BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS
TOM FORESE- CHAIRMAN
DOUG LITTLE
BOB BURNS
ANDY TOBIN
BOYD DUNN

IN THE MATTER OF THE APPLICATION OF TUCSON ELECTRIC POWER COMPANY FOR APPROVAL OF ITS 2016 RENEWABLE ENERGY STANDARD IMPLEMENTATION PLAN.	DOCKET NO. E-01933A-15-0239
IN THE MATTER OF THE APPLICATION OF TUCSON ELECTRIC POWER COMPANY FOR THE ESTABLISHMENT OF JUST AND REASONABLE RATES AND CHARGES DESIGNED TO REALIZE A REASONABLE RATE OF RETURN ON THE FAIR VALUE OF THE PROPERTIES OF TUCSON ELECTRIC POWER COMPANY DEVOTED TO ITS OPERATIONS THROUGHOUT THE STATE OF ARIZONA AND FOR RELATED APPROVALS.	DOCKET NO. E-01933A-15-0322 **NOTICE OF FILING PHASE 2 SURREBUTTAL TESTIMONY OF LOUIS WOOFENDEN ON BEHALF OF INTERVENOR BRUCE PLENK**

Please take notice that the original and 13 copies of the Surrebuttal Testimony of Louis Woofenden were filed with the Arizona Corporation Commission and copies served on all parties per the attached service list on this 29th day of September, 2017.

Respectfully submitted

s/ BP

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Q Please state your name and business address

A Louis Woofenden, 101 W 5th Street, Tucson, AZ 85705

Q By whom are you employed and in what capacity?

A Net Zero Solar, LLC, as Engineering Director/Owner

Q How long have you been involved with solar energy and the solar energy business?

A I began working professionally in solar energy in 2003, starting in full-time installation here in Tucson, and eventually moving to additional roles. Before 2003, I had significant experience in solar energy installation on a volunteer basis, including living in an off-grid solar home during the first eighteen years of my life.

Q What is your educational background?

A I hold a Professional Science Master's in Solar Energy Engineering and Commercialization from Arizona State University. I also hold a B.S. in Engineering Management with a minor in Electrical Engineering from the University of Arizona. I have completed several independent courses in renewable energy. I have been a NABCEP Certified PV Installation Professional since 2004.

Q What are your present duties at Net Zero Solar?

A As a small business with eleven partners and employees, my duties are varied. I'm responsible for engineering, supervising system design, process development, quality control, technical consultation, and our educational social media strategy. I built and maintain proprietary software solutions to model likely financial outcomes for our customers.

I also do the large majority of our policy work, including developing understanding of current and proposed utility rate structures affecting solar electric installations, development of policy statements, comments on matters such as this case, and mobilization of our customer base to advocate for positive policy outcomes.

As needed, I still put on my tool belt to install solar electric systems for our clients, typically one or two days each week.

Q Are you familiar with Tucson Electric Power and its regulations and procedures?

A I am. I have been involved with hundreds of solar electric installations in TEP's service territory, and am familiar with their current and proposed rate structures, their interconnection process, and their installation requirements.

Q What about UNS and its procedures?

A Yes. I have been involved with a number of solar electric installations in the UNS service territory. However, my knowledge regarding UNS rate structures is less comprehensive when compared to my understanding of TEP rate structures.

Q Have you previously testified before the Arizona Corporation Commission?

A No, I have not. I have provided public comment at numerous hearings, however, and have submitted information to the docket for various proceedings.

Q Are you familiar with the Commission's recent decision in the Value of Distributed Generation case?

A Yes.

Q On whose behalf are you testifying today?

A For Bruce Plenk, an individual TEP ratepayer and intervenor in this case.

Q Have you had an opportunity to review the testimony filed in this case by TEP and other intervenors?

A Yes. I have reviewed the Phase II Direct Testimony of Craig A. Jones, the Phase II Testimony of Kevin Koch, the Phase II Rebuttal Testimony of

Dallas J. Dukes, the Phase II Rebuttal Testimony of Craig A Jones, and the Phase II Rebuttal Testimony of Richard D Bachmeier.

Q How is your testimony organized?

A I will cover the following topics in my testimony:

1-The imposition of an export rate below current retail prices, DG grid access charge, and increased DG meter fee will significantly reduce the financial benefits of customer-owned solar in TEP (and UNS) territory, and increase uncertainty for customer-owned solar. The cumulative imposition of these new charges will substantially lengthen the payback period for customer-owned solar in the TEP service territory.

2- The DG production meter provides no benefit to DG customers.

3- TEP should make customer load data easily available in sufficient resolution to allow consumers and renewable energy providers to model performance under various rate structures.

4- The local Tucson solar industry will be hurt and consumer choice will be reduced if the TEP proposals are adopted, because the likely outcome of these proposals will be a substantial decrease in the number of new customer-owned systems in the TEP (and UNS) service territories. This will cost jobs and remove energy options for local consumers.

While I am not covering all aspects of the TEP proposals in my testimony, that does not mean I agree with all of the other proposals. I have chosen to focus on what I see as the most significant aspects of their Phase 2 positions and the ones that will hurt local solar the most.

THE IMPOSITION OF AN EXPORT RATE BELOW CURRENT RETAIL PRICES, DG GRID ACCESS CHARGE, AND INCREASED DG METER FEE WILL SIGNIFICANTLY REDUCE THE FINANCIAL BENEFITS OF CUSTOMER-OWNED SOLAR IN TEP (AND UNS) TERRITORY, AND INCREASE UNCERTAINTY FOR CUSTOMER-OWNED SOLAR. THE CUMULATIVE IMPOSITION OF THESE NEW CHARGES WILL SUBSTANTIALLY LENGTHEN THE PAYBACK PERIOD FOR CUSTOMER-OWNED SOLAR IN THE TEP SERVICE TERRITORY.

Q TEP has proposed an initial export rate of 9.73¢/kWh for all "extra" power generated by solar customers at their home or business, a time of use rate with generally lower volumetric rates (TRRESTDG), a monthly grid access charge for distributed generation systems of $2.50 per kW-DC, and an increase in the distributed generation meter fee to $4.32 per month. When taken together, what impact would these changes have on the financial benefits of customer-owned distributed generation in TEP's service territory?

A The overall effect of these proposed changes would be to make rooftop solar largely uneconomic in TEP's service territory. Although I believe that some consumers would still choose to install solar for other reasons, such as desire for independence, interest in supporting our local economy, and environmental beliefs, it is highly likely that the number of TEP ratepayers choosing to install solar would drop precipitously.

Q Why do you believe that solar would be uneconomic under TEP's proposed rates?

A I have completed significant modeling regarding the economics of residential solar, comparing TEP bills under TEP's TRRES Residential Basic Service rate, and TEP bills for customers with rooftop solar under the proposed TRRESTDG Residential Service Time-of-Use Distributed Generation rate. The modeling process was as follows:

1. Obtain 15-minute customer energy consumption and solar electric system output data for thirteen residential solar electric systems in the Tucson area, using energy monitoring systems installed by Net Zero Solar. Basic information about these systems is shown in Table 1.
2. For these thirteen customers, for each 15-minute period of my 15-year modeling period, calculate solar production, energy exported to the grid, energy imported from the grid, and determine the amount of any energy imported during an on-peak period.
3. For each of these thirteen customers, organize data into 180 monthly totals for energy consumed, energy imported from the grid,

percentage on-peak grid use, energy exported to the grid, and solar production.

4. Calculate 180 monthly bills under the TRRES rate for each customer as if they did not have rooftop solar, calculate 180 monthly bills for the same customer under the TRRESTDG if they had installed rooftop solar, and find any savings provided from solar for the each of the 180 months. These bill calculations include riders, taxes, and assessments.
5. Calculate net solar installation costs for a purchased system for each of the thirteen customers as if the solar was installed in 2018, 2019, 2020, 2021, and 2022, including appropriate sales taxes, the federal residential renewable energy tax credit, and the Arizona residential renewable energy tax credit.
6. Determine how many months it would take to recoup the net solar installation cost through bill savings, or "simple payback."

Table 1: Basic information for modeled solar electric systems.

System Information					
	Installation Jurisdiction	**System Size, kW DC**	**Solar as % of Total Energy Use**	**Percent Self-Generation**	**Year 1 System Performance (kWh/DC-kW/year)**
Cust. 1	Pima County	11.16	96.92%	41.67%	1925.7
Cust. 2	Pima County	11.115	109.60%	58.31%	1927.1
Cust. 3	Town of Marana	9.92	83.32%	58.92%	1886.9
Cust. 4	City of Tucson	3.55	88.17%	29.48%	1707.7
Cust. 5	City of Tucson	5.16	122.72%	32.89%	1709.5
Cust. 6	Town of Sahuarita	7.44	104.97%	40.35%	1903.2
Cust. 7	Pima County	9.92	107.71%	48.94%	1836.7
Cust. 8	City of Tucson	3.1	86.51%	38.70%	1982.3
Cust. 9	City of Tucson	7.44	99.89%	52.04%	1979.1
Cust. 10	Pima County	10.54	61.25%	57.45%	1793.6
Cust. 11	Town of Oro Valley	6.27	99.57%	56.71%	1887.1
Cust. 12	Town of Marana	10.26	110.15%	55.74%	1630.4
Cust. 13	Town of Marana	12.48	102.35%	43.17%	1732.0

Q In any model, assumptions can often change the outcome of that model. Can you briefly explain each of the major assumptions made in your model?

A Yes, I can. My assumptions include:

- An installed cost per-watt of $2.80 (before sales tax), based on information from Net Zero Solar.
- Sales tax values based on the actual installation jurisdiction.

- A 6% annual reduction in installation costs, based on recent cost reduction trends in National Renewable Energy Lab's *U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017*[1].
- An annual decrease in solar electric system production of 0.5% of initial system production value.
- No change in customer energy consumption.
- Initial export rates for new solar customers decreasing 10% each year, but remaining locked in for ten years for each customer installing solar within a "tranche."
- Export rates for consumers dropping to current export rates once the ten-year lock-in period is completed.

Q When taken together, do these assumptions reflect a worst-case scenario, best-case scenario, or something in between?

A. I believe these assumptions represent a best-case scenario. Other probable scenarios would result in longer payback times. Due to the pending trade case regarding imported solar electric modules and cells, there is considerable doubt regarding the ability of solar installers to lower their prices over the next few years. In fact, prices may even rise, leading directly to a large increase in payback times.

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[1] U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017, page iv, available at https://www.nrel.gov/docs/fy17osti/68925.pdf

Q Can you summarize the results of this modeling?

A A summary is shown below as Table 2. In every case, simple payback is over ten years for installations in 2018 (under the initial export rate). In many cases, simple payback is much longer. This information is also shown in Figure 1. Even under the current net metering policy, I find that most consumers do not choose to install solar if the simple payback is beyond ten years. With the increased uncertainty and reduced financial payback due to the export rate dropping beyond year ten, I expect that consumers will want to see simple payback somewhat less than ten years before they choose to install solar.

For systems installed in 2019, I expect payback times similar to those for systems installed in 2018 (see Figure 2), but as the federal residential renewable energy tax credit begins to decline in 2020, simple payback times will climb (see Figure 3). By 2021, all modeled customers would have payback periods of over eleven years, with several customers over fifteen years, as shown in Figure 4. With the full phase-out of the Federal residential tax credit in 2022, all customers would have a payback period of over fifteen years, as shown in Figure 5.

Table 2: Calculated Payback for Systems Installed 2018-2022

Simple Payback Period in Years					
	Installed 2018	**Installed 2019**	**Installed 2020**	**Installed 2021**	**Installed 2022**
Customer 1	11.5	11.5	12.4	13.3	15+
Customer 2	11.3	10.8	11.4	11.7	15+
Customer 3	10.8	10.5	10.9	11.3	15+
Customer 4	15+	15+	15+	15+	15+
Customer 5	15+	15+	15+	15+	15+
Customer 6	13.3	13.2	14.4	15+	15+
Customer 7	12.8	12.6	13.5	14.3	15+
Customer 8	11.7	11.6	13.3	14.5	15+
Customer 9	10.7	10.5	11.2	11.6	15+
Customer 10	10.9	10.5	11.0	11.4	15+
Customer 11	12.1	11.6	12.3	12.7	15+
Customer 12	15+	15+	15+	15+	15+
Customer 13	15+	14.7	15+	15+	15+

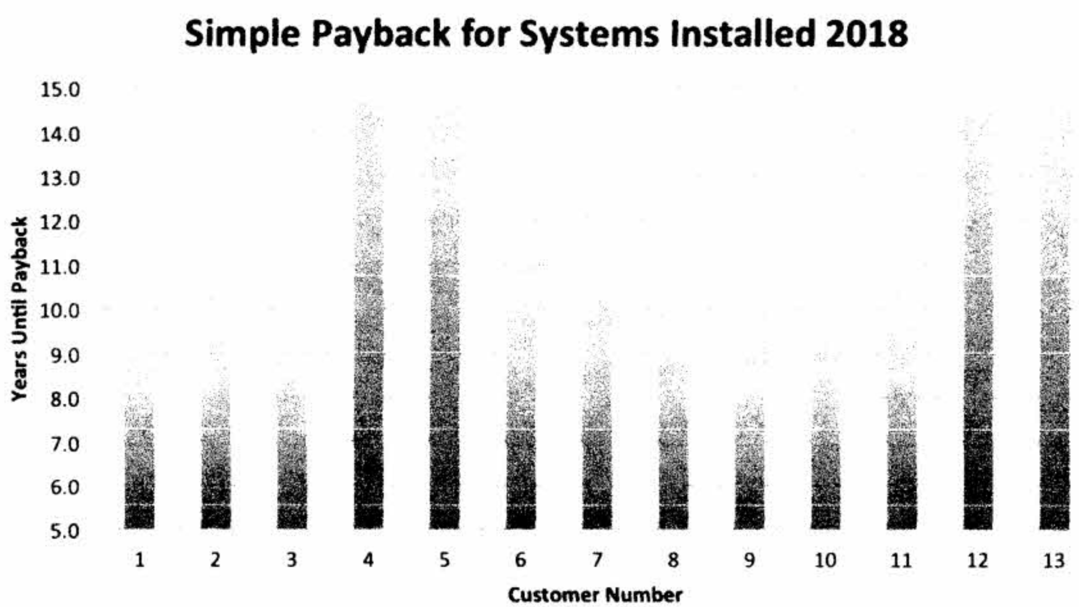

Figure 1: Simple payback for modeled systems, if installed in 2018

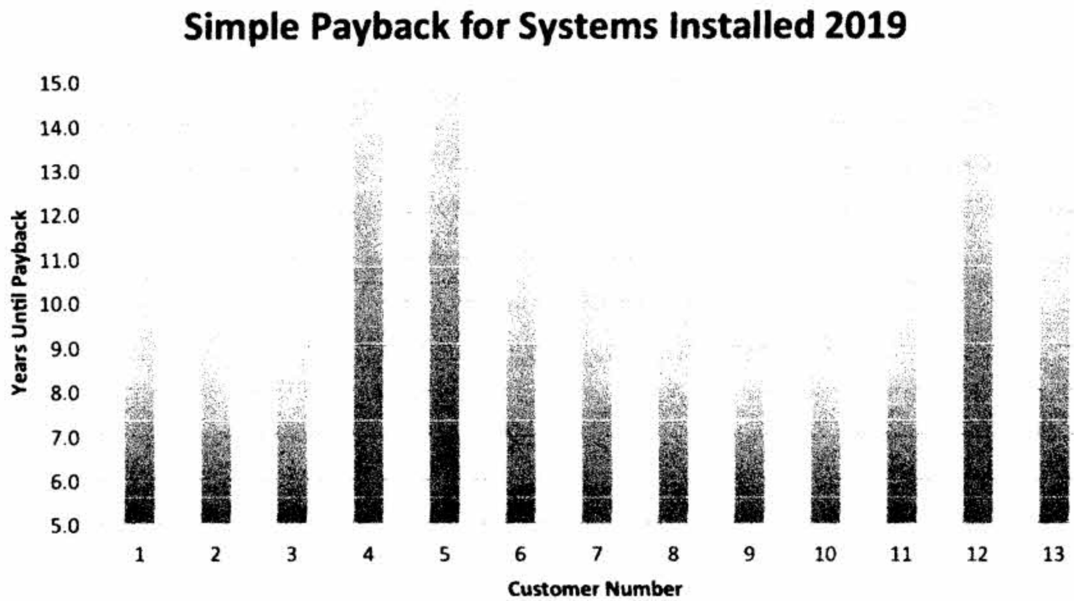

Figure 2: Simple payback for modeled systems, if installed in 2019

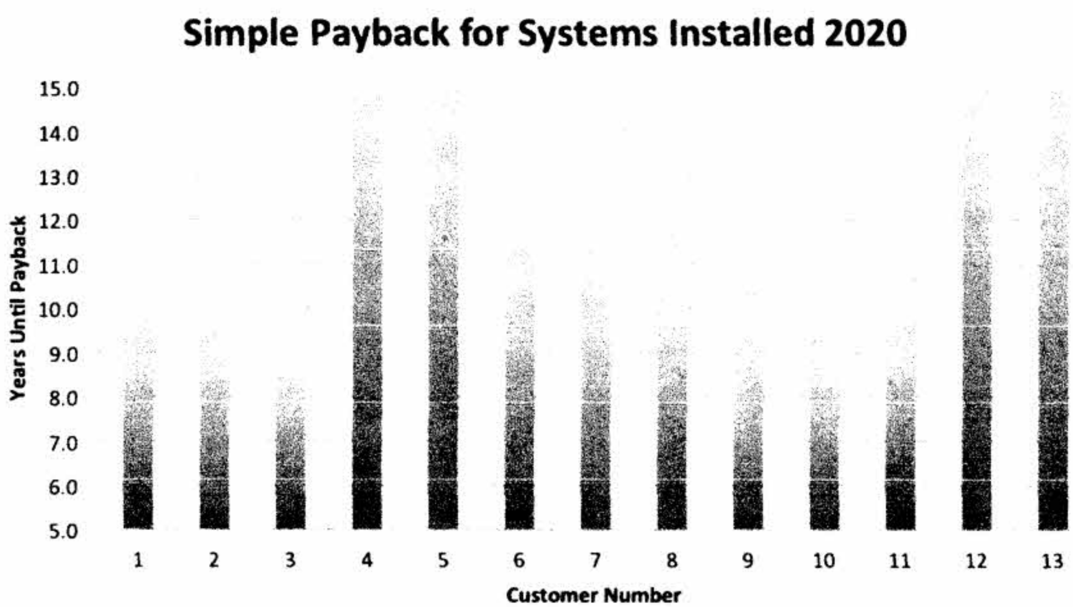

Figure 3: Simple payback for modeled systems, if installed in 2020

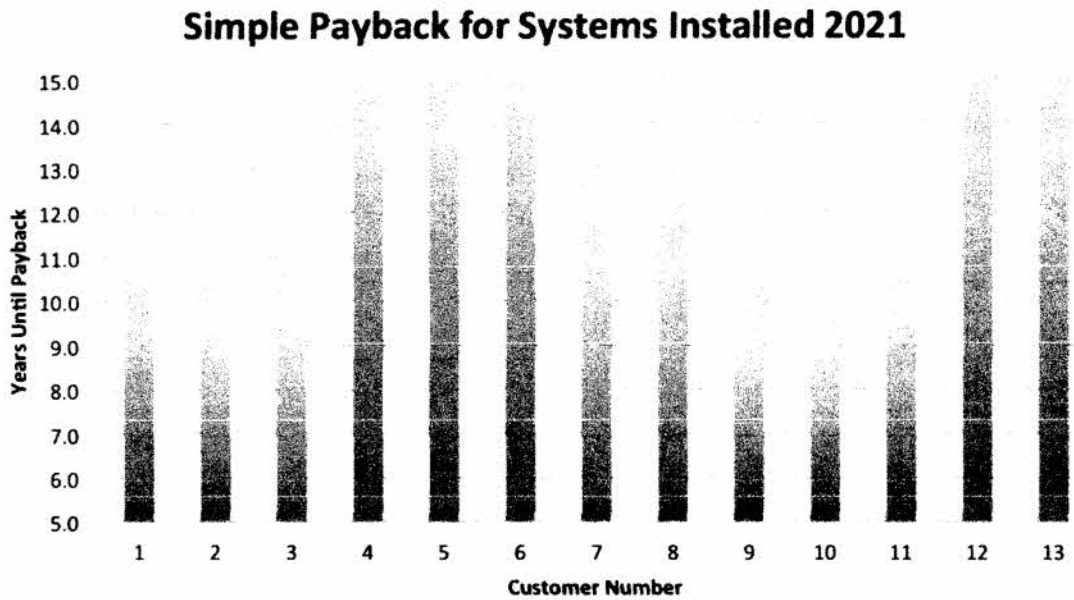

Figure 4: Simple payback for modeled systems, if installed in 2021

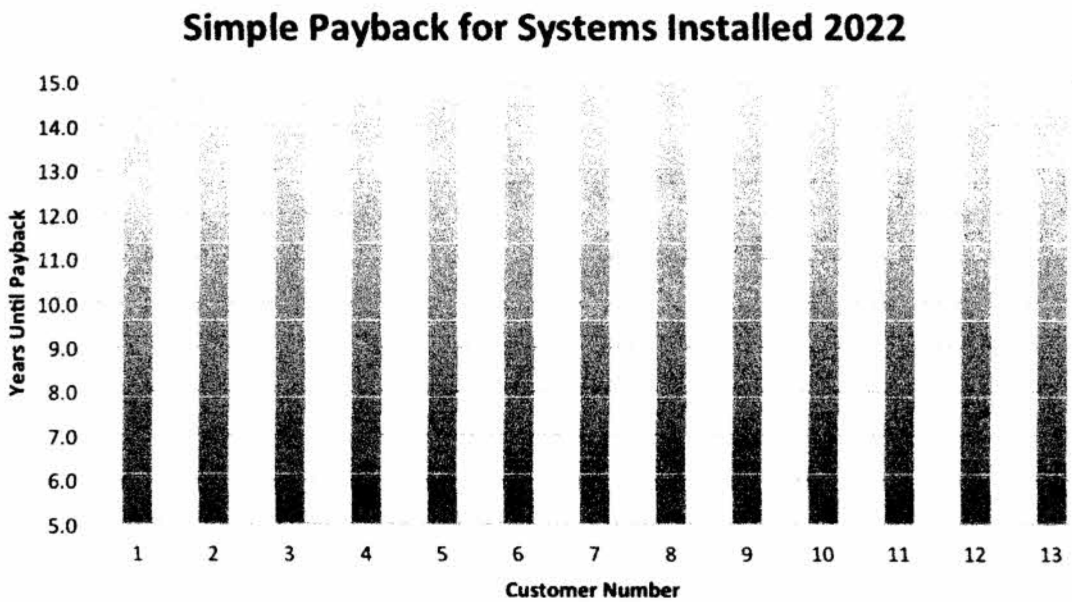

Figure 5: Simple payback for modeled systems, if installed in 2022

Q In your last answer, you mentioned consumers typically require a simple payback time of less than ten years under net metering and current rate structures. Do you agree with intervenor Kevin Koch's statement that "Under the pending changes to rates, I believe that minimum payback period to be 8 to 9 yrs."[2]

A. Yes, I largely do, although I do not have specific data on consumer sentiment regarding investment in solar under TEP's proposed rate structures. I suspect that in some cases, customers will want to see an even shorter payback time, as the opportunity to save with a solar electric system under TEP's proposal is drastically decreased after year ten of system operation.

Q In his direct testimony, Mr. Koch presents installation prices that differ from your assumptions.[3] If your model used the installation costs he presented, would the results be different?

A To answer this question, I calculated payback for each system per the $/W installation prices[4] presented by Mr. Koch in his rebuttal testimony, using the cost per watt of the nearest system size listed. The results of this calculation are shown as Table 3. Payback times would be slightly less

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[2] Phase II Testimony of Kevin Koch, page 2.
[3] Phase II Testimony of Kevin Koch, page 3.
[4] Ibid.

overall compared to my original model, but would in all cases still be over nine years, even for systems installed in 2018. Trends in payback times would remain the same. Therefore, we can see that even with a different cost structure, solar installation would be rendered uneconomic for all customers modeled.

Table 3: Simple payback with installation price per Koch rebuttal testimony

Simple Payback Period in Years, Costs Per Koch Rebuttal Testimony					
	Installed 2018	**Installed 2019**	**Installed 2020**	**Installed 2021**	**Installed 2022**
Customer 1	9.3	9.3	9.7	10.4	15+
Customer 2	9.3	9.0	9.3	9.6	12.8
Customer 3	9.7	9.4	9.7	10.1	13.4
Customer 4	15+	15+	15+	15+	15+
Customer 5	15+	15+	15+	15+	15+
Customer 6	10.6	10.6	11.7	12.6	15+
Customer 7	11.3	11.0	11.7	12.4	15+
Customer 8	11.7	11.6	13.3	14.5	15+
Customer 9	10.7	10.5	11.2	11.6	15+
Customer 10	10.4	10.2	10.5	10.8	14.4
Customer 11	10.2	9.8	10.4	10.8	14.9
Customer 12	13.5	13.3	13.7	14.4	15+
Customer 13	11.5	11.4	12.4	13.3	15+

Q Are the cost estimates provided in your testimony, and by Mr. Koch in his Phase II testimony, sufficient to determine likely payback for all customers who choose to install residential solar electric systems in TEP's service territory?

A No. Each contractor may have different business models, cost structures, or select different equipment. But at this time, the data provided by Mr. Koch in his testimony and my internal data from Net Zero Solar is the best data that I have access to.

Q Are there other sources of cost data that would provide additional perspective?

A In my experience, TEP has collected installation cost data as part of their interconnection application process for many, many years. Installation costs provided by TEP could give additional perspective into actual current costs and cost trends for installation of solar electric systems of various sizes. Other sources could also provide some perspective. For example, the National Renewable Energy Lab's *U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017* notes a Q1 2017 PV cost benchmark of $2.80 per watt DC for residential systems.[5]

Q Why might the results of your modeling regarding payback significantly differ from those shown by TEP in the rebuttal testimony of Richard D. Bachmeier, even when using similar installation cost assumptions?

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[5] U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017, page iv, available at https://www.nrel.gov/docs/fy17osti/68925.pdf

A Although I have not seen working papers or any other information regarding Mr. Bachmeier's calculations beyond what is in the public record, I can share one factor that may contribute to differing results. In his discussion of his bill comparison and payback period calculations, Mr. Bachmeier states "Average hourly load profiles for each of the customer sizes are used to develop monthly energy billing determinants[.]"[6] This averaging of customer load data can mask variability in the actual load data of an individual customer. To illustrate, I extracted the 15-minute production and consumption data for a six-hour period on July 1st, 2017, from the same data set used for my earlier payback calculations. As shown in Figure 6, the individual energy usage for each of the thirteen customers is highly variable, yet the average (mean) value is much more smooth.

[6] TEP Phase II Rebuttal Testimony of Richard D. Bachmeier, pages 9-10.

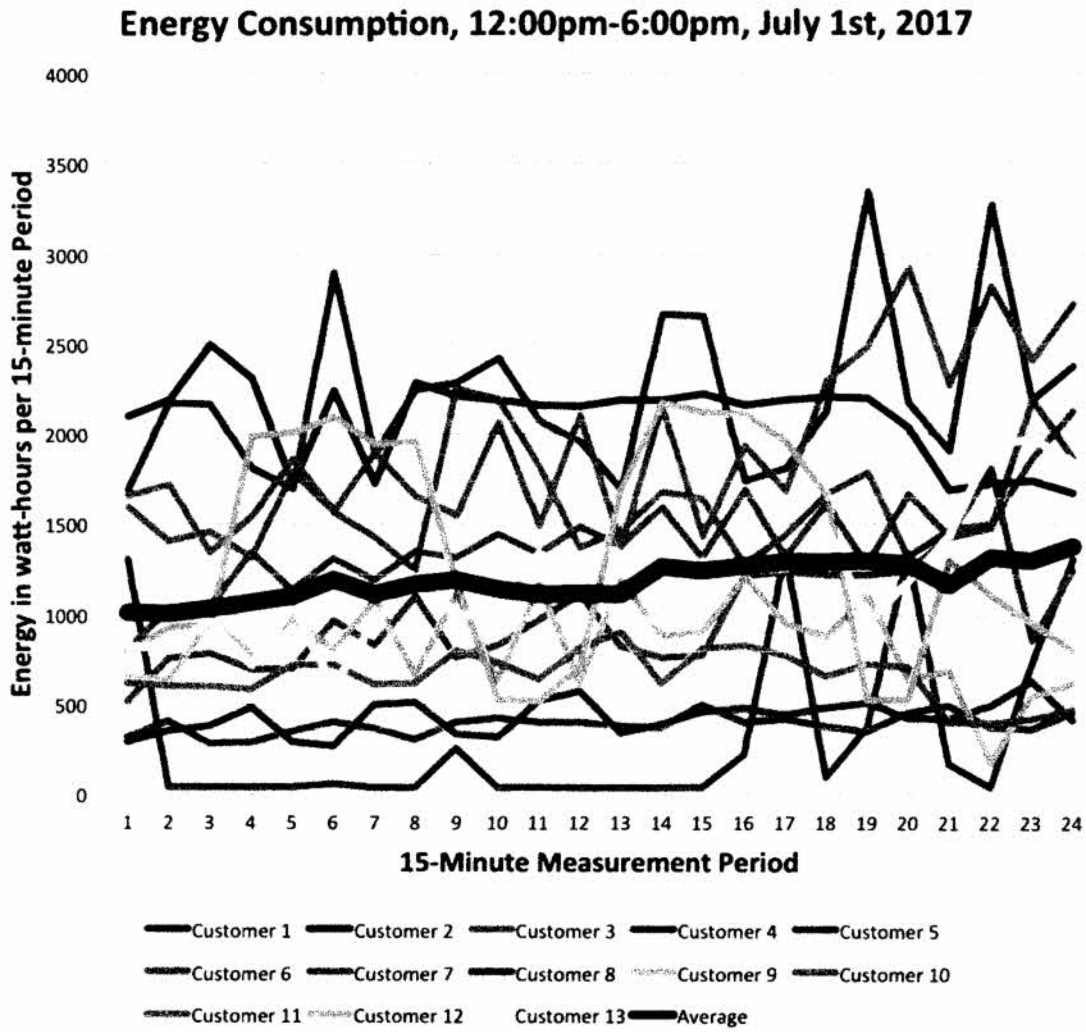

Figure 6: Smoothing effect of averaging load data

When we look at the solar production during a typical sunny afternoon, we see a much more smooth graph—solar energy output is relatively predictable, as shown in Figure 7, which shows the energy production of each system and the average energy production during the same time period as shown in Figure 6.

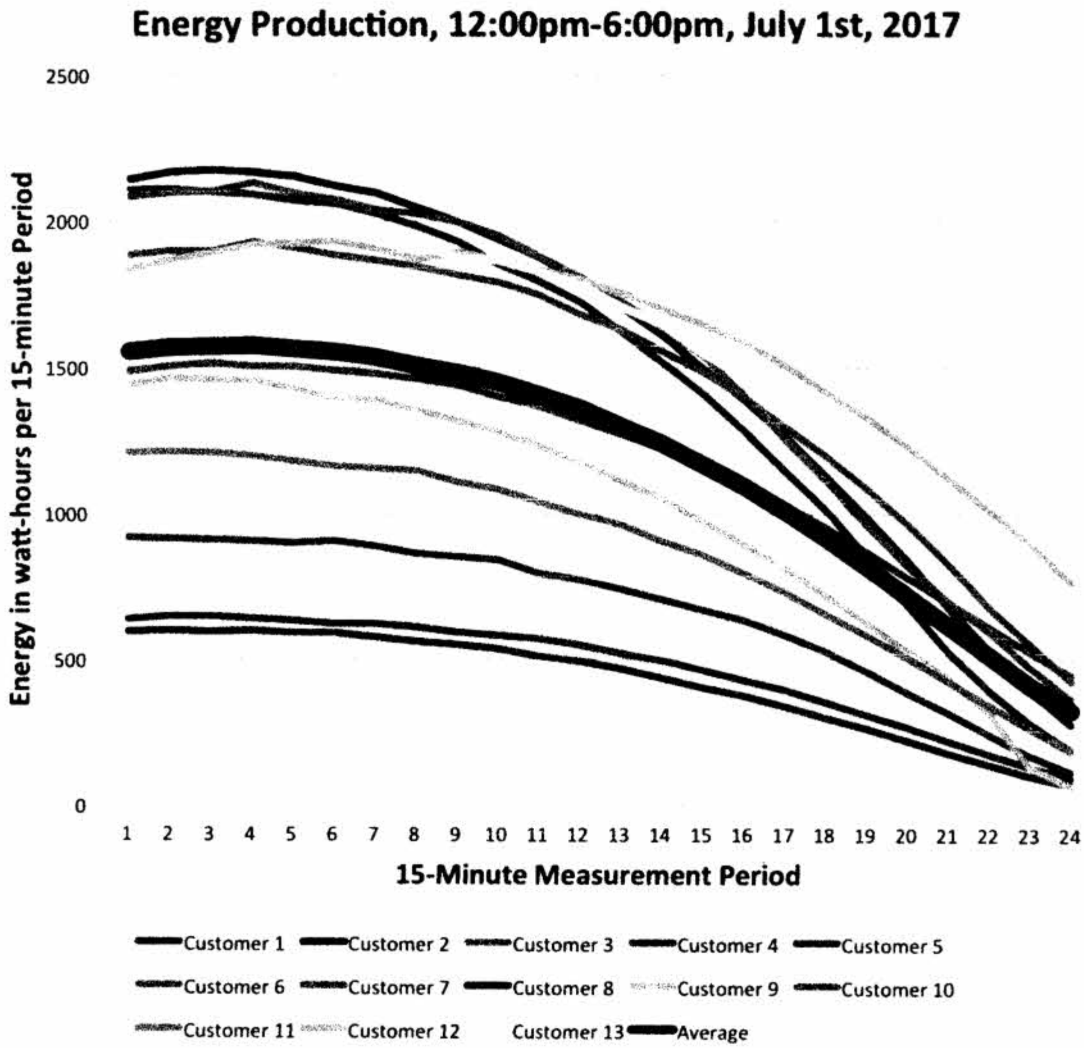

Figure 7: Solar electric system energy production

Q Specifically, how would using average values for energy consumption create an inaccurate model?

A When calculating payback period, it is necessary to determine how much energy from a solar electric system will be used immediately by a customer, and how much will be exported to the utility, because each are compensated differently under the proposed rate structure. Under TEP's rate proposal, exported energy provides less financial benefit to an owner of a rooftop solar electric system, compared to solar energy used immediately on site.

To calculate exported energy, we can subtract energy consumption from solar production for each time period, discarding any negative values (which indicate energy imported from the grid). If I calculate the exported energy for each of the thirteen customers and the exported energy based on the average energy production and consumption as shown in Figure 6 and Figure 7, I can find exported energy over the same time period, which is shown in Figure 8.

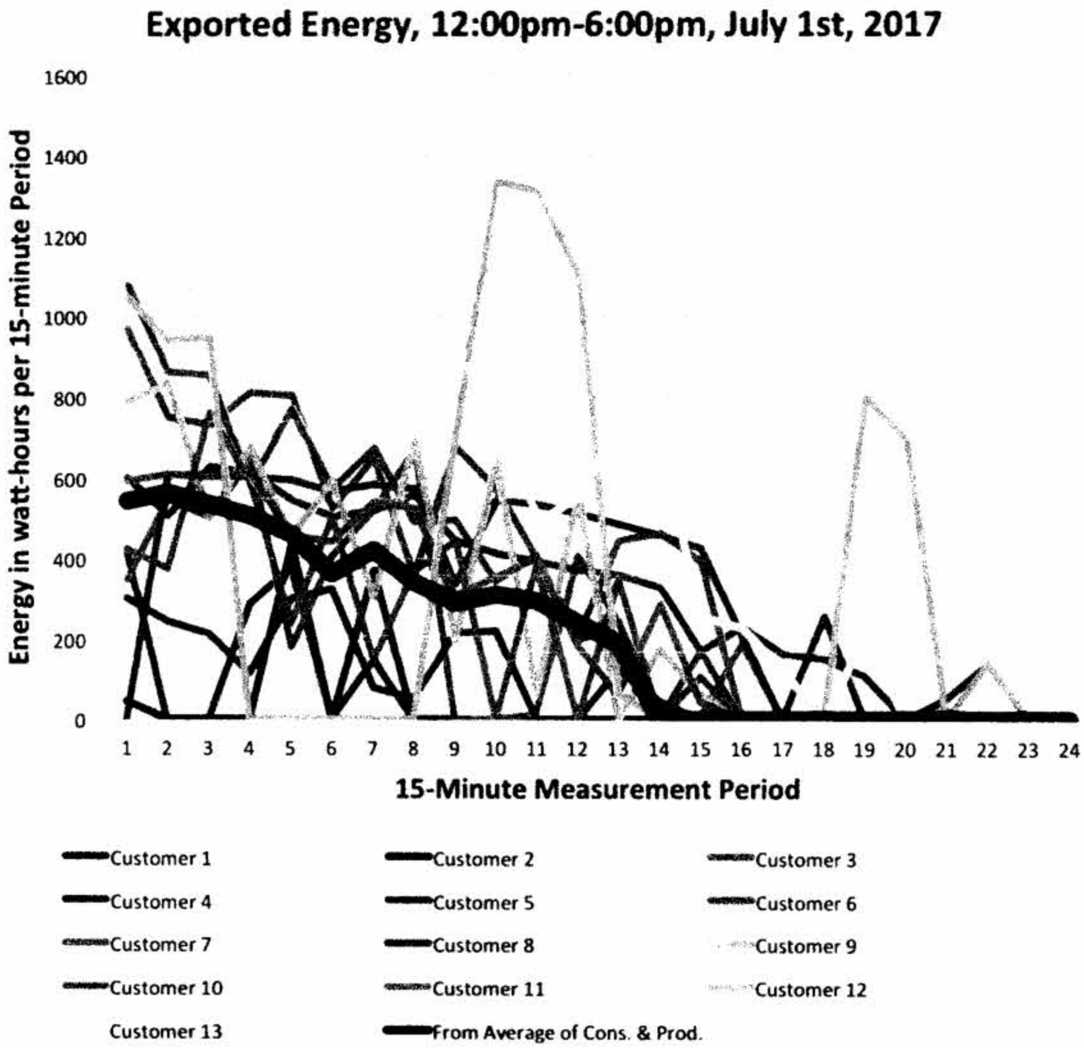

Figure 8: Solar energy exported to the grid

If I examine Figure 8, I see a problem. Although many of the thirteen customers have significant amounts of energy exported, that is not entirely reflected in the alleged exported energy calculated from the average production and average consumption, which is shown as a heavy black line. In fact, the result of that calculation would indicate that no energy was exported to the grid after measurement period 13, which is clearly not the case. For this particular six-hour period, calculation of exported energy based on average production and average consumption for these thirteen systems was 5,059 watts-hours, while the average of the calculated exported energy for each of the thirteen customers was 6,240 watt-hours. Therefore, for this very limited period, actual exported energy would be at least 23% above the values obtained by averaging first, and then calculating exported energy.

Although this particular percentage may or may not be relevant for a longer, more realistic analysis period, it illustrates the challenges that occur when averaged load data is used in payback calculations for rooftop solar electric systems. This discrepancy would result in overestimating the savings from rooftop solar under the proposed rate structure.

Q Do you have any thoughts regarding the revised proposed Residential Service Demand Time-of-Use Distributed Generation (TRRESDTDG) rate, as presented by Mr. Bachmeier in Exhibit RDB-P2-R-1?

A Although I have reviewed the proposed rate, I have not completed any analysis of the impact on specific customers. Based on modeling of similar rates in the past, I expect that few consumers would find this rate beneficial at this time, but I do support the existence of optional demand rates, including the TRRESDTDG rate. In my experience, there are significant challenges to be overcome regarding consumer education with respect to rates that include demand charges. Although all proposed rates require customer load data to model expected bills, the potential extreme costs of demand charges place particular emphasis on obtaining highly accurate load data of appropriate resolution.

Q Do you have any thoughts regarding the revised Small General Service Time-of-Use Distributed Generation rate (TGSGSTDG) rate, as proposed by Mr. Bachmeier in Exhibit RDB-P2-R-1?

A I have also reviewed this rate, but have not completed any modeling. I do not have comments specific to that rate at this time.

THE DG PRODUCTION METER PROVIDES NO BENEFIT TO DG CUSTOMERS AND THE PROPOSED ADDITIONAL METER FEE SHOULD NOT BE IMPOSED.

Q In his direct testimony in Phase II, TEP Witness Craig A. Jones asserted that "[DG] production meters may also be useful to customers, who can analyze the performance of their system."[7]

I disagree, for the following reasons:

- Higher quality information is usually available on a consumer's internet-connected monitoring system, in a more immediate manner, as compared to TEP's DG production meter. For example, the

[7] TEP Phase II Direct Testimony of Craig A. Jones, page 13.

Enphase Energy Envoy monitoring device—which I commonly install for my clients—provides 15-minute production data, with a typical data processing delay of between five and fifteen minutes. In fact, this monitoring system can also provide information on home energy consumption with the same resolution. Solar electric system monitoring systems also usually provide emailed alerts to a consumer and their installer if solar production drops below expected levels.

- DG production meter data is not shown on the bills of DG solar customers, nor is it shown on TEP's new My Energy Usage[8] feature on their website and mobile app.
- The existing data request process to obtain DG production meter data is complex, requires significant time, and the resulting data is not consumer-friendly. In fact, the current data request form[9] does not even mention the ability to request DG production meter data.
- To my knowledge, TEP does not provide any warnings to DG customers if system production falls below expected levels, or if a solar electric system completely fails. Since I began installing solar electric systems on TEP's grid in 2003, I am not aware of a single instance where such a warning was provided.

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[8] https://www.tep.com/my-energy-usage/
[9] https://www.tep.com/wp-content/uploads/2016/07/usage-data-release.pdf

- If consumers desire to have a separate physical solar production meter for redundancy, it is possible for their installer to purchase and install a non-TEP meter at a cost lower than the proposed fee.

TEP SHOULD MAKE CUSTOMER LOAD DATA EASILY AVAILABLE IN SUFFICIENT RESOLUTION TO ALLOW CONSUMERS AND RENEWABLE ENERGY PROVIDERS TO MODEL PERFORMANCE UNDER VARIOUS RATE STRUCTURES.

Under TEP's proposed rate structure, consumers and rooftop solar providers will have to complete detailed modeling to assess any financial payback from installation of rooftop solar, or other distributed generation sources. Because the retail volumetric rate and the export rate will presumably be different, the modeling procedure is generally as follows:

1. Obtain customer load data for a minimum of one year, in as high as a resolution as possible, but at minimum 1-hour resolution. (This 1-hour resolution data is often called an "8760 file," as there are 8,760 hours in a year with 365 days).
2. Using predictive solar modeling software and/or historical data, produce an expected solar electric system output, in the same resolution as the load data.
3. Calculate all energy flows over the desired modeling period, at a resolution equal to the load data and estimated solar production, including making any gradual adjustments to estimated solar

production (such as an industry-standard value of 0.5% decrease in performance each year).

4. Calculate the expected customer bill with and without a solar electric system installed, under any relevant rate structures, and clearly convey any estimated savings to a customer, along with detailed information about all modeling assumptions.

Solar installers have access to a number of tools to facilitate generation of expected solar electric system outputs, as needed in Step 1. There are also software packages to allow solar installers to model expected hourly (or higher resolution) of solar electric system output, as needed in Step 2. Commercial software and custom software is available to compute specific energy flows (Step 3) and to complete bill estimates and financial analysis (Step 4). However, accurate modeling is predicated on obtaining customer load data, which is typically only available from TEP.

Although TEP's new My Energy Usage function on their website and mobile applications does provide some data to the consumer, it is not in a form usable for modeling. To see hourly load data for one day, a consumer would have to go to the My Energy Usage page, select a billing period, then select a desired day. The consumer could then see hourly load data for that day, or even download a .CSV file with that data. But it would be highly impractical for a consumer to download 365 separate data files for each day of the year, and for a solar installer to aggregate these 365 separate data files for modeling purposes.

TEP does have another data request process, including a paper form that can be emailed to TEP. In my experience, a friendly customer service representative does respond, but significant time and communication is expended before an appropriate 8760 data file is provided to the customer. It is not reasonable for consumers to have to wait weeks for load data.

Therefore, TEP should provide load data for each meter on their website, with the following conditions in mind:

- Provided in standard formats for easy download, including at least .CSV and Green Button standard data.
- Allow consumers to select their desired start and end dates before downloading their load data.
- Make data available for the maximum period possible, but for at least twelve months in all cases.
- Make data available at the highest resolution possible, but at least at a one-hour resolution in all cases.

THE LOCAL TUCSON SOLAR INDUSTRY WILL BE HURT AND CONSUMER CHOICE WILL BE REDUCED IF THE TEP PROPOSALS ARE ADOPTED, BECAUSE THE LIKELY OUTCOME OF THESE PROPOSALS WILL BE A SUBSTANTIAL DECREASE IN THE

NUMBER OF NEW CUSTOMER-OWNED SYSTEMS IN THE TEP (AND UNS) SERVICE TERRITORIES. THIS WILL COST JOBS AND REMOVE ENERGY OPTIONS FOR LOCAL CONSUMERS.

Q Can you share your thoughts on how this proposal would decrease the number of new customer-owned solar electric systems in TEP's service territory?

A Yes. Based on my analysis and professional experience, I believe that if TEP's proposed rates are approved, there will be a drastic reduction in the number of new customer-owned solar electric systems installed in their service territory. Because rooftop solar would be rendered largely uneconomic for most consumers, I believe that only a few customers will still choose to install solar on the basis of personal values not related to system payback. I am deeply concerned about this probable outcome, for several reasons, including reduction in choices for energy consumers and job losses caused by market contraction.

Q How would this result in reduction in energy choice for consumers?

A In my experience, most TEP customers love the opportunity to generate some of their own energy on their homes. But along with this desire for independence or a desire to have cleaner air, they also want to know that they will not be losing money if they choose to invest in rooftop solar.

Imposing a rate structure that makes solar uneconomic would mean that although consumers could theoretically still choose to install rooftop solar, practically, that choice would be severely curtailed.

Q How would this reduction in residential solar installation affect jobs at Net Zero Solar, or other small, local installers?

A At Net Zero Solar, we strive to install high quality solar electric systems, with excellent materials, backed up by friendly and responsive customer service. We have a great crew of folks, who care about serving our community through this work and about increasing the amount of clean energy in Tucson.

Since 2009, we have slowly (and sustainably) grown our business. We're nimble, so we always try to respond to the various outside forces beyond our control. Our team has diverse skills, including service of existing solar electric systems and installation of energy storage systems, so we would pursue any available opportunities.

But the reality is that with the highly probable drop in residential installations under this proposal, Net Zero Solar would have to lay off several of our eleven teammates.

Q Can you summarize your testimony?

A I am deeply concerned regarding how TEP's rate proposals will affect energy consumers who wish to install solar electric systems on their homes in TEP's service territory, and the impact on the local solar industry.

I disagree that TEP's proposals will allow a continued healthy market for installation of rooftop solar in their service territory, and have calculated that simple payback times will be over ten years for all thirteen customers I have modeled, rendering rooftop solar uneconomic for most residential customers.

I do not find TEP's proposed rate changes to be gradual, or well considered. I urge the adoption of rate structures that allow continued implementation of rooftop solar electric systems in TEP's service territory.

Q Does this complete your testimony?

A Yes, it does.