BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Develop a Successor to Existing Net Energy Metering Tariffs Pursuant to Public Utilities Code Section 2827.1, and to Address Other Issues Related to Net Energy Metering.	Rulemaking 14-07-002 Filed July 10, 2014
And Related Matter.	Application 16-07-015

COMMENTS BY SOLAR CONSUMER ADVISOR ON NEM EVALUATION DRAFT RESEARCH PLAN

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In accordance with the Rules of Practice and Procedure of the California Public Utilities Commission ("Commission"), Solar Consumer Advisor (SCA) hereby submits these comments on the Net Energy Metering Evaluation Draft Research Plan sent to the R.1407002 service list by Energy Division on November 27, 2019.

I. Note on Terminology

The Draft Research Plan, like many documents in the solar field, uses the terms "generation" and "usage" loosely, leading to much confusion.

To the IOUs, "generation" means excess electricity sent back to the grid by the homeowner's solar system. But to solar providers and homeowners, "generation" means energy produced by the solar system.

To the IOUs, "usage" means electricity the homeowner draws from the grid. But to solar providers and homeowners, "usage" means all electricity consumed by the house, from whatever source.

The Draft Research Plan perpetuates these confusions. To avoid them, can we please all agree on the following terminology going forward:

- Production (of energy or electricity, not power): kWh produced by the solar
- Consumption (ditto): kWh consumed/used by the home, from all sources

- Draw (ditto): kWh a home draws from the utility grid
- Return (ditto): kWh a home returns to the utility grid

II. Solar Consumer Advisor's NEM Tools

For many years now, SCA has helped many solar shoppers decide what size solar system to acquire. For this purpose, we have developed our own algorithms and tools. These enable us to calculate accurately what size system is needed to minimize the homeowner's utility bills.

Such calculations are complex. They must take into account the following factors for each home:

- Likely electric consumption for the next 5-10 years at least
- Distribution of that consumption by season
- Distribution of that consumption by hours of the day in each season
- Allowance desired for unexpected additional consumption
- Utility rate schedule to be used (although this can change in the future)
- Distribution of solar electric production by hours of the day in each season
- Charging times and amounts for any electric vehicles
- Nonbypassable charges
- Minimum delivery charges and taxes
- California's climate credits
- Baseline charges or credits
- Any other charges or credits

It is important to keep in mind that many studies have shown that the most economical size for a residential solar system is the one that reduces the utility bill as close as possible to zero.

By comparing the results of our sizing tools to actual electric bills homeowners have received after acquiring solar, we have refined the tools so that they are highly accurate.

When NEM 2.0 was introduced, we revised the tools accordingly.

III. Effects on Solar Homeowners of Change from NEM 1.0 to NEM 2.0

The addition of Nonbypassable Charges (NBCs) in NEM 2.0 did not greatly increase costs to solar homeowners.

But what has hit solar homeowners very hard has been the several changes in Time of Use (TOU) rate schedules.

We have alerted Energy Division to these effects, but we'll restate them here. The change in the Peak rate period from noon - 8:00pm weekdays to 2:00pm to 8:00pm weekdays was somewhat costly for homeowners. But it was nothing compared to the now mandatory Peak rate switch to 4:00pm to 9:00pm.

The switch from NEM 1.0 on TOU-D-A with January 1, 2017 Peak rates from 2:00pm - 8:00pm to NEM 2.0 on TOU-D-4-9 with current Peak rates from 4:00pm - 9:00pm requires the average SCE homeowner (whose bill without solar averages about $200 per month) to get a solar system about **40% larger** to achieve the same optimal result - reducing the SCE bill as close as possible to zero.

The full change from NEM 1.0 on TOU-D-A with Peak rates noon - 8:00pm all the way to the current NEM 2.0 on TOU-D-4-9 with Peak rates 4:00pm - 9:00pm requires a **44% larger** system to minimize SCE bills. This percentage is probably close for the other IOUs as well.

This fact does not appear to be generally known, including at the CPUC.

One consequence of this drastic change is the cost of a solar system to a homeowner. An increase of 44% means that an adequate size system would cost about **$10,000 more** than an adequate size one would have cost before this change.

Another consequence is that homeowners who purchased adequate size systems under the TOU-D-A noon-8:00pm or TOU-D-A 2:00pm-8:00pm peak rates will no longer have adequate size systems when they are forced onto the new TOU-D-4-9 rates. Their electricity bills will skyrocket. They will be forced either to pay these higher rates or add more panels and inverter(s) to their system, but be subject to various constraints when they try to do so.

Finally, this drastic blow to the economic advantages of acquiring residential solar is bound to **slow solar adoption** throughout California, in contradiction to the state's legislated goals.

Has any of this been taken into account when authorizing these changes in the TOU time periods?

Please remember that there are presently a bit over 1,000,000 homes in California that have solar, and that another 10,000,000 or so will be suitable for solar in the future. This must not be jeopardized on the altar of load balancing.

Itron should focus specifically on these effects to solar homeowners, past and future, as well as state solar goals. A careful analysis is needed.

IV. Sources of Data for Itron to Use

As far as we know, the only source of data available for specifics of interconnected systems is the DG Stats "NEM Currently Interconnected Data Sets" and, to a lesser extent, the related databases on the DG Stats download page.

We have previously documented many data quality problems with this data set. Please see our Comments on Draft Resolution E-5030, served to this Service List on October 14, 2019 and attached as a supplement to these Comments.

The defects include approximately 16.6% of the records/rows that should have been scrubbed, due to clearly erroneous entries. In particular, you cannot draw conclusions that are at all accurate from this data set as is.

We would be happy to share the results of our work on this data set with Itron or Energy Division or both, if they would like. It could at least get them off to a good start by eliminating these most egregious errors and providing some of the calculations needed to evaluate the remaining records.

Other information needed to characterize interconnected systems should be obtainable from the IOUs. In particular, for each application, Itron should get

- Rate schedule(s) used before solar and during solar ownership
- Electricity bill totals before solar and for each year solar was interconnected
- kWh drawn from the grid for each such year
- kWh sent back to the grid for each such year

Appending this data to the application records in the data set will enable Itron to calculate many of the things it is aiming to, especially including true savings.

Other information could be gathered from a representative sample of homeowners with solar, including reliability, warranty performance, satisfaction, and experience trying to sell a home with solar. Again, please see our attached Comments on Draft Resolution E-5030 for details.

Once more, we'd like to advise extreme caution about drawing any conclusions whatsoever from the DG Stats data sets in their current, raw form. Such conclusions would be wholly unreliable.

V. Generation (really "Production") Profiles

In order to analyze these accurately, one must take into account large differences in energy production among systems with identical power output ratings. Our detailed calculations show that these can vary by at least 35%! You must not lump all panels together. They can usefully be categorized into three quality groups. We're happy to share our data and analyses with Itron on this score.

VI. TOU Rates

A crucial factor to take into account in this area is changes in rates and time periods over the foreseeable future.

It is very hard for consumers to know what to expect from acquiring solar if rates and time periods keep changing. As mentioned above, the latest changes require a 40% larger system to accomplish the same ideal goal of minimizing utility bills.

For this reason, having no guarantees or even forecasts from CPUC about future NEM and TOU changes grossly undermines the adoption of solar. This issue must be addressed for the future. At the very least, there should be some guaranteed parameters for rates, NEM policies, and TOU time periods, so that consumers are not treated to what amounts to bait and switch.

VII. Model to Quantify Cost-Effectiveness of NEM 2.0

This is going to be very hard to do well. It will be very tempting to take shortcuts and oversimplify many assumptions to get it done.

For example, "leveraging existing data sources and simulation tools to quantify the capacity factor of systems during the 4pm - 9pm peak TOU period" is a major challenge. As mentioned above, the existing data sources are very poor quality, and so anything input into the simulators may be garbage in, garbage out. Getting the additional data from the IOUs that we suggested above may help.

There's not much detail in the Draft Research Plan about how Itron plans to do this. Has it really been worked out sufficiently? It would be good to see the details and have someone verify that it can really be done with sufficient accuracy.

The same caution applies to "developing typical DER generation profiles."

VIII. Quantifying Differences Between NEM 1.0 and NEM 2.0 Systems

We respectfully submit that the method suggested at the top of page 4 of the Draft Research Plan will not produce meaningful results. First, all kinds of variables affect size and configuration differences, not just the switch from NEM 1.0 to 2.0. Second, many systems are sold to offset only part of a homeowner's utility bill, while others are correctly sized to minimize it. Third, PPA systems are typically undersized.

The only way to validate our calculations of 40% and 44% larger sizes needed, explained in II. above, is to use a tool like ours to model systems under Jan. 1, 2017 NEM 1.0 with TOU-D-A rates, with peak rates from noon to 8:00pm against the current NEM 2.0 TOU-D-4-9 rates, keeping all variables constant: house, equipment, etc.

Please do not fall into the trap of thinking you can elicit this accurately from the database, even if you clean it up. It will really be misleading.

IX. Analysis of Generation (Production) and Storage Charge/Discharge Data

Again, we're sorry to say we've worked extensively with the CSI data sets that form the basis for the cited reports to be used to develop representative production profiles of NEM 2.0 systems. They are also of poor data quality. Relying on them and the reports based on them can only lead to erroneous conclusions.

If Itron knows of other sources of metered energy production data, including data on charge/discharge of storage devices, we'd be interested to hear about them. If not, another method must be found to depict production and storage charge/discharge relative to customer load and TOU rates.

X. Clustering Analysis (Bins)

Can the IOUs supply Itron with prototypical load shapes representative of sub-classes of NEM 2.0 homeowners?

This is a very complicated business. First, you must distinguish between system production and energy returned to the grid. Second, you must distinguish between total consumption and energy drawn from the grid. These must not be mixed up.

If the object is, as stated, to create sub-hourly production and consumption profiles, it might be more efficient and more accurate to use NREL's System Advisor Model (SAM). If you group panel-inverter combinations into quality categories as suggested above, calibrate SAM losses appropriately for each category (we have already done that), and group the systems further by location, shading %, and maybe 5 categories of system size, SAM will spit out sub-hourly reports of system production for each.

The IOUs should be able to provide total consumption profiles for non-solar customers. If correlated to the bins of solar homeowners above, they may be the closest you can get to actual consumption profiles. Otherwise, you have to use the utilities' net of drawn from the grid and returned to the grid, combined with the production profiles above, to obtain the consumption profiles. Difficult.

The description of this methodology on page 5 of the Draft Research Plan is too vague to tell whether it would suffice as stated. It also relies on some questionable and some unreliable sources, such as historical SGIP data. This should be rethought and checked by experts.

We're afraid that the proposed cost-effectiveness analysis may turn out to be way off. We hope to be wrong about this, but it bears careful watching. Again, we offer to share our data, tools, and insights if Energy Division or Itron thinks it might be helpful.

XI. PV and Storage Measure Costs

There are many pitfalls in this task. One is using cost per watt - a completely misleading and useless figure. Another is segregating systems by how they are paid for, since financing can be a very significant difference in owner costs. Other is system life: lasting 13 years for the worst systems, 18 years for average ones, and 40 years for the best ones makes for huge differences in costs per year. Yet another is reliability and premature failures, whether covered by warranty or not. You cannot assume that homeowners suffer no costs from system problems, just because warranties appear to promise full protection.

Since this represents half of the calculation of costs and savings to homeowners, this cannot be done from a "limited literature search." Nor are the costs shown in the DG Stats data sets at all reliable.

XII. PV Watts

Please do not use PV Watts. This is the baby version of SAM. Use Sam instead, properly calibrated for losses according to equipment quality. We have lots of experience and information about this.

XIII. Conclusion

We are glad that CPUC is funding this extensive NEM lookback evaluation. It is much needed, because it has, in some ways, just been in runaway since NEM 1.0 was released. From the inception of NEM 1.0 to today, forecasts and assumptions that solar providers and homeowners made about their costs and savings have been thrown out the window by the many changes to NEM and TOU rate schedules and their time periods.

We hope this lookback will be accurate. If it uses poor quality data, cuts corners, or makes over-simplified assumptions, it will be worse than useless. It will mislead CPUC and all solar stakeholders into making poor decisions about NEM 3.0 and its accompanying tariffs.

We also hope CPUC will keep the owners of 1,000,000 solar homes and the additional future 10,000,000 in mind in making plans for NEM 3.0. With the Investment Tax Credit shrinking each year, and with all the difficulties the solar industry has experienced, achieving California's goals for residential solar is seriously in doubt. It needs all the help CPUC can give it.

Thank you for the opportunity to participate in this proceeding and to contribute to the very worthwhile work of protecting residential-solar consumers in California. SCA is deeply committed to making serious, rapid progress in this area, and looks forward to working with other stakeholders in forging solutions that benefit all.

Dated: December 18, 2019

Respectfully submitted,

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