

E-01345A-13-0248

ORIGINAL



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ARIZONA CORPORATION COMMISSION  
UTILITY COMPLAINT FORM

Investigator: Richard Martinez

Phone:

Fax:

Priority: Respond Within Five Days

Opinion No. 2013 - 112669

Date: 9/9/2013

Complaint Description: 19Y Net Metering  
08A Rate Case Items - Opposed

Arizona Corporation Commission

DOCKETED

SEP 13 2013

Complaint By: First: Ernest Last: Manuel

Account Name: Ernest Manuel

Home:

Street:

Work:

City: Tucson

CBR:

State: AZ Zip: 85720

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Utility Company: Arizona Public Service Company

Division: Electric

Contact Name: For assignment

Contact Phone:

Nature of Complaint:

Docket No. E-01345A-13-0248.

BEFORE THE ARIZONA CORPORATION COMMISSION  
COMMISSIONERS  
BOB STUMP, Chairman  
GARY PIERCE  
BRENDA BURNS  
ROBERT L. BURNS  
SUSAN BITTER SMITH

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AZ CORP COMMISSION  
DOCKET CONTROL

IN THE MATTER OF THE APPLICATION OF DOCKET NO. E-01345A-13-0248  
ARIZONA PUBLIC SERVICE COMPANY FOR  
APPROVAL OF NET METERING COST SHIFT COMMENTS

My name is Ernest H. Manuel, Jr., Ph.D. I reside at Tucson, Arizona. I offer these comments as an individual resident of Arizona (full-time since 1994) and not as a representative or advocate of a particular group. Nor do I have any stake in the outcome of this ACC proceeding. While I currently own a home with rooftop solar within the Tucson Electric Power (TEP) service area, my system was installed in 2011, and APS has proposed that such pre-installed systems be grand-fathered under the old Net Metering program. I would expect that TEP would take a similar position if the APS proposal is adopted by the ACC.

I am qualified to offer these comments by virtue of both my education and experience. I received M.S. and Ph.D. degrees in Engineering-Economic Systems from Stanford University, following an earlier B.S. degree in Electrical Engineering from the same institution. I also spent the first 24 years of my career, from 1970 through 1994, providing research and consulting services relating primarily to the electric power industry, the oil and gas industry, and

# ARIZONA CORPORATION COMMISSION

## UTILITY COMPLAINT FORM

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environmental regulation. My clients then included individual electric utilities, the Electric Power Research Institute, the U.S. Department of Energy, the U.S. Environmental Protection Agency and others.

### INTRODUCTION

In July 2013, Arizona Public Service (APS) filed an application with the Arizona Corporation Commission (ACC) relating to Net Metering for residential customers with solar PV systems ("rooftop solar"). Net Metering is a program under which APS reduces a rooftop solar customer's monthly electric bill by one kilowatt hour ("kWh") for each kilowatt hour that the rooftop solar system supplies to APS during those times when the system produces more electricity than is needed by the homeowner.

The APS Application seeks to amend the Net Metering program. The Application is part of Docket No. E-01345A-13-0248. The change proposed by APS in its Application would require that customers with rooftop solar installed after a certain future date who want to engage in Net Metering must also agree to receive any supplemental electric service from APS under APS Rate Schedule ECT-2.

APS Rate ECT-2 is a time-of-use rate with an additional charge related to the monthly peak demand. Under that type of rate schedule, a customer pays more per kWh during "on-peak" hours (generally weekdays between noon and 7:00 p.m., excluding holidays) and less per kWh during "off-peak" hours (all other hours). Under Rate ECT-2, the customer also pays an additional charge per kilowatt ("Kwh" for the customer's highest hourly peak electric demand during on-peak hours during a month. Rate ECT-2 differs from the other two rate schedules under which the majority (89.3%) of APS residential customers purchase power under which there is no per Kw demand charge.

APS has also proposed a second alternative to the Net Metering program under which APS would essentially buy all of the customer's rooftop solar output and sell all of the customer's electric needs, but this second proposal will not be considered here. APS and opponents of APS's Net Metering proposal have offered studies leading up to the current ACC proceeding. The studies generally concerned the impacts of rooftop solar on APS and its ratepayers.

The results of several APS-sponsored workshops in 2013 at which those studies were presented and discussed have been nicely summarized in a Facilitator's Report dated July 8, 2013 and filed with the ACC as part of the APS Application.

I do not intend to repeat here the comments and arguments pro or con that were covered in the studies or in the Facilitator's Report. Instead, it is my intent to offer some comments on issues that I believe have been overlooked or under-emphasized in the discussions so far.

### SUMMARY OF RECOMMENDATIONS

APS claims that its Application is motivated by a concern about cross-subsidization. Cross subsidization abounds in the APS rate schedules. Why is this one category of customers being single out for special consideration now? It would make more sense to consider the rooftop solar cross-subsidization issue as part of a broader consideration of cross-subsidization generally. I recommend that the ACC take no action on the APS proposal until the next general rate case.

Absent that, if ACC feels the need to act now, then I recommend the following:

First, before acting on the APS proposal, the ACC should first direct APS to provide further study of its Net Metering proposal as to the potential impact on future solar PV adoption

# ARIZONA CORPORATION COMMISSION

## UTILITY COMPLAINT FORM

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that would be caused by the 43 percent and 56 percent reductions in electric bill savings that it would produce as I demonstrate below. For example, I would not have invested in a rooftop solar system if the savings had been reduced by that much.

Second, I would argue that it is unfair to force one class of residential customers to pay demand charges and not other classes. If ECT-2 is an accurate reflection of the cost of providing service to residential customers, then it should be applied to all residential customers, not just to solar adopters. A possible exception could be made for lower income customers or customers with very low energy consumption.

Third, Commercial and Industrial customers who install solar PV in the future should not be excluded from a similar requirement to move to a rate schedule with time-of-use rates and demand charges in the event they are not already on such a rate schedule. APS offered no valid reason for the carve out of these customer groups from its proposal.

Fourth, under the APS proposal, existing rooftop solar customers are grand-fathered under the old Net Metering plan without the need to migrate to Rate ECT-2. However, the grand-fathering would not extend beyond the current homeowner. That limitation is a significant taking - solar systems have a long payback period - mine is about 10 years. I invested in rooftop solar 2 years ago with the expectation that if I sold my home at some time in the future, I could recoup my remaining investment in solar at the time of the sale. Those of us who made investment decisions on the basis of the then current regulations shouldn't have the rules changed on us in mid-stream.

### DISCUSSION

#### The SAIC Study for APS

The first study that I reviewed was prepared for APS by SAIC, a well-known consulting firm. The stated objective of the study was to provide updated estimates of the value of future distributed solar PV installed in the APS service area after 2012. Distributed solar ("DE") includes small-scale solar PV systems installed at residential or commercial sites and designed primarily to serve the loads on-site. DE excludes utility-scale solar PV systems designed to sell electricity at the wholesale level.

Although time did not permit me to do a complete review of the SAIC study my overall impression is that it was competently prepared within the limits of its stated assumptions. However, I do have the following comments:

1. The SAIC study relied on APS's projections of the future market penetration of solar PV within the APS service area (SAIC, p. 2-4). APS supplied three projections: Low, High and Expected. According to SAIC, the "Expected" projection is APS's best estimate of solar PV penetration based on current and observed market factors, near term program expectations, and actual customer installations to date.

a. SAIC does not indicate whether APS considered how its Net Metering proposal might reduce the rate of solar PV installations in the future. The rate of new Installations could be lower than indicated by the "Expected" projection if customers find that the Net Metering proposal, if approved by the ACC, adversely affects the economics of rooftop solar. In that case, the APS forecasts of rooftop solar adoption relied on by SAIC could be too high.

b. Nor is there any discussion of whether the APS "Low" projection is low enough to encompass the reduced rate of installation that the Net Metering proposal could cause.

## ARIZONA CORPORATION COMMISSION

### UTILITY COMPLAINT FORM

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2. Documents within the APS Application provide data that can be used to show the impact of the APS Net Metering proposal on the expected savings from rooftop solar. Exhibit 3 to the Application contains the pre-filed testimony of APS representative, Charles Meissner. Attachment CAM\_3 to Mr. Meissner's testimony contains example electric bill calculations for an illustrative customer before and after installation of rooftop solar using various residential rate schedules. The results of Mr. Meissner's calculations are combined in my Table 1 attached.

a. The first row in Table 1 shows the electric bill for Mr. Meissner's illustrative customer on a traditional inclining block "IB" rate (a rate schedule in which the cost per kWh increases as more kWh are purchased each month). More than 47% of APS residential customers are on the IB rate. This customer would have electric bills that total \$2,346.78 per year without solar installed. With solar installed, the annual cost would drop to \$739.74, an annual savings of \$1,607.04. However, if that customer were forced to convert to Rate ECT-2 after the solar installation, as APS proposes, the annual bill savings would decline from \$1,607.04 to \$908.40. The electric bill savings would be reduced by over 43 percent compared to allowing the customer to remain on the IB rate.

B. The second row in Table 1 shows the electric bill for Mr. Meissner's same illustrative customer, but this time he assumes that the customer is on the APS Time-of-Use Energy ("TOU-E") rate (the rate per kWh is higher during on-peak hours and lower off-peak, but there is no demand charge). Under the TOU-E rate, the customer would have electric bills that total \$2,038.56 per year without solar installed. With solar installed, the annual cost would drop to \$676.02, an annual savings of \$1,362.54. However, if that customer were forced to convert to Rate ECT-2 after the solar installation, the annual bill savings would decline from \$1,362.54 to \$600.18. The savings would be 56 percent lower than if the customer were allowed to remain on the TOU-E rate.

C. The ACC needs to consider whether 43 percent to 56 percent smaller savings on electric bills would: (1) dramatically reduce the attractiveness of rooftop solar in the APS service area; and (2) whether such large reductions would invalidate the projections of solar PV penetration relied upon by the SAIC study.

d. To make matters worse, Mr. Meissner's examples include an assumption that in my experience is unrealistic. He assumes that after installing rooftop solar, the customer would have no net energy purchases from APS during the on-peak period.

i. Recall that the on-peak period is from noon to 7:00 p.m. each weekday year-round. As APS notes in its Application, the output from rooftop solar drops off dramatically in the late afternoon. It is unrealistic to assume that the solar system would continue to supply all electric requirements until 7:00 p.m. I verified that with my own solar PV system for typical summer and winter days as shown in my Table 2. As shown therein, on a typical summer day, the solar production had declined to 38.7% of the daily peak level by 5:00 p.m. and to 12.5% by 6:00 p.m. During the typical winter day, the 5:00 p.m. production was 2.2% of the peak level, and there was no production at 6:00 p.m.

ii. Theoretically, Mr. Meissner's assumption would be valid if the customer had a large enough solar system. In that case, excess solar electric produced and sold to APS during, say, noon through 3:00 p.m., could offset purchases from APS during the 4:00 p.m. to 7:00 p.m. period. However, in my experience this assumption is unrealistic for summer

# ARIZONA CORPORATION COMMISSION

## UTILITY COMPLAINT FORM

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months like July and August when monsoon cloud cover and high temperatures combine to reduce solar panel output at the same time that air conditioning loads are among the highest. The consequence of Mr. Meissner's assumption is to overstate the potential savings from the typical rooftop solar system.

E.. Other data in Attachment CAM\_2 to Mr. Meissner's testimony provides further insight on rooftop solar participation rates as a function of the applicable rate schedule. As shown in my Table 3, the number of customers on the IB rate who have rooftop solar is 6,327 out of 434,491 or 1.5%. Customers on the TOU-E rate participate at a rate of 2.6%. However, customers on the ECT-2 rate participate at a rate of only 0.7%. If the current 0.7% participation rate for ECT-2 customers became the norm for all customers, by imposing ECT-2 on all future rooftop solar customers, the rate of future rooftop solar adoption would decline dramatically from historical levels.

3. The SAIC study indicates that the value of rooftop solar has what economists refer to as diminishing returns to scale. That is, the value to APS from each additional increment of rooftop solar is less than the prior increment. The APS forecasts of the quantity and timing of new generation and transmission resources that APS will require assume continued growth in rooftop solar. If the reduced incentives for residential rooftop solar slow the rate of rooftop solar adoption, APS will need those resources sooner and the avoided cost benefits of rooftop solar will be larger than calculated.

4. If the APS Net Metering proposal reduces the economic attractiveness of residential rooftop solar, the consequence may be to increase the need for utility-scale solar PV projects in order to meet current and future renewable energy goals. Is it possible that APS has an ulterior motive of wanting to invest in solar projects itself or through an unregulated affiliate rather than paying incentives to third parties?

5. Residential solar energy offers two benefits not provided by conventional generation: supply diversification (i.e., reduced dependence on fossil fuels) and grid security (i.e., reduced dependence on the transmission and distribution system). Utility-scale projects also offer the supply diversification benefit, but not always the grid security benefit to the extent such projects are not located near load centers (i.e., they may be located in outlying areas because of siting difficulties for large, utility-scale projects).

6. The modeling of the type used by SAIC may account for unplanned generator outages and transmission and distribution system outages based on historical experience. However, such modeling would not account for "Black Swan" events (i.e., events for which there is little or no prior experience). The latter would include events such as: sabotage of transmission lines or other utility equipment, solar flares which produce electromagnetic pulse ("EMP") damage to transformers and other utility equipment, nuclear incidents, etc. Residential rooftop solar provides additional electric resources that are less susceptible to such events.

7. SAIC points out that the lower values for rooftop solar calculated by its 2013 study compared to the 2008 study are due in part to much lower natural gas prices, reduced load growth forecasts due to the effects of the recession, and lower assumed costs related to carbon dioxide (CO<sub>2</sub>) emissions. How long these effects will last cannot be easily foretold.

a. SAIC addressed the natural gas issue with a sensitivity analysis that looked at prices being up to 30% higher than forecast. However, the current low prices

# ARIZONA CORPORATION COMMISSION

## UTILITY COMPLAINT FORM

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reflect a rapid increase in natural gas supply and a closed domestic market for gas. Prices could increase significantly if plans for the export of gas in the form of LNG are approved, which would significantly increase demand for and prices of natural gas. Also, neither SAIC nor APS appears to have considered whether gas transmission capacity is adequate for the expected future expanded role for natural gas among all customers served by the El Paso Natural Gas Company gas transmission system.

B. SAIC did not do a sensitivity analysis as to the electric load forecast. Arizona's economy could, hopefully, rebound faster than reflected in the APS load forecasts which would increase the near-term value of rooftop solar.

c. SAIC assumed a price of \$22.56 per ton for the cost of CO2 emissions in 2025 and did a sensitivity analysis assuming a high range of \$39.44. These figures may be on the low side. As recently as September 3, 2013, the Wall Street Journal reports that other companies use much higher figures for planning purposes: Exxon Mobil Corp uses \$80 per ton for 2040 and BP PLC uses \$40 per ton today. The same article reported that the U.S. government is now using \$36 per ton for regulatory actions (p. A4)

8. It is appropriate to consider the environmental benefits of rooftop solar in a cost-benefit study. Among the major benefits would be reductions in the criteria air pollutants (SOX, NOX, PM10, Ozone etc.), and the benefits of such reductions have been amply demonstrated. Furthermore, to the extent that residential rooftop solar leads to reductions in and around Arizona-based power plants, then Arizona residents are the primary beneficiaries. SAIC did not adequately consider these environmental benefits of rooftop solar.

9. None of the studies have explicitly mentioned the potential impact of electric vehicles and plug-in hybrid vehicles on future electric loads. Nor is it clear to what extent APS's load forecasts consider this issue. Although adoption of electric vehicles has been slow to date, conditions are in place for more rapid adoption in the future (improving battery technology, increased manufacturing experience, tighter fuel economy standards and tighter ozone standards, etc.). Although some vehicles may be recharged at residences at night, when electric loads are lowest, others will be recharged at workplaces, adding to daytime peak loads. Residential rooftop solar, as well as commercial rooftop solar can contribute to offsetting the latter loads.

### The Crossborder Energy Study

The other study I reviewed was prepared by Crossborder Energy. It was more favorable to the increased adoption of solar energy and, as a result, provoked more commentary as reflected in the Facilitator's Report. I won't repeat those discussions here. However, I do note that the Crossborder Energy study included some benefits of solar power that are more correctly left out or that are more complicated than presented:

1. The study claimed that rooftop solar provides local economic benefits and jobs compared to conventional electric power. While that is a valid "policy" consideration, it is not a valid factor in a cost-benefit study. Providing jobs locally displaces jobs elsewhere (e.g., among oil and gas workers in Oklahoma and Texas). Thus, the effect is to transfer the benefit from one place to another, even though on balance the total benefit may be unchanged. In addition, most if not all of the natural gas is coming from domestic sources while many solar panels are coming from Asia.

2. The study also cited a "market price reduction" benefit, i.e., increased rooftop solar decreases demand for natural gas, which lowers the price of natural gas for all users. This is a tricky issue because if there is a price reduction, then the valuation of avoided energy

# ARIZONA CORPORATION COMMISSION

## UTILITY COMPLAINT FORM

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costs would need to take into account that lower price as well, thereby lowering the calculated solar benefit.

3. Despite the above problems, neither would be likely to invalidate the study's basic conclusion that the benefits of rooftop solar exceed the costs.

### The APS Application

The APS Application provides a misleading summary of the findings of the SAIC study. For example, on page 11 of the application it states that:

"The SAIC study concluded that rooftop solar provides benefits by reducing (a) fuel expenditures; and (b) a modest amount of power plant costs. Because solar customers use the grid, however, rooftop solar does not avoid or reduce any other costs required to build, operated and maintain power plants or electrical wires."

APS representative, Gregory L. Bernosky repeats essentially the same conclusion in his filed testimony which is Exhibit 2 to the Application at page 9.

These statements are misleading because Table 1-1 at page 1-3 of the SAIC report clearly shows that fuel and other variable costs are only 72% of the benefit of rooftop solar. Another 24% is the

"modest power plant cost savings, including Fixed O&M for those plants, and the balance of 4% is savings in Transmission System costs. SAIC found essentially no benefit to the Distribution System. Although methodology assumptions depress the estimated Transmission and Distribution savings, APS could at least more accurately state the results of the study it commissioned.

Also, it helps to put these cost savings percentages in perspective. We can do that using Table 1 in Exhibit 3 to the Application, which is from the filed testimony of APS representative, Charles Meissner. His Table 1 shows that excluding taxes, public benefit programs and metering/billing, the average residential rate is 10.6 cents per kWh comprised of the following cost elements:

Fuel and variable O&M 4.0 cents/kWh (38%)  
Power Plant 2.8 cents/kWh (26%)  
Distribution 2.7 cents/kWh (25%)  
Transmission 1.1 cents/kWh (10%)  
Total 10.6 cents/kWh (100%)

Thus, it is not surprising the Fuel and variable O&M would be the largest source of savings to APS from rooftop solar; they are the largest cost element. Power plant costs are in second place, and transmission system costs are the smallest cost element.

Mr. Meissner's filed testimony also indicated that customer investments in energy efficiency are more valuable than rooftop solar generation because with the former:

"APS does not have to provide infrastructure to back up the customer's load when they invest in energy efficiency. Rooftop solar requires a constant connection to the grid to supply voltage and VAR support. And when a customer installs an energy efficiency measure, their load is actually gone, not just partially supplied by on-site generation. If an energy efficiency measure fails-such as when an energy efficient air conditioner fails-the power required to run the air conditioner is no longer needed. By contrast when a rooftop solar system fails, such as when clouds pass overhead, the solar customer's

# ARIZONA CORPORATION COMMISSION

## UTILITY COMPLAINT FORM

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entire load must suddenly be served."

This logic is faulty in several respects. First, the description ignores the well-known phenomenon of "snapback" or "takeback." Customers who invest in a more efficient air conditioner (or other measure) may, as a result of the electric bill savings, run the air conditioner at a lower temperature than before, thereby "taking back" some of the electric savings. And APS can't know when and by how much this will occur so it must continue to plan for additional load. Second, when clouds pass overhead, reducing rooftop solar output, they also reduce the air conditioning load. But as anyone who has lived through Arizona's monsoon season knows, when the cloud moves over my house, it has just come from over your house, so that the load swing on the utility is partially smoothed out by statistical averages.

### CONCLUSIONS AND RECOMMENDATIONS

At a conceptual level, APS has a valid argument that rooftop solar could result in crosssubsidization. APS, supported by the SAIC study, claims that rooftop solar customers are receiving the subsidy. Other presenters at the workshop claim it goes the other way. As an individual, I do not have the time or resources available to sort that conflict out.

However, if APS is motivated primarily by a concern about cross-subsidization, that should be addressed in a more general rate proceeding. Cross subsidization abounds in the APS rate schedules. Why is this one category of customers being single out for special consideration now? It would make more sense to consider the rooftop solar cross-subsidization issue as part of a broader consideration of cross-subsidization generally. I recommend that the ACC take no action on the APS proposal until the next general rate case.

Absent that, if ACC feels the need to act now, then I recommend the following:

First, before acting on the APS proposal, the ACC should first direct APS to provide further study of its Net Metering proposal as to the potential impact of the 43 percent and 56 percent reductions in electric bill savings that I demonstrated above. How much would reductions of that magnitude reduce the rate of rooftop solar adoption in the near term, and how does that compare to the APS solar PV projections used by SAIC and to the State of Arizona's goals for renewable energy?

Second, I would argue that it is unfair to force one class of residential customers to pay demand charges and not other classes. If ECT-2 is an accurate reflection of the cost of providing service to residential customers, then it should be applied to all residential customers, not just solar adopters. A possible exception could be made for lower income customers or customers with very low energy consumption.

Third, Commercial and Industrial customers who install solar PV in the future should not be excluded from a similar requirement to move to a rate schedule with time-of-use rates and demand charges in the event they are not already on such a rate schedule. APS offered no valid reason for the carve out of these customer groups from its proposal.

Fourth, under the APS proposal, existing rooftop solar customers are grand-fathered under the old Net Metering plan without the need to migrate to Rate ECT-2. However, the grand-fathering would not extend beyond the current homeowner. That limitation is a significant taking - solar systems have a long payback period - mine is about 10 years. I invested 2 years ago with the expectation that if I sold my home at some time in the future, I could recoup my remaining investment in solar at the time of the sale. Those of us who made investment decisions on the basis of the then current regulations shouldn't have the rules changed on us in mid-stream.





**ARIZONA CORPORATION COMMISSION**  
**UTILITY COMPLAINT FORM**

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APS RESIDENTIAL SOLAR PV PARTICIPATION RATES by RATE SCHEDULE

Rate Schedule	Residential Customer Count CY 2012	Percent of Total Customers	Solar Customers June 2013	Solar Participation Rate
Inclining Block (IB)	434,491	47.1%	6,327	1.5%
Time-of-Use Energy (TOU-E)	390,255	42.3%	10,047	2.6%
Time-of-Use w/Demand Charge (ECT-2)	98,643	10.7%	650	0.7%
(totals)	923, 389	100%	17,024	1.8%

Data Source: APS Application, Exhibit 3, Attachment CAM\_2

\*End of Complaint\*

**Utilities' Response:**

**Investigator's Comments and Disposition:**

9/13/13

Emailed to the Phoenix ACC office for docketing.

FILE CLOSED.

\*End of Comments\*

**Date Completed: 9/13/2013**

**Opinion No. 2013 - 112669**

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