the record.

A. I am an economist with a Ph.D. (1999) and M.A. (1996) in economics from the University of California at Los Angeles (UCLA). My research, teaching, and professional practices have focused on statistical sampling and econometric modeling. I have designed and selected statistical samples and performed extrapolations for various federal agencies, including the U.S. Department of Defense, the U.S. Department of Housing and Urban Development, the U.S. Department of Labor, the U.S. Small Business Administration, and the U.S. Department of Transportation.

I have published articles in peer-reviewed and industry journals on mathematics and economics. I have lectured on statistics, advanced quantitative methods, and graduate-level econometrics at UCLA, the George Washington University, and Columbia University, respectively. I am a member of the American Economic Association ("AEA"), the American Statistical Association ("ASA"), and the Econometric Society. Since 2012, I have been an ASA Accredited Professional Statistician. I have served as an econometric

expert in several matters. In 2019, I was admitted as an expert in statistics in a case pending before the New York State Supreme Court. My curriculum vitae, included as Exhibit 5-AJL to my Revised Affirmative Testimony filed on May 8, 2020, lists the cases in which I testified or provided written affidavits in the past four years and the publications I have authored in the past ten years.

II. BACKGROUND

Q. Have you submitted testimony before the Utah Public Service Commission ("PSC" or "Commission")?

A. Yes, I submitted testimony in Phase 1 of this docket on April 10, 2018 based on my review of the statistical sample design proposed by Rocky Mountain Power's ("RMP" or the "Company") expert for capturing the deliveries, production, and export statistics for commercial and residential solar panel owners in the state of Utah. I provided live testimony regarding my opinions at the Phase 1 hearing of this proceeding on April 17, 2018. Additionally, I submitted Affirmative Testimony in Phase 2 of this matter on March 3, 2020 and Revised Affirmative Testimony on May 8, 2020.

III. PURPOSE OF TESTIMONY

Q. What is the purpose of this rebuttal testimony?

A. I was asked to provide my expert opinion of the Direct Testimony of Daniel MacNeil (the "MacNeil Testimony") submitted on February 3, 2020 filed on behalf of RMP and the Direct Testimony of Robert Davis (the "Davis Testimony") submitted on March 3, 2020 on behalf of the Division of Public Utilities ("DPU"). I provide my assessment of the

Davis Testimony first because Mr. Davis relies on the sample design and implementation I have critiqued in previous testimonies.

IV. SUMMARY OF OPINIONS

Q. Please provide a summary of your opinions regarding the Davis Testimony.

A. I provide the following opinions regarding the Davis Testimony:

1. The sample used by Mr. Davis to calculate the Full Requirement (i.e., Deliveries + Production – Export) figures in his Testimony is not representative of the entire RMP population;
2. The sampling weights used for calculating the export totals in the Davis Testimony and supporting files are incorrect;
3. Therefore, the total export figures in the Davis Testimony are calculated incorrectly and are an inaccurate estimation of the population;[1] and
4. The sample sizes are insufficient to meet the prescribed requirements of +/-10% of the estimated totals with a 95% confidence level as set forth by Mr. Kenneth Lee Elder in his Phase 1 testimony, on behalf of RMP, which detailed his sampling plans[2] for the studied populations.

[1] DPU provided the raw 15-minute interval data and calculations to Vote Solar in Response to Vote Solar's First Set of Data Requests to DPU. *See* DPU's Responses to Vote Solar 1st Set Data Requests – Confidential Attachments in Response to DPU 1.-1.3 (April 13, 2020). These files have been combined by subpopulation (i.e., Original 36, Schedule 135 Commercial, and Schedule 135 Residential) and are included as Exhibit 2-AJL, Exhibit 3-AJL, and Exhibit 4-AJL. The work was performed in Workpaper 2-AJL (file name "workpapers 02_Schedule 135 Residential Read In"), Workpaper 5-AJL (file name: "05_Schedule 135 Commercial Read In"), and Workpaper 8-AJL (file name: "08_Original 36 Read In").

[2] RMP, *Direct Testimony of Kenneth Lee Elder, Jr.*, Feb. 15, 2018.

Q. Please provide a summary of your opinions regarding the MacNeil Testimony.

A. I provide the following opinions regarding the MacNeil Testimony:

1. The proposed export credit rates ("ECR," referred to as "Schedule 137" rates) suggested by Mr. MacNeil would result in a reduction of export credits of 80% or more for residential customers as compared to the current amount of export credits;
2. The expected annual credits under the proposed Schedule 137 are so low that the fees for exporting energy will be higher than the export credits, meaning the average customer would effectively be paying to export energy back to the grid for the first three years; and
3. While the proposed rates include higher credits for designated peak hours, these peak rates are still well below the level that would be required to cover RMP's proposed fees. My conclusions regarding the low export credits would not change substantially even if the number of peak hours is expanded beyond what is proposed in the present Schedule 137 proposal. In other words, the proposed rates are insufficient regardless of the number of peak hours.

My lack of comments on any components of other parties' direct or affirmative testimony should not be interpreted as acquiescence or agreement. I reserve the right to express additional opinions, to amend or supplement the opinions in this testimony, or to provide additional rationale for these opinions as additional documents are produced and new facts are introduced during discovery and trial. I also reserve the right to express additional opinions in response to any opinions or testimony offered by other parties in this proceeding.

V. REBUTTAL OF THE DAVIS TESTIMONY

Q. Please define the relevant solar customer categories.

A. Customers who submitted an application to interconnect a distributed generation ("DG") system by November 15, 2017 are considered the "Legacy Period" customers, also known as the "Schedule 135 Customers" or "NEM customers," because these customers are on Net Metering Schedule 135 through December 31, 2035. The "Transition Period" customers, those who submitted an application to interconnect a DG system after November 15, 2017, are on Schedule 136 and are therefore referred to as the "Schedule 136 customers" or "Transition customers."[3] Mr. Davis also used data related to 35 customers who were part of a 2014 sample performed by RMP (which are called the "Original 36" customers).[4]

Q. Please describe your understanding of the Davis Testimony.

A. Mr. Davis used sample and census data from RMP to present the RMP Load Research Study ("LRS") and offer DPU's assessment of the RMP ECR proposal.[5] In particular, Mr. Davis was responsible for converting the 15-minute interval data from RMP's samples of the Original 36 and Schedule 135 customers, along with the census data from the Schedule

[3] Customers may be grouped in their schedules based on when they installed their system or when they submitted a complete interconnection application. In other words, if a customer submitted their complete application prior to November 15, 2017 but did not install their system by this date, they would be considered a Schedule 135 customer. Dates are based on the Settlement Stipulation. *See* RMP, *Rocky Mountain Power's Settlement Stipulation*, Docket No. 14-035-114, p. 3, Aug. 28, 2017, https://pscdocs.utah.gov/electric/14docs/14035114/296270RMPSettleStip8-28-2017.pdf.

[4] Mr. Davis gives no explanation for why only 35 of the "Original 36" customers are included in his data.

[5] DPU, *Direct Testimony of Robert A. Davis*, Mar. 3, 2020, lines 35–38 (hereinafter "*Davis Direct*").

136 customers, to produce population level total export figures.[6] In addition to producing the total export figures, Mr. Davis produced average Full Requirement (i.e., Deliveries + Production – Export) statistics for the Original 36 and Schedule 135 populations.[7] Mr. Davis was unable to produce the Full Requirement statistic for the Schedule 136 population because RMP did not collect production data for those units. In summary, the figures produced in the Davis Testimony include the following:

1. Extrapolated export totals by month and 15-minute interval for the Original 36 and Schedule 135 populations;
2. Extrapolated average Full Requirement statistics by month and 15-minute interval for the Original 36 and Schedule 135 populations; and
3. Export totals by month and 15-minute interval for the Schedule 136 customers.[8]

Q. Can you explain how Mr. Davis extrapolates results for the populations?

A. For the Schedule 136 customers, Mr. Davis uses the monthly and hourly totals. For the Original 36 and Schedule 135 customers, Mr. Davis uses the statistical sample and applies weights to extrapolate to their respective populations.

[6] *Davis Direct*, lines 231–36.
[7] For an example Full Requirement graphic, see Illustration 2 in the Davis Testimony. *Davis Direct*, lines 221–22.
[8] The analysis for the Original 36 and Schedule 135 utilize the sampling weights since they were derived from a sample, hence the usage of the term extrapolation. The Schedule 135 and 136 customer analyses were bifurcated by Commercial and Residential in accordance with the approach used by Mr. Davis.

Q. Before going into more detail regarding Mr. Davis's statistical sample extrapolation methods, can you describe in general how a statistical sample can be used to estimate population amounts?

A. Each item in a properly selected statistical sample represents a defined number of items in a population. Using the simplest type of statistical sample as an example, suppose that 100 solar arrays were randomly selected out of a population of 1,000 solar arrays. In this case, each sampled array would represent 10 arrays in the population. Each sampled array thus has a "weight" of 10 in the sample. To calculate the total capacity of the array population, the capacity of the sample would be added together and then multiplied by 10.

A slightly more complicated type of sample is a stratified random sample. Under this design, the population is first grouped into mutually exclusive groups (i.e., each element of the population must reside in one group, and only one group) and then a random sample is selected from each group. Suppose the hypothetical population of 1,000 referred to above is split into groups, or strata. The first stratum consists of the 900 arrays with a capacity of less than 20kW. The second stratum consists of the 100 arrays in which there is a capacity of more than 20kW. If a random sample of 50 is selected from each of these strata, each item in the sample from the first stratum of smaller capacity arrays would represent 18 arrays (i.e., 900 divided by 50), because the 50 arrays sampled must represent 900 arrays. Each item in the sample from the second stratum of larger capacity arrays would only represent 2 arrays (i.e., 100 divided by 50), because each of the 50 items sampled in the larger stratum only needs to represent 2 arrays. Therefore, the sampled arrays have a weight of 18 if they are in the first stratum and a weight of 2 if they are in the second stratum.

Thus, for the stratified sample described above, a population estimate of capacity could be obtained by: (1) summing the capacities of sampled arrays in the small-capacity stratum and multiplying by 18; (2) summing the capacities of sampled arrays in the large-capacity stratum and multiplying by 2; and then (3) adding the results from steps (2) and (3).

The keys to a proper statistical sample estimate are (1) granting each member of the population of interest a greater than zero chance of being selected and (2) properly weighting the sampled items. If the selection is not random – suppose only smaller arrays were available to be selected – then the ensuing estimate of the total population could be subject to bias because estimated capacity and output would be too small. If the weighting is incorrect, the estimate is also biased.

Suppose in the second sample that the two strata were weighted equally with a weight of 10 for each array. Then the 50 small-capacity arrays would have only represented 500 arrays, when there are actually 900 such arrays in the population, and the 50 large-capacity arrays would have effectively represented 500 arrays, when there are only 100 such arrays in the population. Thus, the incorrect weighting of 10 leads to under-weighting small-capacity arrays and over-weighting large-capacity arrays. Despite a properly selected sample, this improper weighting would bias the sample results toward larger capacity arrays. Thus, the estimates of total system capacity production or exports for the population would be too high as a result.

Q. What do you understand to be the pertinent conclusions of the Davis Testimony?

A. My understanding is that Mr. Davis concludes:

1. The omission of the Schedule 136 production data did not have an impact on the Full Requirements analysis.
2. The extrapolated total exports for the Original 36 and Schedule 135 customers for 2019 was [redacted] gigawatts, according to Mr. Davis's calculations.[9] These [redacted] gigawatts are broken down among the subpopulations as follows:
    a. Residential Schedule 135 totaled [redacted] gigawatts;
    b. Commercial Schedule 135 totaled [redacted] gigawatts; and
    c. Original 36 totaled [redacted] gigawatts.
3. The sample sizes used for the Original 36 and Schedule 135 populations were sufficient to meet the required level of precision of +/- 10% at the 95 percent confidence level.[10]

Q. What was your approach for reviewing the work performed by Mr. Davis?

A. My approach for reviewing the Davis Testimony was to replicate the analysis performed by Mr. Davis using my understanding of the sample design and the supporting work papers provided by Mr. Davis. Specifically, I used the following three methods:

---

[9] Exhibit 2-AJL, Exhibit 3-AJL, and Exhibit 4-AJL. The calculations were performed in Workpaper 3-AJL (file name: "03_Schedule 135 Residential Monthly Total Exports Extrapolations and Comparisons"), Workpaper 6-AJL (file name: "06_Schedule 135 Commercial Monthly Total Exports Extrapolations and Comparisons"), and Workpaper 9-AJL (file name: "09_Original 36 Monthly Total Exports Extrapolations and Comparisons").
[10] *Davis Direct*, lines 114–15.

1. To quantify the impact of the Full Requirement findings in the Davis Testimony, I tested the statistical difference between the Schedule 135 nameplate capacities and Schedule 136 nameplate capacities.[11]
2. To estimate the export totals for the Original 36 and Schedule 135 customers, I used the 15-minute interval data from the sampled customers, the population counts by stratum, and sample size counts by stratum to calculate the statistical sampling weights. Upon combining each of these pieces of information into a single dataset, I used standard extrapolated formulas for producing the respective population level export totals.[12],[13]
3. For calculating the precision statistics based on the extrapolated totals calculated above, I calculated standard confidence intervals to determine if the Original 36 and Schedule 135 samples provided the stated precision.[14] In particular, I tallied the number of times the calculated precision statistic (i.e., margin of error) was less than or equal to 10% of the calculated export total.[15,16]

Q. What information did you use to perform your review of the Davis Testimony?

A. I relied on the raw 15-minute interval export, delivery, and import data from the Original 36 and Schedule 135 customer samples. In addition, I relied on the 15-minute interval

[11] The figures were pulled from Vote Solar, *Revised Affirmative Testimony of Albert J. Lee, PhD*, May 8, 2020, Exhibit 2-AJL.
[12] *See* William G. Cochran, Sampling Techniques (Wiley ed., 3d ed. 1997).
[13] *See* Table 5, Table 6, and Table 7 in Appendix A.
[14] *See* Cochran, *supra* note 12.
[15] The equations used for Steps 2 and 3 are provided in Appendix B.
[16] Exhibit 2-AJL, Exhibit 3-AJL, and Exhibit 4-AJL. The calculations are included in Workpapers 4-AJL (file name: "04_Schedule 135 Residential Monthly Interval Export Extrapolation Totals"), Workpaper 7-AJL (file name: "07_Schedule 135 Commercial Monthly Interval Export Extrapolation Totals"), and Workpaper 10-AJL (file name: "10_Original 36 Monthly Interval Export Extrapolation Totals").

census data for the Schedule 136 customers. The 15-minute interval files for the Original 36 and Schedule 135 customer samples were disaggregated by month and included Mr. Davis's calculated 15-minute interval and monthly estimates used in his Testimony. These files also provided Mr. Davis's step-by-step calculations of the population figures provided in the Davis Testimony.[17]

I also received the statistical sampling plan and sample size scenario analyses used to derive the overall sample sizes and sample allocations by group, or strata, for the Original 36 and Schedule 135 populations.[18]

Q. What are your opinions of the Davis Testimony?

A. Upon review of the Davis Testimony and supporting workpapers, which included the calculations performed for producing his Full Requirement and export total figures, I do not agree with his population performance statistics. First, Mr. Davis's calculations of the Full Requirement figures do not account for the production for the Schedule 136 customers. This feature of the RMP statistical sample design was one of the main critiques I levied against their design in my Phase 1 Affirmative Testimony.[19] Statistical samples are required to provide each member of the population a chance of being included in the sample. Since the Schedule 136 customers were not included in the sampling frame—and therefore did not have the opportunity to be sampled—any findings in the Davis Testimony

[17] *See supra* note 9.
[18] Exhibit 7-AJL, UT Res DG_SamplingPlansProceduresSelections_201405, RMP's Responses to Vote Solar 11th Set Data Requests – Attach 11.7-1 (Apr. 17, 2020); Exhibit 8-AJL, UT CG_LoadResearchAnalysis_draft 201806, RMP's Responses to Vote Solar 11th Set Data Requests – Attach 11.7-2 (Apr. 17, 2020) .
[19] Vote Solar, *Direct Testimony of Albert J. Lee, Ph.D.*, Apr. 11, 2018, lines 40–50.

that include production values are incorrect. Second, the export totals for the Original 36 and Schedule 135 customers did not utilize the appropriate sampling weight calculation based on the sample design. Therefore, Mr. Davis's export totals are incorrect. Third, when I used the appropriate precision statistics formula for quantifying the degree of uncertainty of the export totals for the Original 36 and Schedule 135 populations, I found that the precision was lower than designed.

Q. Regarding your first opinion, what are your findings regarding the sample used by Mr. Davis to calculate the figures in his Testimony?

A. I compared the excluded Schedule 136 population to the included Schedule 135 population to see if there were inherent biases in the exclusion. I found that the average nameplate capacity for the Schedule 135 Residential customers was 6.4 kilowatts per hour and the average nameplate capacity for Schedule 136 Residential customers was 6.9 kilowatts per hour. This difference in nameplate capacity was statistically significant.[20]

Based on these findings, the Schedule 136 systems have more capacity, meaning they are likely to produce more electricity and return more energy to the grid (i.e., exports). Therefore, exclusive use of Schedule 135 systems in the samples likely biases the production estimates used for the Residential Full Requirement figures downward.

[20] The t-test is used to determine whether there is a significant difference between the means of two groups. Explanation and formulas for the t-test can be found in standard statistics textbooks. *See, e.g.*, James T. McClave, et al., Statistics for Business and Economics 435-40 (Pearson ed., 13th ed. 2018).

Q. What are your findings regarding the sampling weights used for calculating the export totals in the Davis Testimony?

A. Based on the workpapers provided by Mr. Davis on May 5, 2020,[21] I found that he was using incorrect sampling weights for the Original 36, Schedule 135 Residential, and Schedule 135 Commercial sampled items. According to Mr. Davis's workpapers, the sampling weights were calculated by the dividing the respective strata population size by the total population count.[22]

For example, for Stratum 1 of the Schedule 135 Residential population, Mr. Davis calculated the sampling weights by dividing the Stratum 1 population size of [redacted] by the total population size of [redacted] and arrived at a sampling weight of [redacted].[23]

The correct calculation of the sampling weights for Stratum 1 totals is to divide [redacted] (i.e., Stratum 1 population size) by 10 (i.e., Stratum 1 sample size). This results in a sampling weight of [redacted] for each sampled item in Stratum 1.[24]

As a result of miscalculating the sampling weights, the population export totals provided by Mr. Davis are underestimated. As explained above, the importance of the sampling weights is that they provide the number of units in each stratum that is represented by each sampled item. For example, based on the sampling weights in Mr. Davis's calculations, each sampled unit in Stratum 1 of the Schedule 135 Residential population represents [redacted]

---

[21] *See supra* note 16.
[22] For details on sampling weights, *see supra* lines 112–153.
[23] The weight of [redacted] is not technically a sampling weight but would be an appropriate weight to use in a calculation of the population average, but the Davis Testimony is calculating totals. *See, e.g.,* Steven K. Thompson, Sampling 103-04, (Wiley ed., 2d ed. 2002).
[24] *See* Cochran, *supra* note 12; Thompson, *supra* note 23.

units. In contrast, according to the correct sampling weights, a sampled unit in Stratum 1 represents approximately [redacted] units.

The results with corrected sampling weights for each of the sampled customers in the Schedule 135 Residential sampled are shown below in Table 1. As shown, the total monthly exports using the correct sampling weight calculations are materially higher than those calculated by Mr. Davis. For example, for Schedule 135 Residential exports, the estimated total is [redacted] gigawatts, 161 times more than the [redacted] gigawatts arrived at using Mr. Davis's calculations.[25] Overall, Mr. Davis's calculation results in [redacted] gigawatts of annual exports versus [redacted] gigawatts using the corrected calculation.

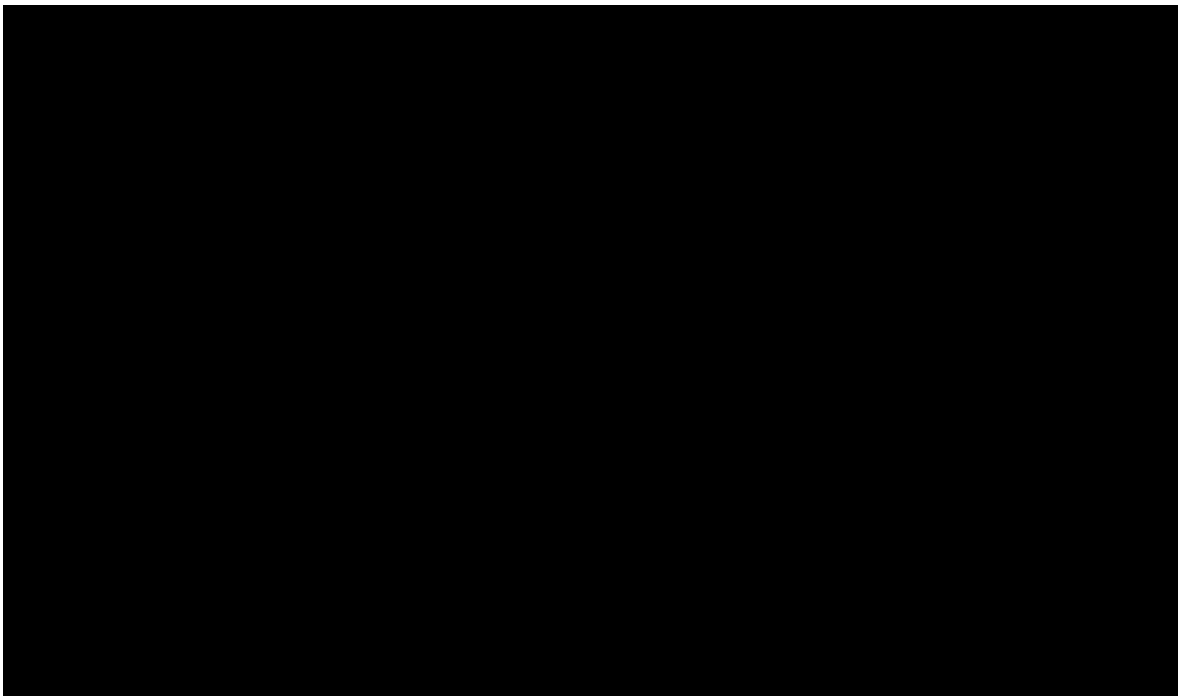
Table 1: Davis Results Versus Results with Correct Sample Weighting[26]

[redacted]

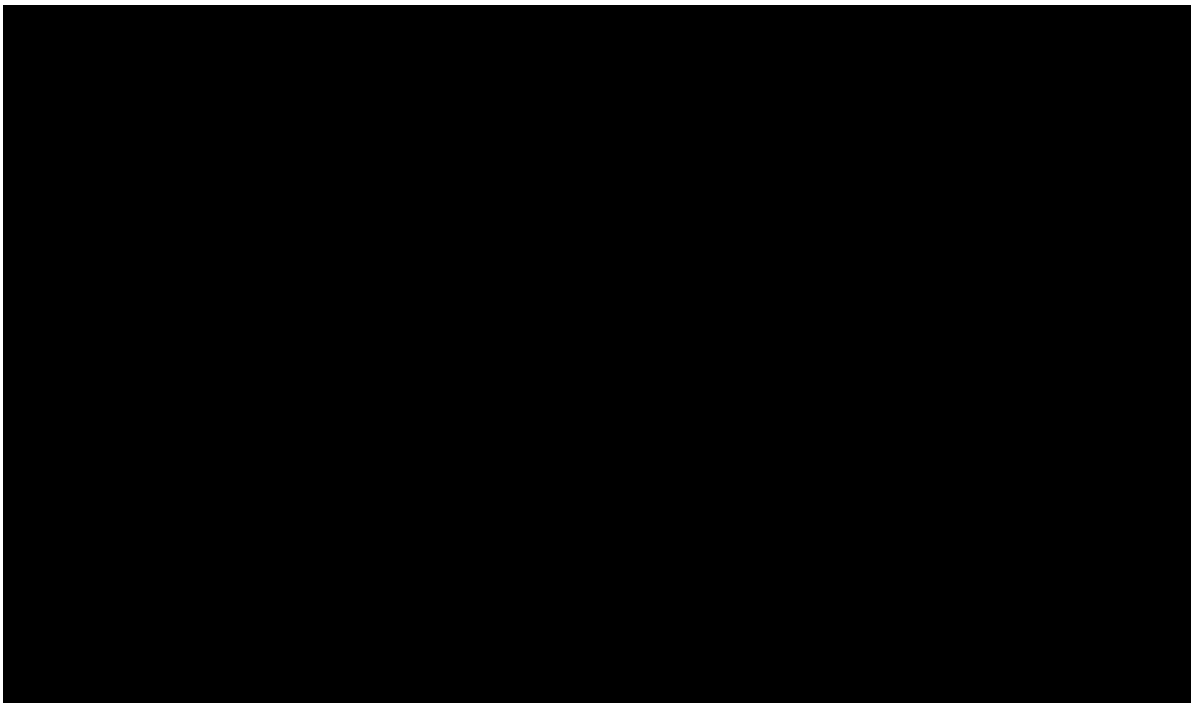
The implications of the material disparities in the sampling weights shown in Table 1 are further illustrated in the following three graphs in which I compare Mr. Davis's monthly export totals to the monthly export totals calculated using the sampling weights I derived.

[25] The total of these figures, which is about [redacted] gigawatts, is still below but much closer to the [redacted] gigawatts reported as the total exports to RMP in 2019 by Mr. Davis in Table 15. *See Davis Direct*, lines 287–89 (Table 15).
[26] *See supra* note 9.

[redacted] shows the monthly total export figures using the two sampling weight approaches for the Schedule 135 Residential population.



[redacted] shows the monthly total export figures using the two sampling weight approaches for the Schedule 135 Commercial population.



[redacted] shows the monthly total export figures using the two sampling weight approaches for the Original 36 population.

[redacted]

Q. What are your findings regarding the population estimates in the Davis Testimony?

A. As discussed above, the sample used by Mr. Davis to calculate the Full Requirement figures in his Testimony is not representative of the Utah RMP population. Additionally, the sampling weights, used for calculating the export totals in the Davis Testimony and supporting files, are incorrect. Therefore, the total export figures in the Davis Testimony do not reflect the statistical sample design and are a biased estimation of the population.

Q. What are your findings regarding the precision statistics used in the Davis Testimony?

A. Based on my review of the Davis Testimony and workpapers, Mr. Davis does not calculate the precision statistics for the population totals he produces based on the sampled figures.[27] Furthermore, when I calculated the precision statistics using standard formulas and compared the results against the industry standards cited by Mr. Davis in lines 114 and 115 of his Testimony, the precision statistics did not meet the prescribed requirements.[28] In other words, the sample sizes for the Original 36, Schedule 135 Residential, and Schedule 135 Commercial are insufficient to meet the required level of precision.

VI. REBUTTAL OF THE MACNEIL TESTIMONY

Q. Please describe your understanding of Mr. MacNeil's testimony.

A. I understand that the MacNeil Testimony addresses RMP's proposed export credit for solar exports. In particular, Mr. MacNeil proposed a Schedule 137 export credit that is purportedly based on the avoided energy costs, avoided line losses, and the integration costs of solar energy.[29] Mr. MacNeil presents RMP's proposal in summary form in a table called "Export Credit Summary by Element" as an attachment to his testimony.[30]

---

[27] *See, e.g.*, *Davis Direct*, lines 198-282, Illustrations 2-14.
[28] *See Davis Direct*, lines 114–15 & n.10 ("The Public Utilities Regulatory Policy Act (PURPA) defines the minimum Accuracy Level of +/- 10 percent at the 90 percent confidence level. 1992 Code of Federal Regulations (CFR), Title 18, Chapter 1, Subchapter K, Part 290.403, Subpart B.").
[29] RMP, *Direct Testimony of Daniel J. MacNeil*, Feb. 3, 2020, lines 41–58 (hereinafter "*MacNeil Direct*").
[30] *MacNeil Direct*, RMP Exhibit DJM-1 (file name: "Export Credit Summary by Element").

Q. What are your opinions of the MacNeil Testimony?

A. I was asked to evaluate the proposed Schedule 137 in the context of the 2019 exports of currently installed systems. My understanding is that Dr. Carolyn Berry was asked to evaluate the cost component of the MacNeil Testimony, and therefore I do not comment on that component of the MacNeil Testimony.[31] With respect to proposed Schedule 137, I found:

1. The rates proposed by Mr. MacNeil would result in a reduction of export credits over the current rate of export credits of more than 80% for residential customers;[32]
2. The expected annual credits under the proposal are so low that the fees for exporting energy will be higher than the export credits, meaning the customer would effectively be paying to export energy back to the grid for the first three years; and
3. While the proposed rates include higher credits for designated peak hours, these peak rates are still well below the level that would be required to cover RMP's proposed fees. My conclusions regarding the low export credits would not change substantially even if the number of peak hours is expanded beyond what is proposed in the present Schedule 137 proposal. In other words, the proposed rates are insufficient regardless of the number of peak hours.

[31] *See generally* Vote Solar, *Rebuttal Testimony of Carolyn Berry*, July 15, 2020.
[32] This is in line with Mr. Davis's Testimony, which estimated that the reduction would be 83% for residential customers. *Davis Direct*, lines 434-435.

Q. Can you briefly describe the method for determining export credits proposed by Mr. MacNeil?

A. Mr. MacNeil proposes a new ECR schedule, Schedule 137, which contains ECRs that differ by month of the year and hour of the day, averaging $24.13 per megawatt hour during peak times and $15.26 during off-peak times.[33] Mr. MacNeil designates the hours of 4 p.m.–8 p.m. as peak times during the months of June through September and designates the hours of 7 a.m.–9 a.m. and 6 p.m.–8 p.m. as peak times during the months of October through May. All other times are designated as off-peak times. The proposed Schedule 137 does not provide different rates for Residential versus Commercial customers.

Q. What was your approach to determining the impact of MacNeil's export credit proposal?

A. I used the ECRs proposed by Mr. MacNeil, which include different rates based on the month and the hour of the day in which the electricity is exported.[34] I used my estimates of total exports for each day and hour in 2019.[35] I then multiplied the total exports by the rates proposed in Schedule 137, applying the peak or off-peak rate as appropriate and applying different rates depending on the month.[36]

---

[33] *MacNeil Direct*, RMP Exhibit DJM-1.
[34] The MacNeil Testimony provides a table showing credits by month and time. *Id.*
[35] I used the daily and hourly figures, which I provided in Exhibit 1-AJL to my Revised Affirmative Testimony, filed May 8, 2020, in order to determine which export credits are subject to peak rates and which are subject to off-peak rates. Schedule 137 proposes the same rate for residential and commercial customers, so this consideration did not impact the calculation.
[36] *See* Exhibit 5-AJL. Exhibit 5-AJL is the product of Workpaper 11-AJL (file name: "11_MacNeil_Credit Analysis."), and Exhibit 6-AJL is the input file for Workpaper 11-AJL.

Q. What were the results of your calculations regarding the proposed Schedule 137?

A. The table below shows the estimated exports and the credits per customer that would accrue over a year, using the proposed Schedule 137.

Table 2: Credits Per Customer Under Proposed Schedule 137[37]

Month	Estimated Total Exports (Kilowatt hours) [38]	Average Exports per Customer (Kilowatt hours)	Credits per Customer Under Proposed Schedule 137
1	8,196,920	211	$3
2	8,350,778	215	$4
3	15,139,997	389	$5
4	23,746,971	611	$7
5	30,905,937	795	$10
6	29,561,464	760	$11
7	26,274,751	676	$15
8	21,878,946	563	$11
9	22,586,139	581	$10
10	25,529,718	657	$9
11	15,698,906	404	$6
12	6,790,325	175	$3
Total	234,660,851	6,036	$94

[37] *Id.*; Exhibit 5-AJL.

[38] While this figure uses my estimates of total exports for current customers, the total exports of 234,660,851 are within 2% of the total provided by Mr. Davis of [redacted]. *Davis Direct*, lines 288–89 (Table 15).

As shown in the table above, I found that, on a per customer basis, each customer would have received an average of $94 in credits annually.[39] These credits are not enough to overcome the proposed $150 application fee and a proposed $160 metering fee.[40]

Table 3 summarizes the proposed Schedule 137 credits and fees, and indicates that, for the average customer, the initial credits from RMP would only begin to exceed the total fees in the fourth year of exports, after about 20,000 kilowatt hours have been provided by the customer to RMP. As shown in the table, if we instead applied the Schedule 136 residential rates, the average customer would have received $1,833 in credits during that same time period.

Table 3: Average Customer Fees Far Exceed Credits[41]

Statistic	Amount
Average Export Credits per year[42]	$94
Cost in Initial Fees[43]	$310
Number of Years Before Total Export Credits Exceed Proposed RMP First Year Fees[44]	3.3
Average Kilowatt Hours Provided to RMP Prior to a Customer Covering Proposed First Year Fees using Export Credits[45]	19,919
Amount of revenue RMP earns from selling these exports, per Customer (at current Schedule 136 residential retail rate of $.092 per kilowatt)[46,47]	$1,833

[39] This includes both commercial and residential customers. The MacNeil proposal does not provide different pricing for commercial and residential exports. Since commercial exports are greater than residential, the average residential customer would receive less than $96 in credits under the proposed Schedule 137, and the average commercial customer would receive more than $96.
[40] RMP proposes "a $150 non-refundable application fee and a $160 customer generation meter fee." *Davis Direct*, lines 388–89.
[41] This chart does not include any system installation costs borne by the customer.
[42] Exhibit 5-AJL.
[43] *MacNeil Direct*, line 389.
[44] Exhibit 5-AJL.
[45] *Id*.
[46] *Id*.
[47] *Davis Direct*, line 430.

Q. Did you consider how the designation of peak versus off-peak hours proposed in Schedule 137 affected your calculations?

A. Yes. I analyzed the sensitivity of the designation of which hours were peak and off-peak by calculating the exports credits under a scheme in which all time is considered off-peak and one in which all time is considered peak. I show the results of those calculations in Table 4 below. As shown in Table 4 in the column labeled "Sensitivity 1," I found the credits would have been $90 per customer for 2019, on average, if all credits were for off-peak time. As shown in Table 4 in the column labeled "Sensitivity 2," I calculated the total credits under a scheme in which all time is considered peak. That calculation shows an average export credit per customer of $156. This leads me to conclude that, while increasing the number of peak hours would increase the credits substantially, they would still be well below RMP's proposed fees for exporting electricity, which are $310 in the first year.

Table 4: Sensitivity of Proposed Credits to Peak Versus Off-Peak Time[48]

Month	Average Exports per Customer (Kilowatt hours)	Proposed Schedule 137 Off-Peak Reimbursement per Kilowatt Hour	Sensitivity 1: Average Credits per Customer if All Time were Off-Peak Time	MacNeil Proposed Schedule 137 Peak Reimbursement per Kilowatt Hour	Sensitivity 2: Average Credits Per Customer if All Time were Peak Time
January	211	$0.01611	$3	$0.02619	$6
February	215	$0.01628	$3	$0.03798	$8
March	389	$0.01336	$5	$0.03132	$12
April	611	$0.01031	$6	$0.02328	$14
May	795	$0.01192	$9	$0.01719	$14
June	760	$0.01389	$11	$0.02095	$16
July	676	$0.02130	$14	$0.03260	$22
August	563	$0.01825	$10	$0.03536	$20
September	581	$0.01577	$9	$0.02083	$12
October	657	$0.01375	$9	$0.02669	$18
November	404	$0.01444	$6	$0.02371	$10
December	175	$0.01751	$3	$0.02798	$5
Total	**6,036**		**$90**		**$156**

Q. Can you summarize your conclusions with respect to the MacNeil Testimony?

A. In summary, the proposed Schedule 137 provides export credit rates that are so low that the proposed initial fees will outpace the annual credits, given the current solar exports for the average customer. Even if the peak hours are expanded, the annual export credits would still be well below the proposed initial fees. This would mean that new customers would be providing electricity to RMP for years before benefitting for providing exports to the grid.

[48] *See supra* note 36.

VII. CONCLUSION

Q. What are your conclusions regarding the Davis Testimony?

A. My conclusions regarding the Davis Testimony are as follows:

a. Failing to consider the lack of inclusion of the Schedule 136 customers in the sample biases the results of the Full Requirement figures;

b. Using an inappropriate methodology for determining sampling weights caused Mr. Davis to underestimate the export totals in his Testimony for the Original 36 and Schedule 135 customers. Mr. Davis estimates total exports of just [redacted] gigawatts, but the RMP sample, correctly weighted, would have led to an estimate of total exports of [redacted] gigawatts;[49] and

c. Mr. Davis did not provide any justification for his approval of the sample sizes used for the Original 36 and Schedule 135 populations. In contrast, when I calculated the appropriate precision statistics, the sample sizes used were determined to be insufficient to meet the requirements provided in the Davis Testimony.

Given these deficiencies, I do not believe the numbers in the Davis Testimony are sufficiently reliable for downstream calculations if they are based on the sample of customers in his analysis.

[49] See Table 1, *supra* line 250, for details.

Q. What are your conclusions regarding the MacNeil Testimony?

A. Using 2019 data and the exports analysis from my Revised Affirmative Testimony, filed on May 8, 2020, I find that the average customer would receive an export credit of around $100 under the proposed Schedule 137 described by Mr. MacNeil. This is well below the application and metering fees Mr. Davis proposed for RMP. As acknowledged by RMP, these proposed export credits are about an 80% reduction for residential customers as compared to those received for Schedule 136. Furthermore, increasing the number of hours that are credited at peak rates would not meaningfully change my conclusions.

Q. Do your opinions from your Revised Affirmative Testimony remain unchanged?

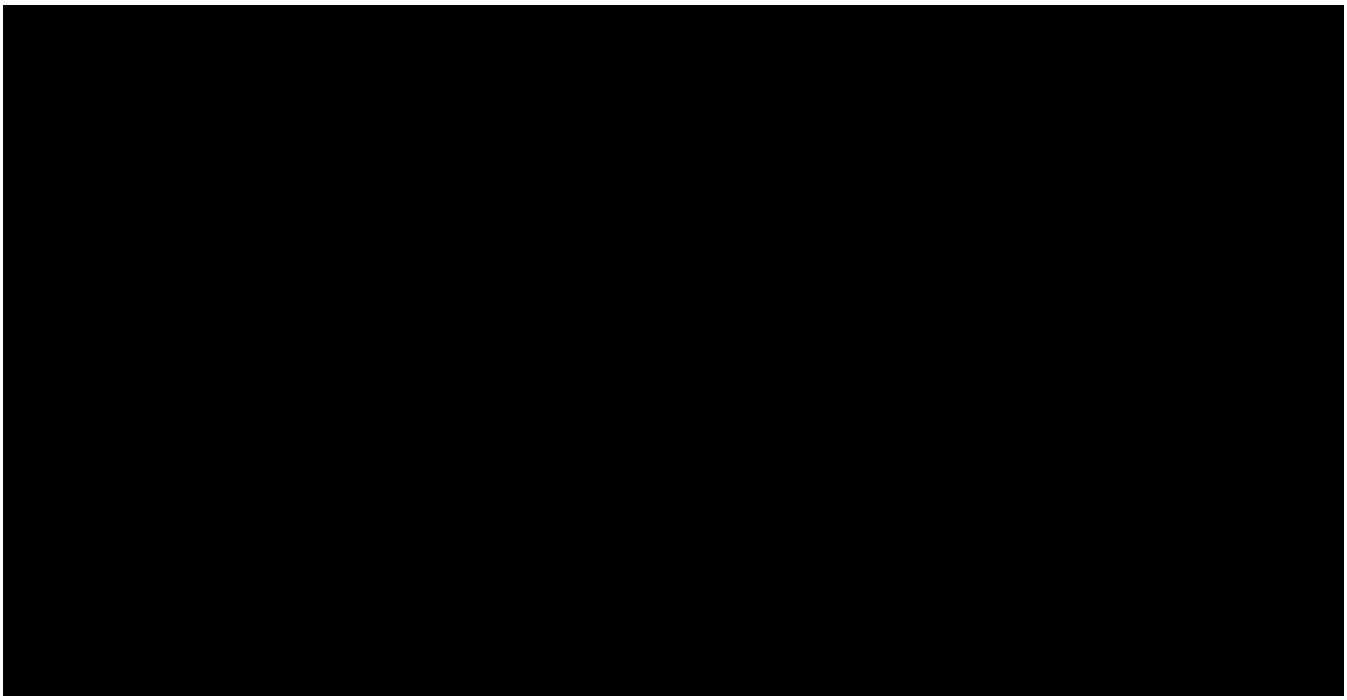
A. Yes.

Q. Does this conclude your rebuttal testimony?

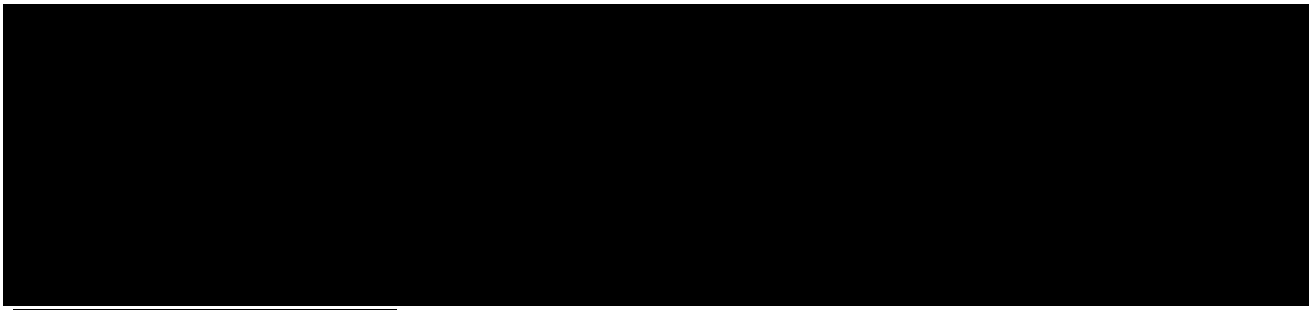
A. Yes.

APPENDIX A – Monthly Total Export Comparisons

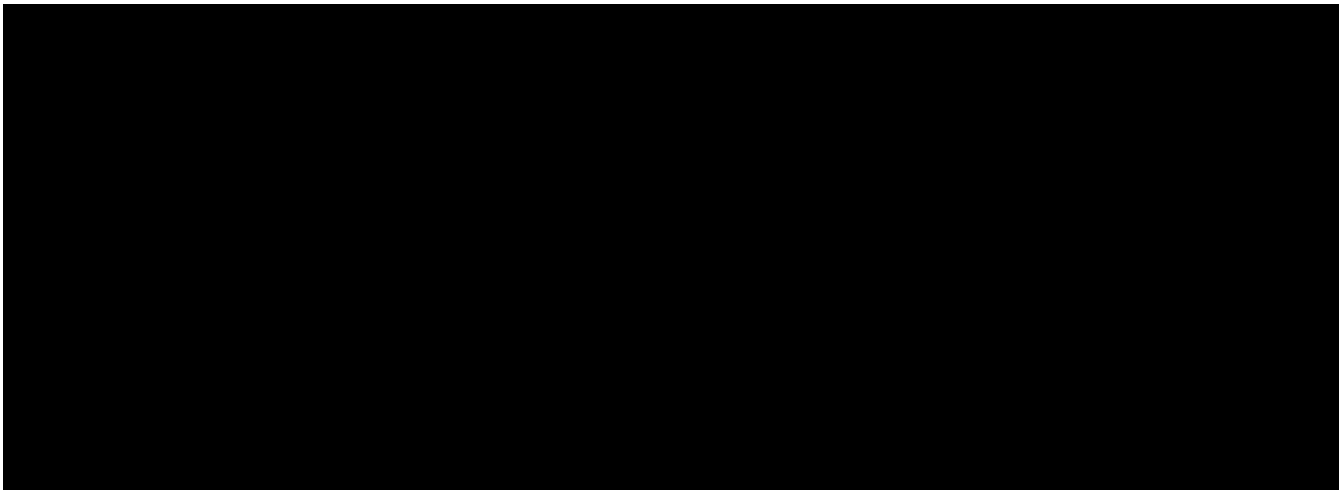
The table below provides the monthly total export comparisons for the Schedule 135 Residential customers between Mr. Davis's and my calculations. The table also provides the ratio of the respective export calculations (Dr. Lee divided by Mr. Davis).



The table below provides the monthly total export comparisons for the Schedule 135 Commercial customers between Mr. Davis's and my calculations. The table also provides the ratio of the respective export calculations (Dr. Lee divided by Mr. Davis).



[50] Exhibit 2-AJL. Calculations performed in Workpaper 3-AJL.
[51] Exhibit 3-AJL. Calculations performed in Workpaper 6-AJL.

400 

401 The table below provides the monthly total export comparisons for the Original 36
402 customers between Mr. Davis's and my calculations. The table also provides the ratio of
403 the respective export calculations (Dr. Lee divided by Mr. Davis).

404 

405

[52] Exhibit 4-AJL. Calculations performed in Workpaper 9-AJL.

APPENDIX B – Mathematical Formulations

Equation 1: Unbiased Estimator of the Population Total

$$\hat{\tau}_{st} = \sum_{h=1}^{H} N_h \overline{y}_h$$

where N_h is the population size for stratum *h* and

Equation 2: Unbiased Estimator of the Variance of the Population Total

$$\widehat{var}(\hat{\tau}_{st}) = \sum_{h=1}^{H} N_h (N_h - n_h) \frac{s_h^2}{n_h}$$

where

$$s_h^2 = \frac{1}{n_h - 1} \sum_{i=1}^{n_h} \left(y_{hi} - \overline{y}_h \right)^2$$

CERTIFICATE OF SERVICE

I hereby certify that on this 15th day of July 2020 a true and correct copy of the foregoing was served by email upon the following:

DIVISION OF PUBLIC UTILITIES:

Chris Parker	chrisparker@utah.gov
William Powell	wpowell@utah.gov
Patricia Schmid	pschmid@agutah.gov
Justin Jetter	jjetter@agutah.gov
Erika Tedder	etedder@utah.gov
	dpudatarequest@utah.gov

OFFICE OF CONSUMER SERVICES:

Alex Ware	aware@utah.gov
Philip Hayet	phayet@jkenn.com
Samuel Wyrobeck	swyrobeck@jkenn.com
Michele Beck	mbeck@utah.gov
Cheryl Murray	cmurray@utah.gov
Robert Moore	rmoore@agutah.gov
Victor Copeland	vcopeland@agutah.gov
Bela Vastag	bvastag@utah.gov

SALT LAKE CITY CORPORATION:

Christopher Thomas	christopher.thomas@slcgov.com
Megan DePaulis	megan.depaulis@slcgov.com

UTAH SOLAR ENERGY ASSOCIATION:

Amanda Smith	asmith@hollandhart.com
Ryan Evans	revans@utsolar.org
Engels J. Tejada	ejtejada@hollandhart.com
Chelsea J. Davis	cjdavis@hollandhart.com

WESTERN RESOURCE ADVOCATES:

Nancy Kelly	nkelly@westernresources.org
Steven S. Michel	smichel@westernresources.org
Sophie Hayes	sophie.hayes@westernresources.org

UTAH CLEAN ENERGY:

Sarah Wright	sarah@utahcleanenergy.org
Kate Bowman	kate@utahcleanenergy.org
Hunter Holman	hunter@utahcleanenergy.org

VOTE SOLAR:

Sachu Constantine	sachu@votesolar.org
Claudine Custodio	claudine@votesolar.org
Jennifer M. Selendy	jselendy@selendygay.com
Philippe Z. Selendy	pselendy@selendygay.com
Joshua Margolin	jmargolin@selendygay.com
Margaret M. Siller	msiller@selendygay.com

AURIC SOLAR:

Elias Bishop	elias.bishop@auricsolar.com

ROCKY MOUNTAIN POWER:

Richard Garlish	Richard.garlish@pacificorp.com
Emily Wegener	Emily.Wegener@pacificorp.com
Jana Saba	jana.saba@pacificorp.com
Joelle Steward	joelle.steward@pacificorp.com
	datarequest@pacificorp.com
	utahdockets@pacificorp.com

VIVINT SOLAR, INC.:

Stephan F. Mecham	sfmecham@gmail.com

/s/ Joshua S. Margolin