June 1, 2019

Alyssa Maurice-Anderson
Entergy Services, Inc.
639 Loyola Avenue
Mail Unit L-ENT-26E
New Orleans, Louisiana 70113

Re: Revised Application of Entergy New Orleans, LLC for a Change in Electric and Gas Rates Pursuant to Council Resolutions R-15-194 and R-17-504 and for Related Relief
CNO Docket No. UD-18-07

Dear Ms. Maurice-Anderson:

I am in receipt of your Request for Information, dated May 6, 2019, regarding the above-named matter.

Please find attached, Building Science Innovators' revised response to Entergy New Orleans, LLC's First Set of Requests for Information (V2)

Thank you for your attention to this matter.

Sincerely,

Myron Katz, PhD
Director of Research
Building Science Innovators, LLC
302 Walnut St
New Orleans, Louisiana 70118
(504) -343-1243
Myron.Katz@EnergyRater.com

Enclosures
cc: Official Service List

REVISED APPLICATION OF ENTERGY NEW ORLEANS, LLC FOR A CHANGE IN ELECTRIC AND GAS RATES PURSUANT TO COUNCIL RESOLUTIONS R-15-194 AND R-17-504 AND FOR RELATED RELIEF

DOCKET NO. UD-18-07

BUILDING SCIENCE INNOVATORS' RESPONSE TO ENTERGY NEW ORLEANS, LLC'S FIRST SET OF REQUESTS FOR INFORMATION

Building Science Innovators ("BSI") hereby submits in the above-entitled and numbered proceeding its response to Entergy New Orleans, LLC's ("ENO") First Set of Requests for Information, which were received on May 6, 2019.

GENERAL OBJECTIONS

The BSI objects to ENO's First Set of Data Requests to the extent that the requested documentation and information is protected by the attorney/client privilege, the attorney work product doctrine, any other privilege, or otherwise calls for information prepared for and in anticipation of litigation and trial, pursuant to applicable law, including, but not limited to, La. C.C.P. art. 1425(E)(1), La. C.C.P. art. 1424, La. C.C.P. art. 1422, and La. C.E. art. 506.

Furthermore, BSI objects to the extent that these requests seek information or documents that are irrelevant and immaterial to the subject matter of this proceeding, not reasonably calculated to lead to the discovery of admissible evidence, and the production of which would be oppressive, and/or unduly burdensome or expensive. BSI reserves the right to supplement these responses.

Without waiving any of the foregoing objections, each of which is expressly incorporated into each individual response as if fully stated therein, BSI responds to the request for information with the following express reservation of rights:

1. The right to object on any ground whatsoever to the admission into evidence or other use of any information or documents produced in response to the discovery requests in any subsequent step, or proceeding in this action, or any other action;
2. The right to object on any grounds, at any time, to any other discovery requests or other discovery procedures involving or relating to the subject matter of these discovery requests; and
3. The right at any time to supplement, revise, correct, or clarify any of the responses propounded herein.

BSI'S SPECIFIC OBJECTIONS AND RESPONSES TO ENO'S FIRST SET OF REQUESTS FOR INFORMATION

Subject to, and without waiving the General Objections set forth above, and the specific objections, noted below, BSI responds to ENO's First Set of Request for Information as follows:

1. Please provide specific data and support related to Entergy New Orleans, LLC for the statement, contained in footnote 10 on page 7 of Dr. Katz' Direct Testimony, that "... utility peak demand is overwhelmingly caused by residential customers because: I) the average utility customer base is 90% residential..."

A. The resource for the above-referenced quote is *Electricity Regulation In the US: A Guide (Second edition)*, a publication of the Regulatory Assistance Project (RAP), an international organization composed of "former utility and environmental regulators, industry executives, system operators, and other policymakers and officials with extensive experience in the power sector".[1] The specific data, originally sourced from the U.S. Energy Information Administration is found on page 63: "For a typical US electric utility, residences make up about 90 percent of the customers, represent about 50 percent of the system peak demand, and use about 40 percent of the energy sold.[53] As a result, costs allocated based on the number of customers will fall overwhelmingly on the residential class, and those allocated on peak demand fall more heavily on residential and small commercial customers than on large-use commercial and industrial users."

---

[1] http://www.raponline.org/wp-content/uploads/2016/07/rap-lazar-electricity-regulation-US-june-2016.pdf

2. Please provide support for the statement, contained on page 9 of Dr. Katz' Direct Testimony, that "Tariffs are extra charges or discounts that are typically calculated without cost-of-service considerations."

A. Page 7, footnote 9, of Dr. Katz's Direct Testimony, states that:

> "[9] The terms of rates and tariffs are used inconsistency [sic]."

That is, the term "tariff" is used ambiguously within the utility industry. Note that the California Public Utility Commission refers to Net Energy Metering (NEM) as a tariff, while Jim Lazar, of the Regulatory Assistance Project, refers to the rate structure as a tariff.[2] That is why the same footnote ends with:

> "For purposes of this testimony, the term "tariff" will refer to a bill credit or charge if it does not need a cost-of-service parameter to define it. Otherwise, the cashflow is a rate."

[2] https://www.cpuc.ca.gov/general.aspx?id=3934 and http://www.raponline.org/wp-content/uploads/2016/07/rap-lazar-electricity-regulation-US-june-2016.pdf

3. Please describe in detail how CLEP "can also be configured to enhance utility profits," as stated on page 11 of Dr. Katz' Direct Testimony.

A. The ***p*** and ***q*** in the formulas for CLEP5 and CLEPM[3] assign the percentage which goes to each customer. BSI recommends that **p** and **q** be initially set to 95%, and the remaining 5% pays administrative costs, and to buydown the "cost-of-energy" — thereby lowering every customer's electricity price.

The utility regulator can decrease **p** or **q** by another 1-2% or more, in order to "**enhance utility profits**" by rewarding the utility for successful program performance.[4] This reward is already being done for Demand Side Management (DSM) programs, such as ***Energy Smart*** in New Orleans. Unlike other performance incentives, the proposed CLEP incentive would be exceptionally strong, easily calculated and therefore strongly effective because it would be directly proportional to the total dollar amount of all CLEP transactions in a given year. Because the utility would incur no capital expense, this profit would enjoy a higher ROE (return on equity) than normal.

Additionally, CLEP has far greater effects on utility income and, thereafter, utility profits (although more indirectly than just discussed). The significant investments required to upgrade failing infrastructure can, unlike methods of the 20th century, be done more cost-effectively with today's modern technologies. These new approaches, collectively called Distributed Energy Resources[5] (DER), are rapidly becoming well-accepted in the utility industry. They include:

> *Investment in energy efficiency, renewable energy, distributed energy resources, demand response, and shifting of demand to non-peak hours. DER generate more jobs and local economic development per dollar than investment in traditional infrastructure, like peaking plants.*[6]

CLEP enhances the cash flows for these types of investments, often doubling them, without putting a burden on the utility's bottom line.

---

[3] Find the formulas for CLEP5 and CLEPm starting at line 17 on page 19 of the Direct Testimony.

[4] BSI has consistently maintained that a portion of the CLEP cashflow normally allotted to the CLEP customer can and should be retained by the utility. See Exhibit 1 of BSI's Direct Testimony/CLEP battery pilot, BSI's CLEP Battery Pilot submission to the 2015 ENO IRP, and CLEP's 10-minute Pitch for the 2017 Bright Minds Challenge found at https://www.BuildingScienceInnovators.com/uploads/1/0/6/2/106256229/customerloweredelectricityprice-10min-pitch.pptx

[5] DER's effect is extensively explained in Tommy Milliner's talk available as the 2nd video and 2nd PowerPoint presentation given on February 24, 2019 and available at https://www.BuildingScienceInnovators.com/align-by-design.html

[6] https://aceee.org/blog/2019/02/florida-could-add-135000-jobs,
www.aee.net/articles/advanced-energy-gains-125000-jobs-in-2018-growing-twice-as-fast-as-u.s.-employment-overall,
https://www.thesolarfoundation.org/solar-jobs-census/
https://www.epa.gov/sites/production/files/2018-07/documents/mbg_2-2_directelectricityimpacts.pdf
https://aceee.org/sites/default/files/Jobs%20Toolkit%203-8-19.pdf

4. Please provide support for the assertion, contained on page 12 of Dr. Katz' Direct Testimony, that "Technically, CLEP5 is a tariff, because it does not depend upon any cost-of-service considerations."

A. Please see the answer to Question 2.

5. The following statement appears on page 13 of Dr. Katz' Direct Testimony: "CLEPm only generates an income or expense during utility peak or near peak demand times.[15] Demanding or supplying power outside of these times has no effect on CLEPm, i.e., CLEPm = 0 outside of these months and demand during these months, but outside of these days and hours are irrelevant to the calculation of CLEPm." Please provide a clear description of the months and time period in which CLEPm would supposedly apply.

A. Please see Dr. Katz's Direct Testimony, page 14: "Although the currently proposed definition of CLEPm restricts its applicability to May through September, on weekdays and between 2 PM and 7 PM, CLEPm's applicable times (to be assigned by the Council) can be shifted in response to anticipated as well as unforeseen changes in supply and demand." These hours of the year will hereinafter be referred to as Peak Utility Demand Hours (PUDH).

6. Please provide specific data and support for the statement, contained in footnote 15 on page 13 of Dr. Katz' Direct Testimony, that: "CLEPm's definition tries to accommodate the paradox that a customer's peak demand in any month is highly unlikely to be coincident with either other customers or that of the utility, and recognizes that AC driven demand has an average demand less than 50% of AC peak demand."

A. The above-quoted statement contains four assertions:

1. AC-driven demand has an average demand less than 50% of AC-driven peak demand.
2. A customer's [15-min] peak demand in any month is highly unlikely to be coincident with that of other customers, or that of the utility.
3. There's a paradox pertaining to the fact that a customer's peak demand in any month is highly unlikely to be coincident with either that of other customers or that of the utility.
4. CLEPm's definition has been designed to accommodate this paradox.

1. **AC-driven demand has an average demand less than 50% of AC-driven peak demand.**

This is best illustrated by a quote from Allison Bailes, PhD physicist, Atlanta resident, and Quality Assurance Designee (QAD) for Residential Energy Services Network (RESNET), the preeminent organization that sets national and international standards for home energy performance certification and testing. He reviews, approves, and/or rejects hundreds of AC-sizing calculations a year. He has concluded that HVAC equipment is normally oversized which causes the equipment to be off more than half the time. Therefore, average AC-demand is less than half of peak AC-demand.[7]

> "I know this from personal experience. Last year we replaced the AC in our condo, and I did the Manual J load calculation. The result was that we needed a 1.6-ton air conditioner for our 1500 square feet, so we had a 2-ton system installed. Knowing that Manual J has a built-in oversizing bias, I wanted to go with the 1.5-ton system, but I chickened out.
>
> Our AC runs maybe 15 minutes max on a hot afternoon, and our relative humidity stays around 60%. The Manual J bias is real, and it's not small. And that's with an accurate HVAC load calculation. I've seen plenty of load calculations that use incorrect inputs so the contractor can come up with a cooling load to match the AC size he wants to install."[8]

---

[7] Among RESNET's QADs, this is common knowledge (Myron Katz's professional experience in energy auditing for twenty years — including certification as a QAD).
[8] https://www.EnergyVanguard.com/blog/24645/How-to-Tell-If-You-Have-an-Oversized-Air-Conditioner.

2. **A customer's** [15-min] **peak demand in any month is highly unlikely to be coincident with that of other customers, or that of the utility.**

a) Most customers with AC-driven demand have oversized equipment. Utilizing oversized equipment causes AC units to be off more than they are on, and thus less likely to be on at the same time as other units.[9]

b) Commercial customers, such as dry-cleaners, have non-AC equipment-driven demand; their peak demand is not temperature-related. Therefore, their equipment is less likely to be in sync with the AC operation of other customers.

c) Establishments, such as houses of worship, have AC-driven demand, but generally operate in the evening and on weekends, not at peak utility times.

3. **There's a *paradox* pertaining to the fact that a customer's peak demand in any month is highly unlikely to be coincident with either that other customers or that of the utility.**

The paradox is that the current meter used to measure the monthly electricity consumed by all non-residential customers, only measures peak demand during any 15-minute period of the month. But because, the meter is not capable of reporting when that peak demand occurred, there is no way to appropriately reward customers for avoiding coincident demand or penalize them for causing it.[10]

4. **CLEPm's definition is designed to accommodate this paradox.**

Although smart meters resolve the temporal resolution problem because usage is reported as often as every 5 minutes, CLEPm is currently the only available rate-design which ***rewards*** the avoidance of coincident demand. It does this reliably, and with cash flows large enough to finance sizable equipment investments, by paying a substantial "negative demand charge" (typically to residential customers or community solar participants) for avoiding or reducing demand at key times. It also charges a "sizeable"[11] demand charge (more applicable to commercial ratepayers). These rewards and penalties are proportional to one-half the average demand during "peak utility demand hours" (PUDH).[12]

---

[9] However, when New Orleans experiences a "heat island" effect, coincident AC operation is likely.
[10] This helps answer question 17(ii) which asks about a "shortcoming in fair electricity rates".
[11] For five months, the "monthly" demand charge is 2.5 times larger than it was before the consumer opted into the CLEP program, but during the other seven months, the demand charge is ZERO.
[12] See the answer to Question 5 for more information on PUDH.

7. On page 15 of Dr. Katz' Direct Testimony, please clarify exactly what is being proposed in paragraph 4 and provide at least one example for a residential customer for a monthly billing cycle.

A. When a CLEP customer stores electricity in a battery, and then buys and sells a kWh, he does not have to pay the cost-of-service for that kWh which he would have, if it were consumed.

Using our newly-developed CLEP Dashboard[13] and hourly 2018 MISO prices, we modeled a generic, (non-CLEP) residential customer's usage for an entire year.[14] For the purpose of Question 7, we focused on October, which is assumed to have no heating but does have modest cooling loads. (See Exhibit 1 for a screenshot.) Daily usage assumptions were:

1. a background load of 0.5 kW;
2. the dishwasher operated daily from 4-5 p.m. at 1 kW;
3. the water heater operated for three, one-hour periods: at 2 a.m. and 5 p.m., using 4 kW, and at 10 a.m., using 2 kW.

Daily consumption was 10 kWh for water heating, 1 for dishwashing and 12 for everything else — or, about 23 kWh /day, with additional consumption early in the month for minor cooling. The ENO bill would be 31 times 23 kWh times $0.11/kWh or $78.43, plus $8.43 for the cooling, totaling $86.86.

As displayed in the screenshot, the *cost-of-energy*[15] for October 2018 was 3.42¢/kWh. See row 3 below the central horizontal line for hourly *MISO* prices in cents/kWh. Row 2 lists the total *Load*; the dishwasher load [*DW*] is displayed in row 4; and the water heater [*WH*] in row 5. (For purposes of this example, the loads for whole-home battery [*Batt*] and community solar [*CS*] have been left blank, because they are not applicable here.)

If this were a CLEP customer, who had not yet program any appliances or invest in upgrades: — like programming a dishwasher, programming a water heater, upgrading to a heat-pump water heaters and programming it, upgrading to an ice-making AC, purchase a whole home battery, electric vehicle or participate in CS, — the screenshot shows that they would still have had savings of $5.70 in October 2018. *These savings would result from accidental, avoided cost-shifts, all from CLEP5 transactions*. *Thanks to CLEP5 transactions*. <u>CLEP income is in addition to, and distinct from, the ENO bill, and</u>

---

[13] As detailed in Exhibit 4, *Experiencing the CLEP Dashboard*, this software models residential and commercial usage.
[14] Since calculating CLEPm needs many months of data, the CLEP Dashboard models a customer's bill a year at a time.
[15] Cost-of-energy is the monthly weighted-average wholesale electricity price. See answer to question 14 for clarification.

CLEP5 has no cost-of-service component. Therefore, CLEP does not affect the customer's payments for cost-of-service for energy delivery.[16]

Although there was net CLEP income for this customer in October 2018, he would experience an annual net CLEP loss of $150. As explained in answer 17 (ii), all but CLEP customers inadvertently cause energy and demand cost-shifts onto others. About half of all new CLEP customers will observe, as shown in the screenshot, that their annual electricity bill will be higher than it was before opting into CLEP — *because of these inadvertent cost-shifts*. However, as more DER technology and timing approaches are integrated[17] — and by using CLEP's ability to track and circumvent cost-shifting — cost-shifting onto other customers will decline, as will the price of electricity. Even so, as simple an action as programing an electric water heater ($50 in labor and materials) changes this $150 annual CLEP loss into net income. (See *Timed Water Heating* in Exhibit 4.)

Adding a battery provides the necessary "buy and sell" criterion implicit within the question to test buying and selling electricity while paying no cost-of-service for the net flows. In that case, the total CLEP5 income (as well as load table) in October changes (see Exhibit 2),[18, 19] and the October bill now shows a $0.99 loss all from CLEP5 transactions.[20] The fact that 12 kWh traveled into and out of ENO's grid each day had no effect on the ENO bill, but lowered that month's CLEP5 income by $6.69.

Despite untimely purchases and sales made while using the battery during October (according to the daily assumption parameters describing battery use in Exhibit 2), a total annual CLEP savings of $570 was produced. Most of this savings was from CLEPm, with little from CLEP5.[21]

---

[16] This is the most relevant assertion to the answer to Question 7.
[17] See the DER technologies referred to and explained in the answer to Question 3.
[18] It is important to note that our CLEP Dashboard — and, indeed, the calculations on the financing of batteries contained herein — are all based on several-year-old battery pricing and technology. We know there are much better options available today. Importantly, CLEP's advocates do not promote any technology by either brand or technology; we are entirely agnostic. Batteries will continue to improve. We only want to point out that our chosen data for battery pricing and capacities is already old and, thus, purposely understate the ability of CLEP to finance current technology.
[19] We note that Question 7 asked for "at least one example", and we have provided two. Our CLEP Dashboard can illustrate all the various examples cited in the original testimony and can be configured to provide calculations with more modern equipment. In the interests of brevity, we invite interested parties to contact us for further examples.
[20] Note that the value with a red background on the right-hand edge of Exhibit 2 is $99.
[21] Note at bottom of Exhibit 2 under "Whole-Home Battery" that the annual cashflow from the battery use is $570.

8. Please clarify which customer (or customers) would be responsible to cover the significant administrative, programming, and related billing costs necessary for Entergy New Orleans, LLC to provide, as stated on page 16 of Dr. Katz' Direct Testimony, "a virtual CLEP bill before choosing CLEP,' to any customer requesting such an analysis?

A. Although we do not have estimates of the costs associated with the provision of a virtual CLEP bill as referenced above, we can say that, as noted in answer 3, CLEP provides a capital-expense-free mechanism by which income can be retained by the utility expressly for this and related purposes.

Additionally, the software for calculating such a bill is already available and already beyond in its earliest stages of development, which we call the CLEP Dashboard (see Exhibit 4). Therefore, it should also not be difficult to engineer a feature into an ENO website that would allow a customer in real-time to draw on ENO's Smart Meter-supplied Advanced Metering Infrastructure (AMI) data and generate such a virtual CLEP bill for himself.

9. Please reference page 16 of Dr. Katz' Direct Testimony. Please (i) describe in detail how "CLEPm can provide a major "demand charge" savings to any commercial customers" and (ii) provide specific data and support for the assertion that "ii) like churches whose demand peak on Sunday morning, and make little to no demand during the utility's near peak hours..."

A. The typical commercial customer can shift some, and perhaps all, demand to outside of PUDH by using alone or in combination: timed water-heaters, timed heat pump water heaters, ice-making ACs and on-site batteries, electric vehicles, as well as rooftop and community solar. In addition, there are many, well established examples of energy efficiency retrofits already within the scope of Energy Smart that can do the same job. To the extent that this happens, CLEP will provide strong, commensurate rewards through demand-charge savings and to a lesser extent, CLEP5 income. Use of CLEP with any of these technologies provides higher annual cashflows than using them without CLEP — often twice as high. And in some very valuable examples, like battery investments,[22] provide full financing where no remuneration was available heretofore.

Houses of worship, which operate primarily in the evening and on weekends, are ideal CLEP consumers. They need not buy any equipment to benefit from CLEP, because utility peak demand seldom if ever happens during a weekend. Churches are paying much higher annual demand charges without CLEP than with it. The following link shows the peak and off-peak hours of Pacific Gas and Electric (PG&E); note that no peak hours occur on weekends when most churches are in operation. https://news.energysage.com/whats-the-cheapest-time-of-day-to-use-electricity-with-time-of-use-rates/

[22] With proper, cost-effective but without subsidy rate design, return on investment for on-site batteries has been higher than for rooftop solar since 2014. https://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf

10. Regarding Paragraph 2 on page 17 of Dr. Katz' Direct Testimony,

a. Please describe in detail the cost and related basis for providing a credit (or charge) of $50/kW-month to a residential customer based on a reduction (or increase) in their actual demand relative to a baseline.

b. Please provide detailed support for the $50/kW-month value.

c. Please state whether Dr. Katz agrees that it would it be easier and equally valid to simply charge the residential customer for any actual peak demand using the same $50/kW-month value? If not, why not?

A. Within parts a. and b., Question 10 is asking: "**Why has "$50" been selected as the monetary factor in the formula for the CLEPm demand charge for residential and then for all other customers?**"

Following the approach in the Direct Testimony[23] we start with the answer to 10 b. i.e., explaining CLEPm's definition for non-residential customers with this quote from the Direct Testimony: [24]

> **For a *non-residential* ratepayer who voluntarily accepts the CLEP tariff,**
> **CLEP is the same as defined for residential ratepayers except,**
> **CLEPm** is redefined and replaces all demand charges where
> **CLEPm = q** * $50 * **d** is calculated monthly;
> **d** = ***Average demand during utility peak hours;***
> *When* **d** *is positive,* ***CLEPm*** *creates a high demand charge paid by the customer***.**

A good way to illustrate that the $50 factor in the definition of CLEPm is appropriate, is through the following example of a small business that cools its building with a single 10-kW AC. This business owner is considering whether to become a CLEP customer but is concerned about what will happen to his annual demand charge under CLEP. Before opting-in to CLEP, that customer will have a monthly demand charge of roughly $100 every month of the year.[25] Therefore, the annual demand bill

[23] For good reasons, the Direct Testimony takes a different approach and order to explaining CLEPm. It begins by explaining CLEPm's rationale and requirements on page 12, line 17 through page 14 line 16. Then on page 16 explains more about CLEPm for non-residential before discussing CLEPm for residential. Then on pages 19 – 20 gives explicit formulas for residential and then non-residential customers and specifies requirements that these formulas and their application must meet beginning on page 21.

[24] From line 10 on page 20 of the Direct Testimony.

[25] See answer to 15.

is $1200 for 10 kW, or $120/kW-year. However, these "demand readings" are based upon the measured maximum peak demand during any 15 minutes, instead of average demand during PUDH.[26] Because average demand is slightly less than one-half of peak demand,[27] we can arrive at the $50 factor as follows.

His annual demand charge starts at $120/kW-y (= 12 times $10/*peak demand in each month*.[28])
The Direct Testimony requires that this customer's annual demand charge will not change.[29]

> "The target of CLEPm is to generate a cashflow (proportional to) the same "average" cost of power charged, i.e. average demand charge, to non-residential customers [in the current rate structure] using the metric of $/KW-year."

Because CLEPm is based upon *average demand during PUDH*[30] and CLEPm replaces ENO's demand charges,[31] all we need is the annual value, **x**, so that $120/kW-y = **x**/*average demand during PUDH*. Because average demand is slightly less than one half of peak demand,[32] we can let **x** = $240.

Unlike ENO's demand charge which accrues monthly, [33] CLEPm only accrues during 5 months.[34]

$240 divided by 5 equals $48/kW-month.

However, because average AC demand is actually a little less than one half of peak AC demand,[35] the simple answer is

CLEPm = $50 * **d**, where **d** = average demand during PUDH.

However, if a customer, such as a dry-cleaner, can demonstrate that his demand profile is not AC-driven, a different coefficient between $25 and $50 will be more appropriate.

---

[26] See part b of the answer to 6. Also see page 13, line 3 of the Direct Testimony that states: "For example, if the average monthly demand charge is $10/KW, this is equivalent to $120/KW-year pricing."
[27] See part a of the answer to 6.
[28] See answer to 15.
[29] "The target of CLEPm is to generate a cashflow (proportional to) the same "average" cost of power charged, i.e. average demand charge, to non-residential customers [in the current rate structure] using the metric of $/KW-year." Page 12 line 19 of Direct Testimony. Where "Proportional to" means equal to but only diminished by the q factor in the definition of CLEPm.
[30] See definition of CLEPm just given, i.e., from page.20 of the Direct Testimony. Note that CLEPm uses "average demand during PUDH" as the measured quantity upon which charges are determined.
[31] See definition of CLEPm just given, i.e., from page 20 of the Direct Testimony.
[32] See part a of the answer to 6.
[33] Although $240 is the annual factor, both the question and this customer need the monthly factor.
[34] Since PUDH only occur during 5 months, CLEPm is only charged during those months. This is reiterated on line 12 of page 21 where it states: "Utility near peak hours are annual and occur weekdays, May through September, between 2 p.m. and 7 p.m.; otherwise CLEPm = $0 for that month."
[35] See part a of the answer to 6.

Suppose this business customer, with a 10-kW peak demand each month, chooses to become a CLEP customer and does nothing else. Then, his average demand during PUDH is slightly less than 5 kW. By paying $50/kW monthly for five months, his annual demand bill stays at roughly $1200 per year.

The answer to 10 a. is given by an explanation of: Why is CLEPm for residential given by:

$CLEPm = q * \$50 * (d_R - d_A)$, where

d_R is the average reference demand during PUDH, and

d_A is the average actual demand during PUDH.

Note that the CLEPm definition given in the Direct Testimony for a residence is on page 18, line 5:

CLEPm = q * $50 * **d** is calculated monthly

d = ***Average demand during utility peak hours*** avoided;

(*i.e.,* **d** = observed reference building demand **minus** observed demand)

We believe that the $50 factor has just been justified on the two previous pages of this answer, i.e., in the answer to question 10 b. What remains is the mapping between the two definitions on this page regarding their respective last two lines; do that by merely defining **d** in the second definition[36] as:

d = $(d_R - d_A)$.

We note that merely by setting $d_R = 0$, the definition of CLEPm at the top of this page equally applies to non-residential customers[37] and is also used for Community Solar farms.[38]

---

[36] As explained in the Direct Testimony on page 17 line 3: "This payment is unique to CLEP, only applicable to residential customers, and calculated by comparing the home's actual demand to a RESNET-defined *reference* home's projected performance as built to the RESNET-standard, building-code-compliant, new home."

[37] "Although this definition is formally identical to CLEP's residential case, because there is no industry-standard way to predict standard demand for non-residential buildings, CLEPm only provides a payment to a commercial customer when that customer sells more electricity to the grid during peak times than the customer buys at the same times." Page 16, line 11 of Direct Testimony.

[38] Direct Testimony, page 20, line 17.

10c. Please state whether Dr. Katz agrees that it would it be easier and equally valid to simply charge the residential customer for any actual peak demand using the same $50/kW-month value? If not, why not?

It would not be appropriate to simply charge residential customers for any actual peak demand by simply using the same $50/kW-month approach.

CLEP is being introduced as an opt-in program because it is new, and we are aware that some unforeseen problems might occur.

Because residential customers pay a 20% higher "cost-of-service" for electricity delivery compared to commercial customers (see answer 15), to be equitable, the rolling out a mandatory residential CLEPm demand charge should also be coupled with a reset of the residential rate to match the average non-residential rate for the cost-of-service rate for electricity delivery, i.e., change that charge to $0.05/kWh from $0.06.

Most important, is the establishment of a reference demand value for each residence. It will impose a minor qualifying process[39] to admit a residence into the CLEP program so that the appropriate reference demand can be established. (Exhibit 1 and Exhibit 2 show that the CLEP Dashboard sets the reference demand for that customer at 3.95 kW.) If we omit this qualifying process it would not allow use of the very profitable and market-transformation enabling, "negative demand charge" payment, only available to residential customers, but not commercial customers, even when their demand is greater than zero.

CLEPm was designed to complement CLEP5. Employing one without the other will have less than ideal results and will most likely incur a larger than optimal carbon footprint. This is because the carbon-footprint per kWh generally increases with the wholesale price.[40] CLEPm only rewards customers during the five months when it is applicable, while CLEP5 is always applicable. CLEP5 always harnesses and encourages the imports of very inexpensive and green electricity such as from wind farms that predominately produce at night, and often many states away. Sales at night and at

---

[39] As explained in the Direct Testimony, qualifying for a higher than zero baseline for CLEPm can be done two ways, via the services of a RESNET certified Home Energy Rater, or by comparison to tens of comparable homes simultaneously experiencing the same climate. See footnote 16 on page 17 of the Direct Testimony.

[40] https://www.nyiso.com/-/carbon-pricing-in-wholesale-energy-markets-frequently-asked-questions

distance is not a problem for MISO because these are exactly at the same times when the long transmission lines connecting the northern and southern ends of MISO are not congested and thus can transport electricity relatively inexpensively. Wind farms are financially supported by a sunsetting Production Tax Credit. Access to that clean and inexpensive power, to a very large extent, is only feasible with deep investments in electric batteries. CLEP provides financing in these situations. Without CLEP5 financing CS is at least 30% more challenging.

Either CLEP5 or CLEPm can be used to greatly decrease growth and even cause decline in peak utility demand. At a 2019 Utility Committee meeting, the cost-effectiveness of AMI was openly associated with lowering future growth of peak demand. For that to work, there must be some form of "time-varying" electricity pricing. This can be done with either CLEPm or CLEP5 — but better results are likely with both rather than with only one of them.

By explaining to customers that "***It saves you money to choose to buy electricity when it is cheaper. If you do that, you will greatly lower your bill***." — That is applicable to both CLEP5 and CLEPm.

Without CLEP5, it may be difficult to finance Community Solar. See line 14 on page 31 of the original testimony: "income for one KW = CLEP5 + CLEPm = $110 + $125 = $235." That calculation shows CLEP5 pays almost half of the CLEP cashflow used to finance CS.

The former CEO of Ice Energy, Mike Hopkins, stated that directly selling Ice-Making AC equipment to end-user consumers is very challenging without a true market-based rate like CLEP and he believes that he has never seen one that is better. He noted that: neither sustainable microgrids nor ice-making AC equipment can be fully financed without such a rate design as this.[41]

---

[41] In support of this financing energy retrofit issue, representatives of Ice-Energy, Gallo Mechanical and Johnson Controls specifically appeared in person or by conference call to express support for CLEP in a meeting in City Hall with Andrew Tuozzolo, Chief of Staff for Helena Moreno on July 30th, 2018. A video clip of Mike Hopkins, former CEO of Ice-Energy, making the same point is available via a URL link at www.BuildingScienceInnovators.com/align-by-design.html.

11. Regarding Paragraph 3 starting on page 17 of Dr. Katz' Direct Testimony, please describe in detail how a community solar project that is delivering 100% of its production to Entergy New Orleans' distribution system would be "paid" for reducing demand (i.e., CLEPm)?

A. CLEP rewards a CS farm for reducing demand[42] though CLEP5 as well as CLEPm. In fact, as much as half of the compensation for being a CS owner or renter may come from CLEP5, because our calculations show that they pay for CS almost equally.

The CLEP Dashboard[43] is programmed to calculate CS income using the following formulas (with **p** and **q** = 95%)

1. *CLEPm* = ***q*** ** $50 * (0 –* ***d*****)*,* where **d** is the average drop in demand (in this case, drop in demand is the same as electricity production) during PUDH. Since **d** is a negative purchase, CLEPm > 0.

2. *CLEP5* = ***p*** ** (n * w)*, where **n** = number of kWh produced in each time period and **w** = instantaneous MISO price in the same 5-minute time period.

As estimated previously (see page 31, line 14, of the Direct Testimony), annual income was calculated by adding CLEP5 + CLEPm to be $110 + $125 = $235 for 1 kW .

Almost the identical conclusion can be observed using the CLEP Dashboard in the screenshot of Exhibit 3 for the same generic customer from answer 7. The customer rented 5 kW from a CS farm and generated 9125 kWh. The annual CLEP remuneration for CS was $1142.78 for 5 kW; that is the same as $228.56 for 1 kW.

Because $1142.78 / 9125 kWh is $0.125/kWh, or almost 14% higher than ENO's retail price of $0.11/kWh, CLEP can pay for CS at a much higher rate than Net Energy Metering, the current **industry standard** used when paying for CS.

---

[42] If the CS farm is located within the distribution system of ENO, any flow from the CS farm will reduce ENO's need to provide power; consequently, BSI rewards CS production by using CLEPm with **d** < 0. Because there is no greater than zero baseline demand, CLEPm defined for non-residential is the same as CLEPm defined for CS.

[43] Exhibits 3 or 4.

12. Refer to pages 19 and 20 of Dr. Katz' Direct Testimony. Please explain the basis and discuss the rationale for "p = Utility-regulator determined, "percent" and $0 < p < 2$" and "q = Utility regulator determined "percent" and $0 < q < 2$," respectively.

A. Factors **p** and **q** were specifically inserted into the formulas for CLEP5 and CLEPm to provide mechanisms by which the utility could hold back a percentage of the CLEP income to be used for purposes other than paying the CLEP customer, or if **p** and **q** are set higher than 1, to provide a short-term incentive to encourage customers to try CLEP. Under Regulator guidance, those monies can:

1. pay CLEP's administrative costs,
2. buydown the current cost-of-energy (i.e., the fuel cost adjustment) in order to lower electricity pricing for all consumers,
3. fund utility profit, and/or,
4. creatively provide incentives, for example, encourage new CLEP customers by paying them at a somewhat higher rate than 100% (i.e., by setting **p** or **q** > 1).

During the first rollout of CLEP, **p** and **q** should be set to 95%, but those values are flexible. By setting **p** or **q** lower than what ENO needs to administer CLEP, the Regulator can allow the utility to receive a substantial performance incentive from CLEP. The more popular CLEP becomes, the more profitable it can be to the utility — engaging the utility to become a partner in finding more (and more cost-effective) ways to exploit CLEP. Most noteworthy is that, as long as both **p** and **q** are less than 1, non-CLEP customers would not be subsidizing CLEP customers. In this case, the subsidy is real and always goes in the other direction.

13. Please describe in detail how CLEP5 differs from a 1-part Real Time Price (RTP) rate structure.

A.

1. **Revenue recovery, which has hampered previous attempts at RTP,**[44] **is not at risk with CLEP**. CLEP does not replace the normal ENO rate; and does not need to assure the regulator or utility that kWhs that pass through CLEP will help meet the utility's revenue requirements.

2. **Unlike RTP but like NEM, CLEP5 allows sales to the utility**, but CLEP also lets consumers become *proactive prosumers,* a role advocated by Navigant, one of ENO's major consultants.[45] For over a decade, NEM has allowed ENO customers to be prosumers. This approach is a demonstrated success, allowing the development of over 35 MW[46] of rooftop solar at no cost to ENO and, in the last few years, was given confirmation of cost-effectiveness by a special utility committee docket on this subject. However, **CLEP5 + CLEPm can and should do an even better job than the highly successful NEM program. Roughly half the cashflow from CS, financed by CLEP, comes from CLEP5 and with the addition of CLEPm, CLEP pays almost 14% higher than NEM.** (See answer 11.)

3. **CLEP5 can provide profits to the utility; RTP does not have this potential**.

4. **CLEP5 lowers the price of electricity for all customers both directly and indirectly**. RTP is only capable of doing this indirectly.

5. Perhaps, most important to the citizens of New Orleans, is what will happen when the next hurricane comes. <u>After a few years of CLEP's deployment, its ability to finance batteries and sustainable grids can greatly improve electricity reliability and do that service at negligible cost.</u> When the primary grid is down, this will save lives.[47] **CLEP5 and CLEPm support microgrids**

---

[44] https://www.osti.gov/servlets/purl/836966, page ES-3. This is a 2003 study on RTP by our government.
[45] Although ENO and Council Advisors seem to disagree with paying customers in dollars and in the same month these benefits accrue, this reluctance to pay for benefits is not the publicly stated opinion of Jan Vrins, managing director of Navigant, at a talk given a the National Governors Association meeting of November 2017, titled "Matched energy production and consumption among renewable power prosumers and end-users." This is found on slide 16 of his talk found at the website link https://classic.nga.org/files/live/sites/NGA/files/pdf/2017/Navigant%20Energy%20Transition%20November%20%202017%20NGA%20FINAL.PDF ENO has hired Navigant to improve its Integrated Resource Planning.
[46] By 2015, much growth has probably happened since, but the LA subsidy expired around that time.
[47] Lessons learned from Hurricane Sandy. https://www.greentechmedia.com/articles/read/microgrids-hurricanes-resiliency#gs.epb1q0

which are now growing to be common, but these were not on the radar 15 years ago when RTP was first broadly tested around the country.[48]

6. **Unlike the opportunities for RTP in 2003, CLEP will attract energy and power aggregators.** The fact that RTP did not attract many customers was suspected to be largely caused by customer inability to respond effectively and on time.[49] Now, energy and power aggregators, such as Voltus[50], are increasingly common. They help participants meet and exceed expectations but are far more interested in a rate design that can fund transactions in both directions because such a rate allows the aggregator to more easily compete in the wholesale marketplace.

7. "Experience with existing RTP programs suggests that ***customers with on-site generation have been among those most receptive to RTP and, in some cases, the most price-responsive***"[51] This demonstrates that having alternative electricity resources is very important to the success of RTP. The strategies commonplace in 2003 have given way to more technologically advanced and cost-effective methods like customer-owned batteries.[52] **Unlike RTP, CLEP5 both remunerates electricity sales and helps finance batteries together, these can create a mutually supportive feedback loop.**

---

[48] https://www.osti.gov/servlets/purl/836966, "microgrid" is not found in the executive summary.
[49] IBID.
[50] https://www.sdge.com/businesses/savings-center/energy-management-programs/demand-response/base-interruptible-program
[51]https://www.osti.gov/servlets/purl/836966, page ES-10.
[52] In "Inverted Demand Compliant Construction, a key to a renewable energy future", EEBA conference, 2014, Dr Katz demonstrates that battery investments are more cost-effective than rooftop solar. https://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf

14. Refer to page 22 of Dr. Katz' Direct Testimony. Please describe in detail how "… selling electricity to ENO when the instantaneous wholesale is higher than the monthly average price …will lower the average cost of electricity ENO incurs and thereby passes some of those savings to all customers."

A. The answer to this question is best explained if broken into four parts:

a. What is a CLEP5 transaction and where does the money go?
b. How can "cost-of-energy" and "average cost of electricity ENO incurs" be modelled?
c. How will "selling electricity to ENO when the instantaneous wholesale [price] is higher than the monthly [weighted] average price… lower the average cost of electricity ENO incurs"
d. How a "lower average cost of electricity ENO incurs" provides "savings to all customers".

a. What is a CLEP5 transaction[53] and where does the money go?

A CLEP customer pays ENO the sum of the normal ENO bill (which raises the customer's financial obligation to ENO) plus the CLEP "income"[54] for that month where CLEP = CLEPm + ∑CLEP5, and each CLEP5 transaction generates a cashflow according to the following definition.

CLEP5 = p * n * (e - w) is calculated every 5 minutes, where:

p = utility-regulator determined, "percent" with $0 < p < 2$, (as discussed above, p is at first set to 95% by default);

n = number of kWh purchased by the customer during this time interval, if this were a net sale, **n** is negative;

e = monthly weighted-average wholesale price (i.e., cost-of-energy)[55]; and

w = instantaneous wholesale electricity price (from MISO).

Clearly, both the meaning of and how to calculate the cost-of-energy is important to understand CLEP5's definition as well as the key issues in the answer to Question 14.

---

[55] See Appendix 1.

b. How can "cost-of-energy" and "average cost of electricity ENO incurs" be modelled?

Let **e** = cost-of-energy and **C** = ***cost of electricity ENO incurs***, then define the difference, **D** = **e - C**. In almost all cases, when its customers buy electricity, ENO makes it or purchases it from MISO. Because ENO is a regulated monopoly, ENO may not profit from purchases from or sales to its customers. Thus, costs and income for electricity ENO incurs are set by or reported by MISO's prices.[56] Thus, to a large extent[57], ENO's membership in MISO determines and broadcasts the ***cost of electricity[58] ENO incurs***. BSI contends that whether D=0, ENO's cost-of-energy should be calculated as the monthly weighted average wholesale price, via:[59]

Let $\mathbf{e} = [\sum \mathbf{N}_i * \mathbf{w}_i - \sum \underline{\mathbf{N}_i} * \mathbf{w}_i] / [\sum \mathbf{N}_i - \sum \underline{\mathbf{N}_i}]$ is calculated monthly, where:

> $\mathbf{N}_i$ is the number of kWhs ***purchased*** by all ENO customers while the MISO price is $\mathbf{w}_i$ and
> $\underline{\mathbf{N}_i}$ is the number of kWhs ***sold*** at $\mathbf{w}_i$.

Very important to both question 14 and intrinsic to the definition of CLEP5 is the key adjective "***weighted***" in the definition of **e** that was accidently omitted from the Direct Testimony. I.e., BSI asserts that ENO's membership in MISO effectively forces the above definition of **e** to equal ENO's "cost-of-energy" and only differs from "the average cost of electricity ENO incurs." by a very small or almost constant D.[60]

---

[56] The principal and perhaps only exception is in the case of NEM, where according to Andrew Owens, roughly 3 million kWh/y, i.e., about 5% of the production of New Orleans' residents' rooftop solar (roughly 35 MW a few years ago) is sold to ENO at retail rates — at various times the retail rate is higher than MISO prices. Assuming a conservatively high, weighted average amount of $0.05 higher than wholesale, the total addition to the cost of energy from these NEM purchases would be less than (1/20) *$3 million/y = $150,000/y = D.

[57] Considering the annual total cost of energy for ENO from all other causes is around $300 million, D's percent of **e** is about = 150E3/(300E6) = 1/2E-3 = 0.05%.

[58] Note that the definition of LCOE in this publication from DOE absolutely conflates the ***cost-of-energy*** with the ***cost of electricity production***. https://www.energy.gov/sites/prod/files/2015/08/f25/LCOE.pdf

[59] The formula that defines **e** is translated into "English" in Appendix 1.

[60] See last footnote of Appendix 1.

c. **How will "selling electricity to ENO when the instantaneous wholesale** [price] **is higher than the monthly** [weighted] **average price… lower the average cost of electricity ENO incurs?**

What happens when a customer sells a kWh to ENO when the then-current MISO wholesale price is higher than the weighted average price — that is, when **w** is greater than **e**?

Two things happen:

i. The first is relevant to question 14 but independent of CLEP:

> *More electricity is sold to MISO at a price higher than* **e** *than would have happened had this transaction not occurred. But since this is "monetized into ENO's budget according to the definition of* ***e****", this transaction will lower* **e.**[61]

How much will that transaction lower **e**? The answer comes from the formula for **e** and is very small because around one billion kWh are purchased or made by ENO monthly, i.e., "$\sum \mathbf{N}_i$" in the definition of **e** is roughly 1 billion, and all that was done by this single kWh sale to ENO was: it decreased the numerator in the formula for **e** very slightly. E.g., if **w** – **e** = 2 cents, **e** will decrease by roughly 2 hundredth-billionth of a cent. Although this is very small, it is real.

ii. The second thing is very important to the CLEP customer but seems at first to be irrelevant to Question 7. The CLEP customer will be rewarded with a relatively substantial and positive cashflow from CLEP5. In that case, (**e** – **w**) < 0, and because it is a sale of one kWh, **n** = -1, thus:

CLEP5 = **p** * **n** * (**e** – **w**) > 0.

For example, if **w** were 2 cents greater than **e**, then

CLEP5 = 0.95 * -1 * (-2 cents) = $0.019.

It is not irrelevant to Question 7 because this action creates perceivable income for CLEP customers — thereby encouraging them upon seeing the effect, to do this kind of transaction as much as they can — thus creating a positive feedback loop. They can do this with a battery sending electricity to ENO when the MISO price is above **w**, and they can also do it with some forms of electrical generation, including rooftop solar or partial ownership community solar.

---

[61] Explained in detail and proven in Appendix 1.

d. How does a "lower average cost of electricity ENO incurs" provide "savings to all customers".

As explained in the answer to question 15, every customer pays an extra charge for each kWh beyond the cost-of-service for electricity delivery, called the Fuel Cost Adjustment, i.e., cost-of-energy. But that is the same as **e**.[62] So when **e** decreases, it will lower the price of electricity for all customers.

[62] See footnote in that appendix.

15. Refer to page 24 of Dr. Katz' Direct Testimony. Please provide data and support for the statements: "Although residential customers have been "forgiven" demand charges, this "largess" "may be fairly" accommodated by the fact that residential customers pay substantially more for energy in their "cost-of-service" part of their charge for a kWh as compared to commercial customers. This practice may work out "on average," but this practice unfairly lumps all residential customers together: some residential customers have either much smaller cumulative energy/demand ratios than others, and other residential customers have substantially less demand during peak hours than others."

A. ENO publishes rates/tariffs at http://www.entergy-neworleans.com for:

1. Non-residential customers[63]:
   a. Average cost-of-service to deliver energy is near $0.05/kWh.
   b. Average demand charge is close to $10/kW-m.
2. Residential customers[64]:
   a. cost-of-service to deliver energy is near $0.06/kWh
   b. demand charge is $0/kW-m
3. Cost-of-energy[65].

Cost-of-energy[66] is added to cost-of-service[67] to establish the retail price for each kWh sold by ENO to each of its ratepayers, regardless of rate, whether residential or non-residential.

As indicated above — compared with non-residential customers, the residential customer pays no demand charge, but instead pays a 20% higher cost-of-service fee for electricity delivery.[68] Although all residential have the same cost-of-service charges, without demand charges, this results in an inequitable practice. Some customers have much larger demand versus energy consumption ratios, while other customers have substantially less demand during PUDH. Examples include the greater AC use associated with the 25% of residents who have home-based businesses[7] and would benefit from higher energy prices without demand charges. Compare that to those residents who only have heavy demand outside of PUDH.

---

[63] http://www.entergy-neworleans.com/your business/tariffs/

[64] https://cdn.entergy-neworleans.com/userfiles/content/price/tariffs/eno/enol_elec_res.pdf?_ga=2.84937625.1088849381.1557336145-2120711373.1557336145

[65] https://cdn.entergy-neworleans.com/userfiles/content/price/tariffs/eno/enol_elec_fac.pdf?_ga=2.97469343.1088849381.1557336145-2120711373.1557336145

[66] My testimony uses the standard jargon explained in the primary footnote from the Regulatory Assistance Project, as found in the direct testimony for CLEP — where ENO uses the term "fuel adjustment & purchase power cost" and this difference in terminology adds to the difficulty in discussing this topic.

[67] Unlike cost-of-energy, the cost-of-service addend in the retail price depends on the particular rate for that customer class.

[68] This ratio does not include the fuel cost adjustment, a.k.a., "cost-of-energy", added to the price of electricity.

16. Refer to page 24 of Dr. Katz' Direct Testimony. Please provide data and support for the statement: "Some commercial customers, like churches, have only a negligible amount of demand during typical utility peak hours but are nevertheless charged using the same method applied to all commercial customers."

A. Please see answer 9.

17 Refer to page 24 of Dr. Katz' Direct Testimony. Please describe in detail and provide support for (i) why a utility's rate structure should provide a way to "to fully finance them [batteries]" and (ii) his assertion that there is a "shortcoming in fair electricity rates."

A. Within a utility grid, batteries have at least 20 uses:

" **ISO/Market**

1 Ancillary services: frequency regulation
2 Ancillary services: spin/ non-spin/ replacement reserves
3 Ancillary services: ramp
4 Black start
5 Real time energy balancing
6 Energy price arbitrage
7 Resource Adequacy

Generation

8 Intermittent resource integration: wind (ramp/voltage support)
9 Intermittent resource integration: photovoltaic (time shift, voltage sag, rapid demand support)
10 Supply firming

Transmission/ Distribution

11 Peak shaving
12 Transmission peak capacity support (upgrade deferral)
13 Transmission operation (short duration performance, inertia, system reliability)
14 Transmission congestion relief
15 Distribution peak capacity support (upgrade deferral)
16 Distribution operation (voltage / VAR support)

Customer

17 Outage mitigation: micro-grid
18 Time-of-use (TOU) energy cost management
19 Power quality
20 Back-up power "[69]

Clearly extremely useful, when given the right rate — such as that proposed by CLEP — customers and/or their aggregators will install batteries on the customer side of the meter[70] at no cost to the utility or non-participating customers. Investments in batteries bestow many direct and indirect benefits for customers, not the least of which is getting a good ROE. Others include:

1. Lowering the price of electricity for all customers
2. Lowering peak demand
3. Making the grid more stable
4. Causing electricity delivery within buildings to become more reliable.
5. Lowering a customer's utility bill with better ROE than rooftop solar.[71]

---

[69] *Perspective on Solar and Energy Storage*, Thomas Bialek, PhD PE, Chief Engineer for Sempra, SG&E, Jan 13, 2014, Integrated Solar and Storage Workshop, Sunshot Initiative, Berkeley, CA.
[70] Fitzgerald, Garrett, James Mandel, Jesse Morris, and Hervé Touati. The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid. Rocky Mountain Institute, September 2015. http://www.rmi.org/electricity_battery_value
[71] *Inverted Demand Compliant Construction may be an Indispensable Key to a Renewable Energy Future*, delivered at the 2014 Annual EEBA Conference, Myron Katz.

As noted above, utilities also benefit from batteries in myriad ways, ranging from enhanced grid reliability to a reduced need for "spinning reserve". The real question is why wouldn't they want them?

Although already addressed in this and prior answers (e.g., see answer 16), more "shortcoming[s] in fair electricity rates", are addressed below.

ENO's rates provide no financial support for battery purchases — unlike CLEP's ability to fully finance them. Further benefits are presented below; these are taken from a PowerPoint slide.[72] Note, ENO's rates, at best, provide good treatment for less than half of them. CLEP provides good to very good treatment for most of them.

Simple
Quick to Implement
Cheap to Implement
Continuously Effective
Low Administrative Cost
Low Regulatory Burden
Reduces Consumption
Reduces Demand
Promotes Energy Efficiency
Requires Smart Meters
Shifts Time of Use
Market Transformations
Shaves Peaks
Treats Peak's Shoulders
Not A Subsidy
Timely Charge or Reward
Balances Supply VS Demand
Finances Rooftop Solar
Looks Like a Subsidy
Pays as Well as Retail
Reduces CO2 Production
Tax
Finances Community Solar
Real Performance Based
Lowers Electricity Prices
Market Based
Adequately Granular
Adjusts to Changes
Pays for Whole-Home Batteries

Here is Jim Lazar's brief take on what constitutes a fair and reasonable price model. (Jim Lazar is a consultant on ratemaking and resource planning whose clients include utilities and commissions.)

"What's the Fair and Reasonable Price Model?

There are a number of options for utility regulators to align pricing and incentives in a way that covers system costs and makes the grid more efficient.

- Use time-varying pricing, so that customers pay more for energy when it actually costs more to produce.
- Give/sell customers tools to shift their electricity use and reduce their costs and grid costs.
- Consider market-based approaches, even within monopoly markets, by setting appropriate prices for distributed energy or demand response (e.g. paying customers to *not* use energy when it's in high demand)."[73]

The next few paragraphs provide two, interdependent messages:

Each ratepayer should be

- **able to lower the carbon footprint directly caused by actions of that customer, and**
- **almost fully financially rewarded for the utility cost-savings THAT customer generates.**

[72] www.buildingscienceinnovators.com/uploads/1/0/6/2/106256229/customerloweredelectricityprice-10min-pitch.pptx
[73] https://www.raponline.org/knowledge-center/fixed-charges-demand-charges/

Because the carbon-footprint per kWh generally increases with wholesale price,[74] CLEP5 most often harnesses and encourages the imports of very inexpensive and green electricity such as from wind farms that predominately produce at night and most often many states away. Wind farms are financially supported by a sunsetting Production Tax Credit.[75] CLEP supports an important sustainability solution.

CLEP directly remediates two significant effects of old-school electricity pricing: "inadvertent cost-shifting from one customer onto others". This happens "ON" electricity ***energy pricing*** when electricity is bought when wholesale prices are instantaneously higher than this month's cost-of-energy price: we call this "energy-cost-shifting" and the fix for it is CLEP5. This happens "ON" electricity ***demand pricing*** when electricity is "excessively" demanded during the utility's peak demand hours: we call this "demand-cost-shifting" and the fix for it is CLEPm.[76, 77]

Demand charges unfairly burden houses of worship because their demand is seldom coincident with utility peak demand. Compare to Germany where demand charges only accrue when coincident.[78]

ENO's rates provide, at best, minimal support for load-shifting to outside of peak demand. This underfunds electric batteries, electric vehicles, timed water heaters, and ice-making ACs. (Exhibit 4.)

The biggest cause of both climate change as well as high peak demand is air-conditioning.[79] Ice-making ACs do load-shifting, drastically reduce heat islands, and can run when the wholesale price is lowest. This is a win, win, win. ENO's rates do not support ice-making ACs. CLEP does this for free.

Electricity reliability is most cost-effectively accomplished with the use of on-site batteries.[80] ENO has a major electricity reliability problem with neither a good handle on either how to fully fix it nor what benefit/cost ratio any proposed means would provide. CLEP provides batteries without any cost to ENO ratepayers. Batteries are not just a guarantor of reliability, they save lives.[81]

---

[74] www.raponline.org/wp-content/uploads/2016/05/rap-cowart-carboncapsandefficiencyresourcesaceee-2009-06-05.pdf
[75] https://www.natlawreview.com/article/sunrise-to-sunset-phasing-out-renewable-energy-tax-credits
[76] https://www.buildingscienceinnovators.com/align-by-design.html
[77] Also see Appendix 1 to fully explain this in combination with the answer to Question 14.
[78] www.raponline.org/wp-content/uploads/2016/05/rap-faruquihledikpalmer-timevaryingdynamicratedesign-2012-jul-23.pdf
[79] https://www.iea.org/newsroom/news/2018/may/air-conditioning-use-emerges-as-one-of-the-key-drivers-of-global-electricity-dema.html
[80] See RMI quote two pages back.
[81] See Lessons learned from Hurricane Sandy… many pages back in the footnotes.

New Orleans' long-term existence depends upon rapid, worldwide deployment of means to arrest global warming.[82] ENO is, at best, running to catch up with other utilities worldwide and instead has a long track-record of draging its feet on a host of progressive policies including community solar,[83] integrated resource planning and deployment of obsolete before building, gas-fired peaking plants. It is time to reverse that trend and let ENO take the lead.

Unless HVAC equipment incorporates variable refrigerant volume (VRV) or hydronic delivery (HD), AC oversizing almost invariably greatly undermines dehumidification in homes and offices — the more so in a climate like New Orleans where humidity is so high. Nowhere in ENO's rate structure (and virtually none within Energy Smart) is there any effort to remedy this failing of the HVAC industry nor any means to promote the market transformations needed to better adapt to New Orleans' cooling needs. Moreover, because of the very high and growing humidity in New Orleans' ambient air, comfort within buildings is far more dependent upon relative humidity (RH) than temperature.[84] Because the most common and conventional HVAC types sold in New Orleans, are either window units or ducted systems, which, far too often, fall outside of the VRV and HD design approaches, our buildings are BOTH: over-cooled and under-dried, EVEN WHEN the equipment is not oversized. The simplest solutions to these problems — easily incorporated throughout most of the building stock and readily in the market — are heat-pump water heaters and ductless mini-splits ACs. Although these technologies are already subsidized within Energy Smart, the subsidy for ductless is grossly inadequate and the subsidy for heat-pump water heaters gets exhausted in the first month of the Energy Smart's program year. CLEP can easily remediate these problems, place the solution in the rates instead of in a highly regulated and heavily administration-loaded DSM program, and really get the job done because of CLEP's strong, intrinsic and performance-based, market transforming, *carrot and stick* rate design.

As Jim Lazar pointed out: the right way to induce good results is with truly progressive rates.

---

[82] https://expo.nola.com/news/erry-2018/11/b64a03f8128002/climate-report-louisiana-south.html

[83] Community Solar by the name "Remote Displace Generation" was invented in New Orleans in 2006, because it appears in the Energy Hawk, but CS was not allowed by ENO until 2018. http://www.theregengroup.com/docs/EnergyHawk.doc

[84] Standard HVAC equipment does 3 times as much cooling as drying and can only get that much work done if the equipment is on at least 25 minutes per cycle. That is, if the equipment is oversized, the ratio degrades to more like 95% cooling to 5% drying. However, because New Orleans' high RH, the needed air conditioning in New Orleans is: 3 times as much drying as cooling. Not only does this grossly undermine comfort at high energy cost, it even more effectively undermines building durability. Expert opinion of Dr Katz.

18. Refer to page 28 of Dr. Katz' Direct Testimony. Please provide the basis and detailed calculations to support his assertion that a 3-ton AC unit in New Orleans will consume approximately15,000 kWh/year.

A The assertion that a 3-ton AC unit in New Orleans will consumer approximately 15,000 kWh/year is based on information from three sources, but others can be identified.

a. The Department of Energy's Energy Information Administration (footnote 29 on page 29 of the Direct Testimony) has stated that residential AC energy consumption is three times water heating consumption in the southeast.[85]

b. Information from a December 15, 2018 article in the San Francisco Chronicle, "*How much does the hot water heater affect the electric bill?*" by Jessica Lietz, stated that:

"An average water heater runs three hours daily. A 50-gallon, 5,500-watt water heater with a .90 EF and an electricity rate of $.16 per kilowatt hour will cost $781 to operate each year. Most water heaters include a label listing the annual operating cost."[86]

Therefore, a water heater will consume approximately 5000 kWh/y.

c. The median home in New Orleans is fitted with a 3-ton AC.[87]

---

[85] https://www.EIA.gov/consumption/residential/
[86] https://homeguides.sfgate.com/much-hot-water-heater-affect-electric-bill-88704.html
[87] Dr. Katz's expertise and experience as a certified home energy rater who audited hundreds of New Orleans-area homes between 1995 and 2005.

19. Refer to page 29 of Dr. Katz' Direct Testimony. Please provide supporting data for his assertion that "energy can be sold back to the wholesale [MISO] market at an average profit of at least $0.04/kwh."

A. Douglas Jester, a utility and energy research, modeling and policy expert, as well as senior energy policy advisor to the Michigan Department of Energy, Labor, and Economic Growth,[88] stated that a $10,000 battery that stores about 10 kWh can be completely financed using only price arbitrage on a MISO node in less than the 10-year warranted life of the battery.[89] Paying for the battery over ten years would cost $1000/y or about $3/d. At one discharge / recharge cycle a day of 10 kWh, the average profit from price arbitrage (buying and selling electricity) per kWh moved would be about $0.30. At 3 cycles per day, profit would be about $0.10/kWh. The more modest $0.04/kWh was chosen instead because the New Orleans MISO node may offer fewer or smaller price swings.

The larger issue is whether CLEP can finance such a battery within the window of its warranty. The answer is **not at this time**. It was originally estimated that CLEP would provide less than $700/y (see page 29 of Direct Testimony) and, more recently, the CLEP Dashboard (Exhibit 2) came to roughly the same conclusion, arriving at $570/y with a 12-kWh battery that charged during 4 hours at night and discharged during 4 hours in the afternoon. A battery can still be financed with CLEP cashflows in three *indirect* ways (pages 32-33 of Direct Testimony), but not yet *directly* financed at this time.

---

88 https://5lakesenergy.com/our-team/douglas-jester/

89 Personnel communication with Tom Stanton, of the National Regulatory Research Institute, 2017.

20. Refer to page 30 of Dr. Katz' Direct Testimony. Please provide detailed support and data for the assertions that (i) a 1 MW community solar facility in New Orleans would cost "less than $1 per watt," (ii) the NREL PVWatts model would predict an average solar production value of 1,800 kWh/year, and (iii) the average wholesale (MISO) price will be over $0.06 per kWh.

A. Please see the first footnote below[90] (also cited on page 30 of Direct Testimony as footnotes 33 and 35) for short explanations and references to the source material from which assertions (i) and (ii) came. The third assertion is justified below.

The statement, "the average wholesale (MISO) price will be over $0.06 per kWh", means that the ***annual, weighted-average MISO price*, while solar panels make electricity in New Orleans, is greater than $0.06 / kWh.** Because of the time-dependent variations in solar output, the average price must be "weighted". Weighting assigns higher values to the hours that make more electricity: all nighttime hours are assigned a "0" weight factor, while daytime hours have varied weights — increasing in value closer to midday.[91]

The "over $0.06/kWh" price was supported by a statement by the owner of a successful, local solar company who thought that the weighted-average MISO price was higher than the ENO retail price (about $0.105/kWh at that time), as well as a subsequent ENO conclusion reached in a recent utility docket that NEM was not burdening non-NEM ratepayers. Either assertion infers that the weighted-average price was greater than the retail price. Because $0.06/kWh is only a bit more than half the retail price, "over $0.06/kWh" is a conservative estimate.

When the CLEP Dashboard is applied to CS, using the default resident discussed in answer 7 (see Exhibit 3), results are surprisingly similar. The CLEP Dashboard calculated that 9125 kWh are generated by 5 kW of solar which resulted in $1,142.78 of income. Page 30 of Direct Testimony predicted $235 in CLEP income for 1 kW. When $1,142.78 is divided by 5, it results in $228. In short, Community Solar is a big win for New Orleans when financed with CLEP.

---

[90] "At the utility scale, solar farms will be at least 1 megawatt, which is a solar plant capable of supplying about 200 households. The cost per watt per solar installation (at this scale) will vary, based on several factors, such as available sunlight hours and location, but it's usually around $1/watt." https://www.EnergyCentral.com/c/gn/initial-steps-building-solar-farm; also see https://PVWatts.NREL.gov/

[91] Because of great fluctuations in the real world, it is easy to try harder than useful to improve accuracy, this was taken into consideration when estimating the average price.

21. Please provide a working Excel file with all formulas intact for Exhibit MBK-1.

A. The requested Excel spreadsheet, with all calculation formulas, is attached as Exhibit 5. Utilizing 2016 battery technology and prices, the spreadsheet projects the economics[92] of a CLEP Battery Pilot from the utility's perspective, displaying initial utility and customer investments, as well as the cashflows that allow the utility to recoup its costs over 10 years and earn a 37% profit — with non-CLEP participants bearing no burden.

Created in 2016, the spreadsheet displays the economic details of a CLEP battery pilot. Each of the 1000 residents in the pilot would be using a battery purchased, installed and owned by the utility and each battery would earn the utility about $600/y in CLEP income, or $600,000 annually. However, this $600/y value was approximated and not calculated within the Excel file. At the time the spreadsheet was created, obtaining a more accurate estimate of CLEP cashflows was hampered by both limited access to MISO data and inadequate software. A year's worth of 5-minute MISO data would have helped arrive at more accurate projections of CLEP cashflows but the advanced, custom software needed to manage this data was not available. Since the February 1, 2019 submission of Direct Testimony in this docket, the CLEP Dashboard was developed and largely overcomes both of these problems. Our CLEP development team believes that a live, hands-on demonstration of the CLEP Dashboard would be of great benefit and we welcome the opportunity to provide that service.

---

[92] Using the same approach as a similar spreadsheet used by Green Mountain Power in its successful application to its regulator for a 500-home battery pilot in 2015. www.wbur.org/morningedition/2016/06/28/vermont-tesla-home-batteries

22. Please state whether Dr. Katz agrees that Council Resolution 19-111 regarding community solar rules currently specifies a clear billing framework that will be used to credit customers for their participation in a community solar project?

A. Council Resolution 19-111 does specify clear billing on Community Solar. It represents some movement in the right direction, but it is inadequate in that:

1. Resolution 19-111 only applies to "low income" residents — leaving out all other residents and all non-residents (such as commercial, industrial, municipal, etc.), and
2. Resolution 19-111 only pays at the retail rate, i.e., at a rate equivalent to NEM.

The previous Utility Committee resolution on Community Solar, which passed on Dec 13, 2018, had a very different billing framework. Unlike Resolution 19-111, it provided the means to pay all customers, but even that remuneration was deemed by Councilwoman Helena Moreno to be far below adequate and that amount was around half of the value provided by Resolution 19-111.

CLEP is in this Rate Case docket. It has the advantages that it applies to all customers. The CLEP Dashboard has calculated that, when applied to Community Solar, CLEP can generate cashflows almost 14% higher than retail. (See answer 11.)

The economic feasibility of Community Solar depends as much on the cost of ownership as upon the amount of the remuneration. Question 22 has only raised issues regarding the output side. BSI would welcome a discussion on the cost of ownership but, for purposes of this answer, has stayed within the scope of the question.

Appendix 1

Because ENO is a member of MISO, ENO's cost-of-energy, **e,** for any month must[93] be defined as follows. Above, we define **e** as the monthly, weighted-average MISO wholesale price, and here we describe how **e,** the **cost-of-energy** for some month, is calculated[94]:

$\mathbf{e} = [\,\sum \mathbf{N}_i * \mathbf{w}_i - \sum \underline{\mathbf{N}}_i * \mathbf{w}_i\,] \,/\, [\,\sum \mathbf{N}_i - \sum \underline{\mathbf{N}}_i\,]$, where:

each $\sum$ is a sum over all $\mathbf{w}_i$ in {all MISO prices used at the New Orleans node in that month};

$\mathbf{N}_i$ = net # of kWhs ***purchased*** by all ENO customers in the current month while the price is $\mathbf{w}_i$;

$\underline{\mathbf{N}}_i$ = net # of kWhs ***sold*** at $\mathbf{w}_i$, and;

$\mathbf{w}_i$ = the instantaneous wholesale electricity price from MISO. [95]

Theorem 1: If you buy a kWh at a lower price than **e,** then the new weighted average decreases. Restated, if another kWh were bought at price **w**, where $\mathbf{w} < \mathbf{e}$, then the new weighted average < **e**.

<u>Proof: </u>(Here we provide alternative but equivalent ways to re-write the formula for **e.**):

$\mathbf{e} = [\sum \mathbf{N}_i*\mathbf{w}_i - \sum \underline{\mathbf{N}}_i*\mathbf{w}_i] \,/\, [\sum \mathbf{N}_i - \sum \underline{\mathbf{N}}_i] = \sum (\mathbf{N}_i - \underline{\mathbf{N}}_i)*\mathbf{w}_i \,/\, \sum (\mathbf{N}_i - \underline{\mathbf{N}}_i) = \sum (\mathbf{N}_i - \underline{\mathbf{N}}_i)*\mathbf{e} \,/\, \sum (\mathbf{N}_i - \underline{\mathbf{N}}_i)$

The equality expressed across the third "=" is helpful because it says **e** can be expressed either as a weighted sum using ***differing values*** of $\mathbf{w}_i$ or equally with ***each of those "w_i" factors replaced with the value*** **e** because any weighted average of addends, where each addend is the same constant, **C**, must have **C** as the calculated weighted average. To help make this clearer, if we let $\mathbf{M} = \sum (\mathbf{N}_i - \underline{\mathbf{N}}_i)$, then the last weighted average is just **M** * **e** divided by **M**.

Now we prove the theorem: The premise of the theorem applied to the above definition of "cost-of-energy" says the new weighted average is $(w + \mathbf{M} * \mathbf{e}) \,/\, (1 + \mathbf{M})$. Because the numerator is smaller than $(1 + \mathbf{M}) * \mathbf{e}$, the new quotient must be less than **e**.

---

[93] Dr Katz suspects that perhaps ENO has additional contributions to the definition of **e** other than simply the monthly weighted average of MISO prices, however, **e**, as defined, must at least be a major part of ENO's cost of energy. Indeed, even if **e** as defined on this page were ***only a part*** of ENO's cost of energy, CLEP5 can still be defined using the definition **e** on this page and the same conclusions asserted in Question 14 and anywhere else in this testimony or the Direct Testimony would still be accurate.

[94] This formula for e, restated in plain English, merely says: "cost-of-energy = [the sum of the expenses (i.e., from buying) minus the sum of the income (i.e., from selling)] divided by [the number of purchases minus the number of sales]."

[95] The subscript i indicates correspondence with the values N_i and w_i. (It could be thought of an "index" into an array of values.) (Theorem 1's corollary uses w without the index, meaning just the then-current price.)

Corollary: If you sell a kWh at a higher price than **e**, then the weighted average decreases.
Restated: if a kWh is sold at price **w**, and **w** > **e**, then the new weighted average < **e**.

Proof: The premise of the theorem applied to the definition of "cost-of-energy" says the new weighted average is [-**w** + **M** * **e**] / [-1 + **M**]. Because **w** > **e**, the new numerator must be less than (**M** - 1) * e.

Because the denominator is **M** – 1, the new quotient is less than **e**.

Exhibits 1, 2, and 3:

Exhibit 1: CLEP Dashboard, Residential Customer, Reference Demand = 3.94 kW, Oct 20, 2018 Annual Study /with and /without CLEP

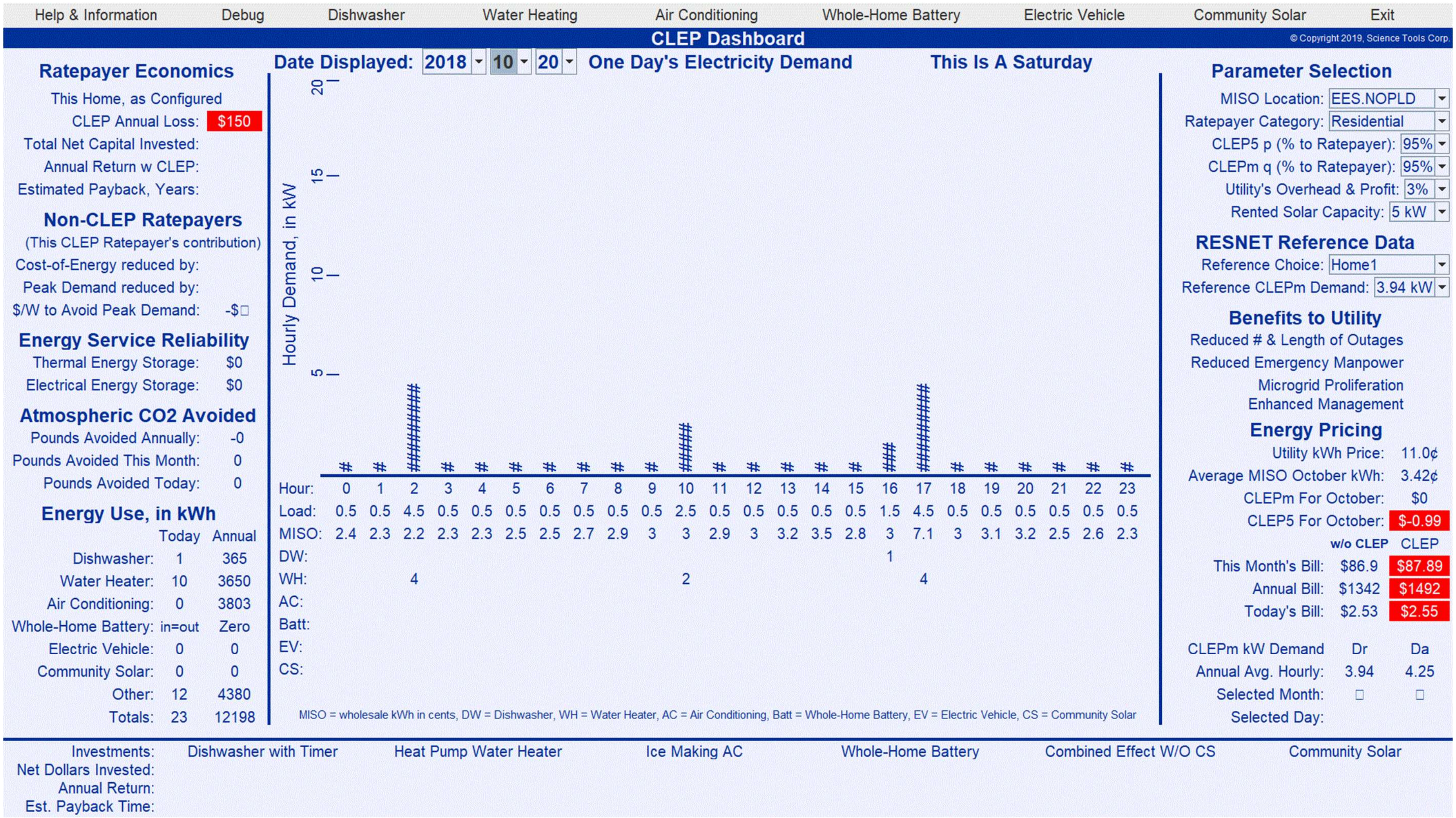

Exhibit 2: CLEP Dashboard, Residential Customer, Reference Demand = 3.94 kW, Oct 20, 2018 Annual Study with and without CLEP Resident has purchased a 12 kWh Whole-Home Battery and has it completely charge and recharge daily.

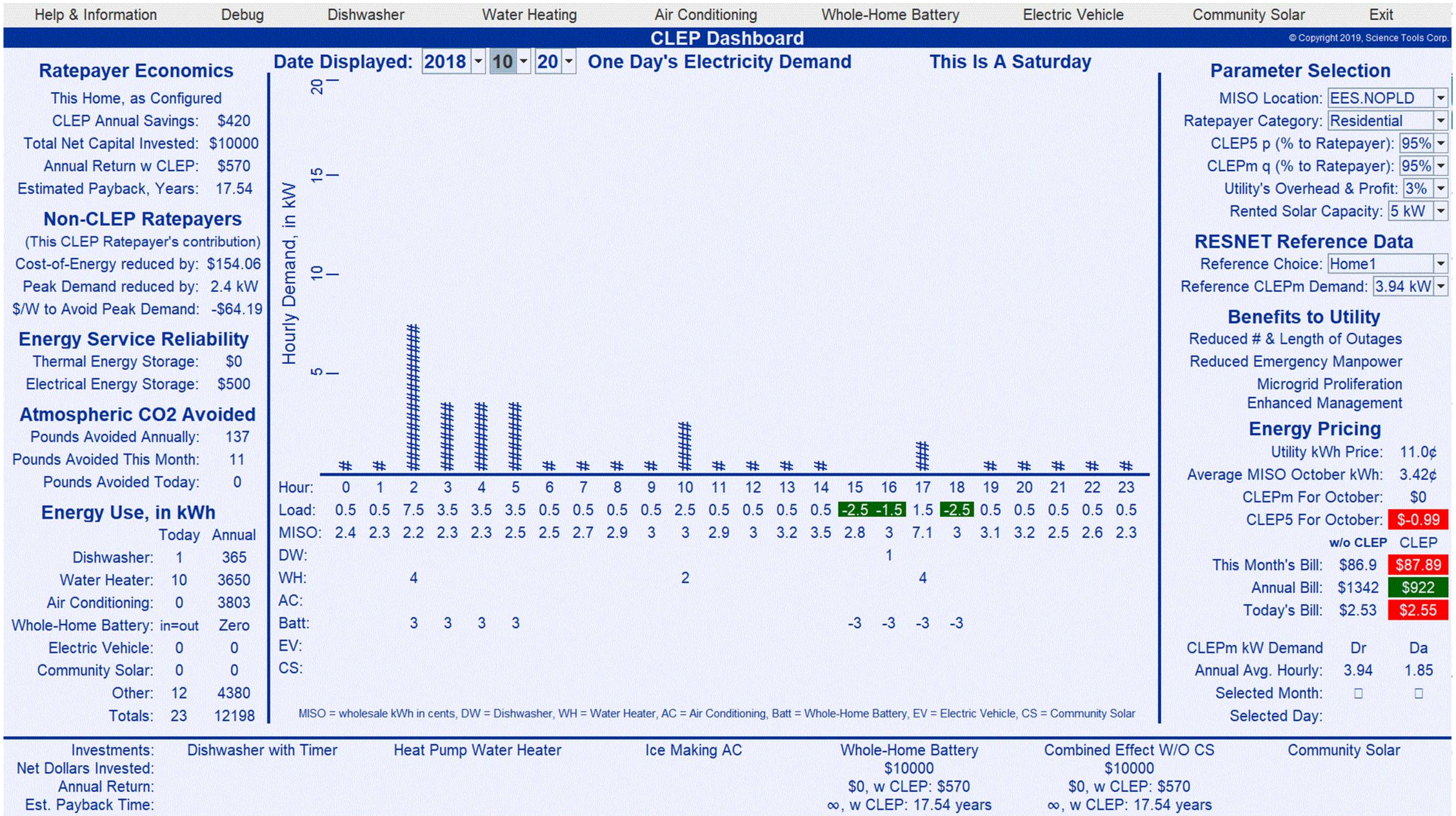

Exhibit 3: CLEP Dashboard, Residential Customer, Reference Demand = 3.94 kW, Oct 20, 2018 Annual Study with and without CLEP Resident has rented 5 kW of a Community Solar Farm.