

**BEFORE THE
COUNCIL OF THE CITY OF NEW ORLEANS**

**APPLICATION OF ENTERGY NEW ORLEANS,)
LLC FOR A CHANGE IN ELECTRIC AND GAS)
RATES PURSUANT TO COUNCIL) **DOCKET NO. UD-18-07**
RESOLUTIONS R-15-194 AND R-17-504 AND)
FOR RELATED RELIEF**

**DIRECT TESTIMONY OF
MYRON B. KATZ, PhD**

ON BEHALF OF

BUILDING SCIENCE INNOVATORS, LLC

FEBRUARY 1, 2019

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16

1 **INTRODUCTION**

2 Q1. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

3 A. My name is Myron B. Katz, PhD. My business address is 302 Walnut, New Orleans,
4 Louisiana, 70118.

5

6 Q2. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

7 A. I am currently a managing partner of Building Science Innovators, LLC (BSI) and serve as
8 its Director of Research. In this capacity, I oversee research, development, company
9 methodology and practices, and infrastructure policy analysis, in service to the long-
10 term health, safety, comfort and sustainability of the buildings and citizens of New
11 Orleans. Regarding building practices, we offer solutions for energy and moisture
12 problems that result in improved building health and durability, construction and
13 building-code improvements while helping to lower energy and water use and thus
14 utility bills.

15 Additionally, BSI has intervened in various utility dockets in order to make
16 recommendations concerning the public interest. In these dockets, BSI has focused on
17 utility reliability, efficiency, conservation and costs. BSI also focuses on making
18 proposals for improved electricity and gas distribution systems and rate structures, with
19 real-time system monitoring. In the face of a rapidly changing and threatening climate,
20 we feel a responsibility to improve long-term practices and paradigms that are no longer
21 optimally effective. Our proposals are aimed to both improve and support current utility
22 systems as well as facilitate a transition to a cleaner energy future.

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Q3. ON WHOSE BEHALF ARE YOU SUBMITTING THIS REVISED DIRECT TESTIMONY?

A. I am submitting this testimony before the Council of the City of New Orleans (“Council”) on behalf of Building Science Innovators, LLC.

Q4. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I earned a Doctor of Mathematics from the University of California, Berkeley (1976) and a Bachelor of Science in mathematics from Louisiana State University with a strong secondary concentration in physics. I have focused my life’s work on improving the health, sustainability, durability, and reliability of the building environment and utility infrastructure of New Orleans. To these ends, after the regulatory jurisdiction of public utilities had been transferred to the Louisiana Public Service Commission during the early 1980s, Gary Groesch, Councilman Joe Giarrusso, Councilman Jim Singleton, and I promoted two referenda, informally called “GET NOPSIS BACK”, which succeeded in transferring regulatory control of the New Orleans Public Service, Inc.¹ back to the City Council in May, 1985. Following the return of regulatory jurisdiction, I worked with Gary Groesch, Karen Wimpelberg, Betty Wisdom, and Thomas Lowenberg to inaugurate the Alliance for Affordable Energy. During 1986-1987, as the energy consultant to Louisiana Attorney General, William Guste, I assisted a successful legal action that challenged the prudence of \$2 billion in the construction of the River Bend Nuclear Power plant. In subsequent years, I earned professional credentials as a certified home energy rater and

¹ New Orleans Public Service, Inc (NOPSIS) was later renamed to Entergy New Orleans (ENO).

1 rater-trainer, an indoor air quality specialist, and a real estate agent. With other
2 researchers, I have published in ASTM's (formally known as American Society for Testing
3 and Materials) Journals on innovations in home energy performance testing and
4 ventured into broader energy policy. For example, "Inverted Demand-Compliant
5 Construction may be an Indispensable Key to a Renewable Energy Future," is the title of
6 a talk I have given at professional conferences.² I have also participated in broader
7 energy policy debates. After Hurricane Katrina (2005), with Pres Kabakoff of HRI
8 Properties and area architects and engineers, as members of the Council's New Orleans
9 Energy Policy Taskforce, we produced a report titled *The Energy Hawk*³, which made
10 many sound public-policy recommendations, including community solar. However, only
11 Integrated Resource Planning (IRP) was accepted. In 2008, the Council mandated that
12 IRPs should happen every 3 years.

13 During the 2015 ENO IRP, BSI formulated and recommended three pilot programs for a
14 rate-design innovation called Customer Lowered Energy Pricing (CLEP).⁴ In 2017, CLEP
15 was submitted to compete in an international sustainable design competition and
16 reached the semi-final round.⁵

² <https://www.EEBA.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf>

³ <http://www.theRegenGroup.com/docs/EnergyHawk.doc>

⁴ Visit these sites for more comprehensive descriptions of CLEP:

<https://www.youtube.com/watch?v=yvT7A5d9BF0&feature=youtu.be;>

[https://www.BuildingScienceInnovators.com/customer-lowered-electricity-price.html;](https://www.BuildingScienceInnovators.com/customer-lowered-electricity-price.html) and

<https://www.facebook.com/Customer-Lowered-Electricity-Price-CLEP-968877309871636/>

⁵ https://www.ResearchGate.net/publication/321181279_CustomerLoweredElectricityPrice-PitchFor12Apr2017

1 CLEP is an innovative hybrid tariff/rate that effectively encourages consumer-side
2 investments while optimally supporting the utility’s goals. Jim Lazar and the staff of the
3 Regulatory Assistance Project briefly describe utility goals as:

4 “Ensuring reliable service at reasonable cost while meeting societal goals
5 involves balancing the interests of utility investors, energy consumers and the
6 entire economy.”⁶

7 CLEP will be presented in a workshop on February 24, 2019 in a pre-conference session,
8 named “Align by Design”, at the Residential Energy Services Network’s (RESNET) 2019
9 Building Performance Conference at the Sheraton New Orleans.⁷

10

11 **CUSTOMER LOWERED ELECTRICITY PRICE $CLEP = CLEP_m + \sum CLEP_5$**

12 Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

13 A. The purpose of my testimony is to provide a blueprint of what is needed to support the
14 adoption of three CLEP rates within ENO’s rate structure, which will be finalized and
15 approved at the end of this docket. These rates include CLEP residential, CLEP non-
16 residential (i.e., commercial, industrial and municipal), and CLEP Community Solar.

17

⁶ <https://www.UtilityDive.com/news/inside-the-new-guidebook-for-electric-utility-regulation/426597/>

⁷ Because RESNET does not require a payment of conference registration fees to attend its Pre-Conference sessions, this session will be free and fully open to the public.
<http://conference.RESNET.us/sessions-preconference>

1 Q6. WHAT IS THE MEANING OF COST-OF-SERVICE, RATE, RATE STRUCTURE, AND TARIFF? ^{8,9}

2 A. As discussed in Question 8, each CLEP “rate” is actually a hybrid of a tariff and a rate.

3 What follows here is our understanding of the meaning of these several terms.

4 For all customers, the price of a kWh is the sum of the “**cost-of-energy**” parameter,

5 a.k.a. energy cost, energy price and fuel price, and a “**cost-of-service**” parameter. In

6 addition to being charged for energy (measured in kWh), all customers, except

7 residential customers, are also charged for power, called “demand,” measured in KW,

8 from a meter reading taken once a month. This “demand charge” employs another

9 “cost-of-service” parameter, but this one is multiplied by the metered KW demand.¹⁰

10 Thus a “rate” is at least the specification of these two parameters, using a formula like:

11 Customer’s utility bill = #kWh * (energy price + first cost-of-service parameter) + #KW

12 (second cost-of-service parameter). For residences, KWs are not measured, or

13 equivalently, the second cost-of-service parameter is zero. This explanation of two

14 parameters is the minimal description of a rate.

⁸ http://mydocs.epri.com/docs/PublicMeetingMaterials/0812/EPRI-SEPA_Aug_2012.pdf

⁹ The terms of **rates** and **tariffs** are used inconsistently. Although the California Public Utility Commission calls NEM a **tariff**, whereas Jim Lazar at the Regulatory Assistance Project refers to the “Rate Structure” as **the tariff** within “Electricity Regulation in the US: A Guide” at <http://www.RAPonline.org/wp-content/uploads/2016/07/rap-lazar-electricity-regulation-US-june-2016.pdf>. 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**.

¹⁰ It is problematic that residential customers are not charged for demand because, as Jim Lazar’s Guide points out, utility peak demand is overwhelmingly caused by residential customers because: 1) the average utility customer base is 90% residential; and 2) residential AC demand in the afternoon and evening drives the summer utility peak, and residential electric heating demand at night drives the winter utility peak.

1 Rates can be more complex in various ways. For example, rates can be time dependent
2 and/or employ inclining or declining block rates.¹¹

3 A **Rate Structure** is thus a list of rates, each specifies how a utility customer's bill is
4 calculated. Each rate has its own pair of energy and power, "cost-of-service"
5 parameters.

6 Indeed, a rate case is all about establishing these "cost-of-service" parameters for the
7 whole utility¹² and then allocating them to each rate. This process is complicated but is
8 explained in the following website link for the State of Michigan:

9 https://www.Michigan.gov/documents/energy/Cost_of_Service_Ratemaking_Industrail
10 [Rates_3-24-2014_451558_7.pptx](#). ("Industrail" [sic]) Michigan's approach to
11 establishing the cost-of-service for each customer class (or rate) appears to be
12 substantially identical to that of ENO. The energy price used for each utility for most of
13 the U.S. is re-established monthly and is set as the average wholesale price during that
14 month.¹³ The following website link provides a sample residential electric bill and some
15 explanations about the relationship between the wholesale and the retail price of
16 electricity. <https://www.ISO-NE.com/about/what-we-do/in-depth/wholesale-vs-retail->
17 [electricity-costs](#). In ENO's case, the wholesale cost-of-energy is the same price whether

¹¹ <https://www.TheEnergyDetective.com/bills>

¹² A Rate Case begins by establishing what is called the **revenue requirement** of the whole utility, then decisions are made to fairly allocate this cost among customer classes; from these two assumptions and the balancing between assigning costs/kWh vs cost/KW... leads to setting these two cost-of-service parameters... paraphrased from Jim Lazar's Guide.

¹³ "This is the cost of fuel we use to generate electricity and the cost of electricity we sometimes purchase from other companies. This charge may go up and down as the cost of fuel changes. Entergy makes no profit on this and the charge is passed through to customers dollar-for-dollar as allowed by regulators." http://www.Entergy-NewOrleans.com/your_home/price.aspx

1 ENO makes electricity using its own generators or purchases these kWh's from its
2 wholesale marketplace called Midcontinental Independent System Operator (MISO).
3 The quoted electricity bill example in New England, located within the above link, is for
4 a residential customer who consumed 650 kWh in a certain month; the cost-of-service
5 was \$33.42 while the energy charge was \$28.80. While the cost-of-service parameter is
6 normally only reestablished during a rate case that generally happens every few years,
7 the energy charge is recalculated each month from data observed within the previous
8 month. For that month, the cost-of-service per kWh for this residential customer was
9 about \$0.051/kWh, while the cost-of-energy was about \$0.044/kWh. Thus, the price per
10 kWh was about \$0.095. For this utility, the price of energy, namely \$0.044/kWh, will
11 apply to all customers, but the cost-of-service will depend on the customer class or rate.
12 Each rate is assigned a cost-of-service for energy and power, which is usually different
13 from those chosen for other rates in the same rate structure.
14 Tariffs are extra charges or discounts that are typically calculated without cost-of-service
15 considerations. A prominent example of this is Net Energy Metering (NEM). A typical
16 application of NEM occurs when a solar panel is installed on a roof, a.k.a., rooftop solar.
17 Sometimes the reverse energy flow is separately metered. NEM results in a one-for-one
18 retail bill credit for kWh's sent back to the utility. Typically, the credit is not monetized
19 in dollars but in prepaid kWh's consumed and thus *only* discounts future consumption.
20

1 Q7. WHY WERE CLEP RATES CONCEIVED DURING THE 2015 ENO IRP?

2 A. BSI was an intervenor in the 2015 ENO IRP proceeding, CNO docket number UD-08-02.
3 During that proceeding, I realized that the IRP process has a host of drawbacks. For
4 example: updating a plan can take 3 years and therefore, cannot be dynamically
5 responsive to rapidly occurring technological and financing changes; examples abound
6 in energy efficiency, renewable energy, grid-side and consumer-side energy storage,
7 microgrids and electrified transportation. Moreover, in the narrow and clearly most
8 germane field to electric utilities, that part of building science, called building energy
9 design, IRPs had not contemplated the new realities that i) the time a kWh was
10 ultimately consumed often has more economic impact than how many kWh's are
11 needed to provide an energy service, ii) with the proliferation of cell phones and electric
12 cars now commonplace, most electricity customers implicitly understand how to use
13 batteries and therefore the importance of electricity dispatch was rapidly declining, and
14 iii) the US energy information agency predicts that 2/3 of all new generation by 2050
15 will be solar-powered. I began to work on a way to engage the wholesale electricity
16 marketplace to incentivize ratepayers to both optimally reduce their economic energy
17 consumption footprint and, their far more valuable, energy demand, particularly at
18 utility peak periods. The outcome of that process is CLEP (Customer Lower Energy Price),
19 a new type of hybrid rate/tariff which takes advantage of the new technologies of smart
20 meters, a.k.a., Advanced Metering Infrastructure (AMI) and energy storage (e.g., water
21 heaters, ice-making air conditioners, batteries) to enable utility customers to buy and
22 sell (or use) energy in such a way as to enable them to not only lower their own

1 particular utility bill, and take individual responsibility for electricity reliability but, in the
2 process, lower everyone else’s bills as well — while incenting the utility to cooperate
3 because CLEP can also be configured to enhance utility profits.

4

5 Q8. WHAT ARE THE UNDERLYING DEFINITIONS OF CLEP RATES?

6 A. CLEP is proposed as three hybrid tariffs/rates whose definitions depend upon: 1) one
7 common cashflow used for all electricity pricing; 2) two new cashflows unique to CLEP;
8 and 3) a few rules regarding the application of these cashflows. The answer here
9 explains these topics. The answers to Question 9 define the three CLEP rates.

10 0. The common cashflow is called the **cost-of-energy**; this is the monthly-average cost
11 of buying electricity from MISO or making electricity using ENO’s generators. This
12 price includes the cost of transmission to ENO’s distribution system because MISO’s
13 energy marketing unit, the “Locational Marginal Price” (LMP), is location-dependent
14 and changes every five minutes. MISO’s data is available at the following website
15 link: <https://www.MISOenergy.org/markets-and-operations/real-time-displays/>¹⁴

¹⁴ The superposition of the term “energy” for “electricity” in the term “cost-of-energy” is problematic because, although the energy content of a kWh is constant and independent of the following, the amount of costs and primary energy (the fuels put into electricity generators), needed to make and deliver a kWh may vary greatly with respect to three or more variables: type of generator, time of day, and distance. And, in fact, with the current advent of significant amounts of renewable energy entering the grid which have negligible operating costs and no associated fuels to waste, the disparity within the range of these variables on the cost and carbon content per kWh is quite large and increasing. However, this issue is fundamentally ignored in utility economics. This issue is being ignored probably because the cost-of-energy is a pass-through cost of the utility that has no real impact on the profit of utilities in the current way that utilities are most commonly regulated, but the wholesale cost of a kWh has a big impact on customers’ bills.

- 1 1. The first new cashflow is called **CLEP5**; this cashflow provides a utility-bill credit or
2 charge for buying or selling electricity from or to the utility that is proportional to
3 the sum of the differences between the instantaneous and monthly-average,
4 wholesale price for making electricity by ENO or purchasing from MISO. CLEP5
5 accumulates every five minutes throughout the year but is paid monthly. A five-
6 minute, CLEP5 transaction provides **income/savings** to a CLEP customer if either: a)
7 electricity is purchased by the customer when the current MISO price is **lower** than
8 the cost-of-energy; or b) energy is sold by the customer when the current MISO
9 price is **higher** than the cost-of-energy. Otherwise, a CLEP5 transaction generates an
10 expense to the customer using the same formula; in that case, a) electricity is
11 purchased by the customer when the current MISO price is **higher** than the cost-of-
12 energy; or b) energy is sold by the customer when the current MISO price is **lower**
13 than the cost-of-energy. CLEP5 is set proportional to this difference instead of being
14 equal to this difference because 5% of the CLEP5 cashflow is used for other purposes
15 and does not go to that CLEP customer. Technically, CLEP5 is a tariff, because it does
16 not depend upon any cost-of-service considerations.
- 17 2. The second new cashflow is called **CLEPm**; this cashflow provides a utility bill credit
18 or charge for providing or demanding power at the nearly the same times that the
19 utility experiences its annual peak demand, respectively. The target of CLEPm is to
20 generate a cashflow (proportional to) the same “average” cost of power charged, i.e.
21 average demand charge, to non-residential customers [in the current rate structure]
22 using the metric of \$/KW-year. Heretofore, ENO has always charged for a customer’s

1 peak demand once a month at a fixed rate dependent only upon the measured (15-
2 min peak) number of KW demanded that month. “\$/KW-year” means twelve times
3 the monthly charge / KW. For example, if the average monthly demand charge is
4 \$10/KW, this is equivalent to \$120/KW-year pricing. This “average” cost of power,
5 the magnitude of the average demand charge of the rest of the rate structure, will
6 be resolved in the current rate case and can be updated at least annually by Council
7 rulemaking. Because demand charges are probably not the same for all rates and
8 the total demand for all customers using one rate is not likely to be the same for all
9 customers using every other rate, an “average” demand charge would have to be a
10 “weighted” average. CLEPm only generates an income or expense during utility peak
11 or near peak demand times.¹⁵ Demanding or supplying power outside of these times
12 has no effect on CLEPm, i.e., CLEPm = 0 outside of these months and demand during
13 these months, but outside of these days and hours are irrelevant to the calculation
14 of CLEPm. CLEPm is paid monthly during these five months and is directly
15 proportional to the average demand or supply of power by/for that customer during

¹⁵ Jim Lazar asserts in his Guide that there are roughly 200 such hours in a year for most utilities. However, CLEPm’s definition recommends that these times be spread out over the five months when they are most applicable. By so doing, the customer gets a more consistent cashflow and thereby better economic opportunity to create a significant and reliable cashflow over a year even though the payment for a specific critical event outside of or during those five months will be necessarily underfunded. 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. The approach is to average all demand during the roughly 500 to 600 hours relevant to CLEPm’s definition which will in most cases cause calculated average demand to be very close to half of peak demand, and then reimburse CLEP customers at very close to twice the \$/KW-year price.

1 the roughly 105 to 120 hours of that month. The number of CLEPm hours/month \approx
2 (5 hours / day) * (5 days / week) * (4.25 weeks/month). CLEPm is only paid five
3 times a year. Because CLEPm is derived from a weighted average of “cost-of-service”
4 values provided elsewhere in the rate structure, CLEPm is much more like a rate
5 than a tariff. Although the currently-proposed definition of CLEPm restricts its
6 applicability to May through September, on weekdays and between 2 PM and 7 PM,
7 CLEPm’s applicable times (to be assigned by the Council) can be shifted in response
8 to anticipated as well as unforeseen changes in supply and demand. An example of
9 an anticipated change is the increase in utility owned, rooftop and community solar
10 power in New Orleans — which may have effects like those currently observed in
11 southern California. Solar power is in such high supply in southern California at 10
12 AM on many days, that the wholesale price/cost-of-energy is often near or below
13 zero. Similarly, the aggregated customer demand minus customer-supplied power
14 curve in California is causing a substantial decline in the need for utility supplied
15 power in the afternoon to less than one-half of what had been common heretofore
16 and, then, very rapidly rises as the sun sets.

17 3. CLEP is an optional, additional cashflow or charge, and is much like NEM which
18 effectively pays owners of rooftop solar at the retail rate for energy produced. CLEP
19 complements but does not replace a retail customer’s bill and otherwise has no
20 effect on the cashflow or cost-of-energy, i.e., for kWh’s, between the customer and
21 the utility — as determined by the primary or specific rate that customer had
22 previously chosen. However, when a customer later becomes a CLEP customer, all

- 1 demand charges (if any) set by the previously chosen rate for this customer are
2 removed and replaced by CLEPm. In the case of residential customers, who
3 conventionally do not pay demand charges, that “advantage” goes away and,
4 instead, changes to accepting the obligations and opportunities provided by CLEPm.
- 5 4. Just like non-CLEP customers, CLEP customers only pay for consumption. That is,
6 customers only pay the full retail price, the sum of the energy price and the cost-of-
7 service, if that kWh is consumed. Put another way: if x = the number of kWh’s
8 bought, and y = the number of kWh’s sold, a CLEP customer only pays full retail for
9 electrical energy (kWh’s) for the amount $x - y$ when $x - y > 0$. Where the full retail
10 cost per kWh for that customer = “monthly average wholesale price of electricity” +
11 “cost-of-service” where cost-of-service for energy for that customer is set by his or
12 her primary electricity rate.
- 13 5. Unlike NEM, however, which only accumulates prepaid kWhs that can only provide
14 value to the customer in some future month and never provides monetary income
15 when the credits exceed costs during any month, when CLEP’s cashflow exceeds the
16 costs of energy and power for a month, the customer is rewarded during that
17 month: as dollars paid to the CLEP customer.
- 18 6. ENO customers can only choose to become a CLEP customer after some metering
19 technology, such as smart meters, a.k.a., Advanced Metering Infrastructure (AMI), is
20 deployed and directly connected to the customer’s building so that energy
21 consumption is tallied every 5 minutes (or whatever is the temporal resolution of
22 ENO’s AMI).

1 7. Any customer so connected to ENO can obtain a virtual CLEP bill before choosing
2 CLEP, and ENO will provide that information broken down on a five-minute and
3 monthly basis for a one-year period, or less time if it has been less than a year since
4 ENO deployed AMI for that customer.

5
6 Q9. WHAT ARE THE CLEP RATES YOU PROPOSE?

7 A. CLEP is proposed as three hybrid tariff/rates whose definitions depend upon the one
8 cashflow used for all electricity pricing and two new cashflows unique to CLEP. The
9 details about these three cashflows and the rules for their application were provided in
10 the answer to the previous question.

11 1. CLEP's non-residential rate is $CLEP_m + \sum CLEP_5$. Although this definition is formally
12 identical to CLEP's residential case, because there is no industry-standard way to
13 predict standard demand for non-residential buildings, CLEP_m only provides a
14 payment to a commercial customer when that customer sells more electricity to the
15 grid during peak times than the customer buys at the same times. But, CLEP_m can
16 provide a major "demand charge" savings to any commercial customers: i) like
17 churches whose demand peak on Sunday morning, and make little to no demand
18 during the utility's near peak hours; or ii) commercial customers who invest in
19 technologies like those described in the answer to question 11. CLEP_m is
20 proportional to the amount of demand for power and, equivalently, the amount of
21 production of power during the utility's near peak hours — and provides costs and
22 payments, respectively.

- 1 2. CLEP’s residential rate is $CLEP_m + \sum CLEP_5$. However, for residential customers,
2 CLEP_m can also pay for avoiding demand, even when the customer has greater than
3 zero demand. This payment is unique to CLEP, is only applicable to residential
4 customers, and is calculated by comparing the home’s actual demand to a RESNET-
5 defined *reference* home’s projected performance as built to the RESNET-standard,
6 building-code-compliant, new home.¹⁶ For example, let us assume that RESNET’s
7 energy rating software applied to the actual home’s characteristics predicts that the
8 “reference” home’s peak electricity demand will be 5 KW. This 5 KW projected peak
9 demand for the reference home will vary depending upon the home’s age, location,
10 size, orientation, number of windows, etc., i.e., the 30 or so normal inputs used by
11 RESNET’s software. The difference between the actual demand of the real home
12 from the calculated demand of the reference home is used to calculate CLEP_m for
13 any month. If the home’s demand exceeds this 5 KW value, CLEP_m establishes an
14 extra charge for this CLEP customer; if less than 5 KW, CLEP_m results in a savings or
15 income.
- 16 3. CLEP’s community solar rate is $CLEP_m + [Cost-of-energy * \#kWh] + \sum CLEP_5$. Because
17 a community solar farm (CSF) must be separately metered and will normally not
18 have net electricity consumption, a CSF needs an alternative rate or tariff not found
19 in the rate structure. Because a CSF requires energy and power distribution as well
20 as customizable accounting services provided by ENO, a CSF must have a “cost-of-

¹⁶ There is an alternative way to calculate this “avoided” demand. It is described in Note f. within the answer to the next question.

1 service” parameter. Unless the CSF has an onsite battery bank, all CSF transactions
2 are sales to the utility, the income from energy is the sum of the last two addends:
3 [Cost-of-energy * #kWh] + \sum CLEP5.¹⁷ Neither the energy’s nor power’s economic
4 values are predetermined by some formula as is the current plan in the Community
5 Solar Resolution approved by the Council’s utility committee on December 13,
6 2018.¹⁸ Instead, the economic value of both the energy and power produced is
7 provided by CLEPm + [Cost-of-energy * #kWh] + \sum CLEP5 and is paid *only after*

¹⁷ Note that the sum of these addends means that the energy income [i.e., for each kWh] is identical to simply the instantaneous MISO price.

¹⁸ Here are excerpts/paraphrases of the THEREFORE BE IT RESOLVED SECTION OF RESOLUTION R-18-538 adopted by the Utility Committee on Dec 13, 2018:

Total CSG (Community Solar Generator) Capacity is Limited to no more than 5% of the utility’s peak demand.

A CSG per kWh credit will be based upon avoided capacity and energy costs.

(The chair of the Utility Committee, Helena Moreno stated publicly during the meeting that the following is a placeholder for a more aggressive and profitable payment proposal that will be improved in the future. Paraphrased from her public statements during December 13, 2018 Utility Committee meeting. <https://council.nola.gov/meetings/2019/20190213-utility,-cable,-telecommunications-and-te/>

The avoided energy costs, expressed in \$/kWh, will be the weighted average of the previous calendar year’s hourly locational marginal prices (“LMPs”) applicable to the Utility. The hourly LMPs shall be weighted based upon the estimated hourly output of a 1kW_{DC} Solar PV installation in New Orleans as calculated by the National Renewable Energy Laboratory’s [NREL] PVWatts Calculator for a standard, fixed array systems with a tilt and orientation typical for New Orleans;

The corresponding avoided capacity cost will be expressed in \$/kWh and based on the MISO Cost of New Entry (“CONE”) value for the planning year that corresponds to the month in which the credit is provided and will be calculated as follows:

$$\text{Avoided Capacity Cost} = (\text{CV} * 0.5) / \text{AEE} \quad \text{where}$$

- i. CV is equal to the CONE value in \$/KW-y for MISO Local Resource Zone 9 for the planning year that corresponds with the month in which the credit is provided.
- ii. 0.5 represents the adjustment used by MISO for solar resource in determining the initial Resource Adequacy value for the purpose of the Planning Resource Auction (“PRA”).
- iii. AEE is equal to the annual estimated energy [output] in kWh from a 1 kW_{DC} solar PV installation in New Orleans as calculated (with NREL’s PVWatts as stated above).

1 *performance*. Nevertheless, Community Solar is paid for both energy and power as
2 two separate valuations in a manner like the final assertions of the Community Solar
3 resolution passed by the Council’s utility committee on December 13, 2018, i.e.,
4 Community Solar remuneration is based upon avoided energy and avoided capacity
5 costs. As stated above, the primary difference regarding the valuation of a CSF
6 between the utility committee's resolution and CLEP is that the utility committee
7 resolution values community solar "prospectively" whereas CLEP values CS "after
8 performance". But the underlying premise between the both valuation approaches
9 is that the remuneration to a CSF comes from both avoided energy and avoided
10 power valuations, which makes them similar to each other but different from a NEM
11 valuation proposal, which is otherwise the current industry standard.¹⁹

12

13 Q10. HOW IS EACH CLEP RATE CALCULATED?

14 **A. Definitions of Customer Lowered Electricity Price, (CLEP)**

15 **For a *residential* ratepayer who voluntarily accepts the CLEP tariff,**

16 **A Monthly CLEP Payment = CLEP_m + ∑ CLEP₅**

17 **where: CLEP₅ = p * n * (e - w)** is calculated every 5 min.

18 **p** = Utility-regulator determined, “percent” and 0 < p < 2;

¹⁹ **Virtual** [meaning simulating rooftop solar] NEM is a common means of remuneration for CSF around the country. For many reasons, NEM is falling out of favor with many utilities and their regulators; chief among these reasons is the controversial assertion that NEM income imposes costs onto non-NEM customers and explains that many utilities and their regulators have observed this problem and are choosing to find alternatives to NEM even for rooftop solar. If NEM can only operate with a subsidy paid by non-NEM customers — even in the case where NEM is only applied to rooftop solar, then NEM applied to CSF must require even more subsidy.

1 **n** = Number of kWh purchased by the customer.

2 If the flow is outbound (i.e., a sale), **n** is negative;

3 **w** = instantaneous Wholesale cost of power;²⁰

4 **e** = Monthly average cost-of-energy;

5 **where: CLEPm** = $q * \$50 * d$ is calculated monthly

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

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

8 **q** = Utility-regulator determined “percent” and $0 < q < 2$.

9

10 **For a non-residential ratepayer who voluntarily accepts the CLEP tariff,**

11 **CLEP is the same as defined for residential ratepayers except,**

12 **CLEPm** is redefined and replaces all demand charges where

13 **CLEPm** = $q * \$50 * d$ is calculated monthly;

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

15 *When d is positive, CLEPm creates a high demand charge paid by the customer.*

16 **When used to finance Community Solar,**

17 **CLEP is the same as defined for non-residential ratepayers except,**

18 **CLEP5** is replaced with $p * n * w$

19 *Notes:*

²⁰ CLEP5 income samples the distribution of instantaneous wholesale energy prices; this testimony assumes a \$0.05 mean and \$0.03 standard deviation— with almost all low values at night and high values on afternoons.

- 1 a. *The “\$50” factor in CLEPm’s definitions may be adjusted to optimally encourage CLEP*
2 *acceptance but not undermine: CLEP transactions lower the electricity price for all*
3 *customers. Its choice is consistent with and proportional to the assumption that “the*
4 *weighted average demand charge is \$10/KW each month, where this average is*
5 *calculated over an entire year and over all non-residential customers”. Thus, if ENO’s*
6 *average monthly demand charge is determined to be \$20/KW, this \$50 factor should be*
7 *replaced by \$100.*
- 8 b. *The negative demand charge paid to a residential customer viewed in \$/KW-y should not*
9 *exceed 2x the highest demand charge paid by a non-residential, non-CLEP customer.*
- 10 c. *If a customer does not have air-conditioner-dominated demand, then replace \$50 with*
11 *\$50/2. However, CLEP for Community Solar should keep this \$50 factor.*
- 12 d. *Utility near peak hours are annual and occur weekdays, May through September,*
13 *between 2 p.m. and 7 p.m.; otherwise CLEPm = \$0 for that month.*
- 14 e. *CLEPm generates a payment whenever **average demand during peak hours** is negative.*
- 15 f. *Avoided demand only applies to homes and can be calculated two ways: by comparison*
16 *to the RESNET reference home’s projected demand or by real-time comparison to the*
17 *performance of a large set of homes of similar age, size, and location. The former*
18 *approach can/should be used to inaugurate CLEP, while the latter is preferable in the*
19 *mature deployment of CLEP when hundreds of similar homes can be sampled.*
- 20 g. *“p” and “q” are extra controls to allow the utility regulator to ensure that goals are met.*
21 *A 5% service charge is described more fully below. These two ideas are compatible and*
22 *generate the same effect by setting $p = q = 95\%$. However, these p & q values can be*

1 *chosen to be smaller or bigger and different from each other — to incent the utility to*
2 *cooperate and/or encourage CLEP use and, thereby, earn a profit on multi-million-dollar*
3 *cashflows that heretofore only serve to increase customer bills but do not affect utility*
4 *profit. By choosing p different from q , more or less emphasis is placed on CLEP5 vs.*
5 *CLEPm.*

6

7 Q11. HOW DOES CLEP LOWER EVERYBODY'S RATES?

8 A. CLEP payments benefit non CLEP customers as follows:

9 1. Every CLEP transaction will include a 5% service charge to be collected by the utility.

10 Thereafter, some portion of the 5% service charge can be distributed to all ENO
11 customers after deducting ENO's administrative costs according to the Council's
12 rulemaking. This distribution will effectively lower the average wholesale price of
13 energy in the case of CLEP5 and the future cost-of-service in the case of CLEPm.

14 2. In addition to a portion of the 5% service charge mentioned in the previous
15 paragraph, CLEP5 transactions provide a net monthly benefit to non-CLEP customers
16 because they lower the average wholesale cost-of-energy thereby providing a
17 benefit to all ENO customers in these ways:

18 a. In the **intended** case that the CLEP customer "appropriately" uses the CLEP5
19 opportunities to lower his/her ENO bill by, i) buying kWh's when the wholesale
20 price is lower than the monthly average or ii) selling electricity to ENO when the
21 instantaneous wholesale is higher than the monthly average price. Both kinds of
22 transactions will lower the average cost of electricity ENO incurs and thereby
23 passes some of those savings to all customers. Let [A] denote this cashflow.

- 1 b. However, when a CLEP customer makes purchases or sales at the wrong times,
2 these transactions will have the opposite effect. In that case, the CLEP5
3 contribution to the CLEP customer will only cause an increase in the ENO bill only
4 for that CLEP customer. Let [B] denote this cashflow.
- 5 c. Before the sum of (roughly 2300/month) CLEP5 transactions change the monthly
6 bill, they are added together; by this addition, the CLEP customer receives a net
7 benefit from CLEP5 transactions only when [A] exceeds [B]. If, on the other hand,
8 [B] exceeds [A], the CLEP customer must pay more for electricity than the same
9 non-CLEP customer, and thereby avoids burdening non-CLEP customers because
10 by payment for [B] the CLEP customers avoids raising the average wholesale
11 cost-of-energy normally done by non-CLEP customers onto each other. In that
12 case, the entire excess monthly CLEP5 burden: “[B] - [A]” is held by ENO and
13 thereafter indirectly disbursed to non-customers because that income is used to
14 lower ENO’s monthly cost-of-energy and thereby indirectly disburses lower
15 electricity prices to all customers.
- 16 3. CLEPm transactions provide long-term benefits to non-CLEP customers that lower
17 ENO’s true cost-of-service to supply power, does it with enhanced reliability, and
18 accomplishes these effects at lower cost than alternative approaches already
19 established or among those that have been proposed. In this manner, CLEPm lowers
20 the current or future “cost-of-service” part of ENO’s rates.
- 21 a. Demand charges are designed to compensate the utility and attempt to
22 equitably distribute increasing costs to customers proportional to their increased

1 demand relative to “standard” customers so that the costs of generation,
2 transmission and distribution that are proportional to “demand for power” are
3 appropriately assigned to those customers who have higher than average
4 demand.²¹

5 b. Although residential customers have been “forgiven” demand charges, this
6 “largess” “may be fairly” accommodated by the fact that residential customers
7 pay substantially more for energy in their “cost-of-service” part of their charge
8 for a kWh as compared to commercial customers. This practice may work out
9 “on average,” but this practice unfairly lumps all residential customers together:
10 some residential customers have either much smaller cumulative
11 energy/demand ratios than others, and other residential customers have
12 substantially less demand during peak hours than others.

13 c. Some commercial customers, like churches, have only a negligible amount of
14 demand during typical utility peak hours but are nevertheless charged using the
15 same method applied to all commercial customers.

16 d. Some customers have invested heavily in energy storage, electric batteries, or
17 orchestrated energy management but have received no economic benefit.

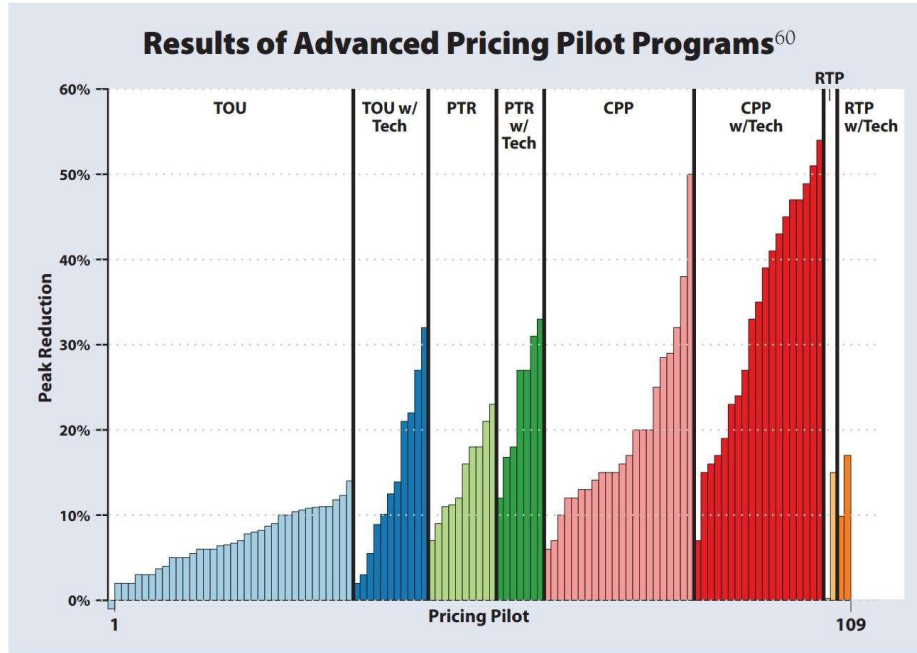
²¹ “Utilities and public service commissions around the country have determined that the most equitable way to cover the cost of this equipment is to have those customers who create this demand and the need for power during the [utility] peaks pay for its availability. For this reason, utilities spread the costs of this extra equipment among all commercial and industrial customer[s] as a separate charge for demand.”

https://www9.NationalGridUS.com/niagaramohawk/non_html/eff_elec-demand.pdf

- 1 e. Electric vehicle owners see no discount for kWh purchases which are most often
2 done when the wholesale price is low. This shortcoming in fair electricity rates
3 suppresses the transition to electric vehicles.
- 4 f. The current rate structure provides no financial incentives to install batteries in
5 homes — much less a way to fully finance them. This shortcoming in fair
6 electricity rates suppresses the ability for a building owner to both take full
7 responsibility for electricity reliability and thereby, accomplishes this feat better
8 and far more cheaply than can be provided by the utility.
- 9 g. Many utilities apply **load management** by orchestrating the use of electric water
10 heaters and/or conventional AC equipment to shift demand out of peak hours
11 but do not equitably share the savings it generates with their customers.²²
- 12 h. These economic opportunities are largely unavailable to ENO consumers. If
13 opportunities were available, customers will make economic choices that

²² “Receive your \$40 every year you participate”, “The EasyCool device is only activated on select summer weekdays. When it is activated, your air conditioner will still operate, but for about half as long, while allowing the fan to circulate already cooled air. This occurs during the summer season between June 1 and Sept. 30. Typically, cycling will occur two to four hours per event between 2-6 p.m. and will not occur on weekends or holidays.”

<https://www.EnergySmartNOLA.info/easy-cool-program/#1527113141937-a7bdf28a-23e6>



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substantially lower utility peak demand,²³ increase electricity-reliability, decrease the cost-of-service and make these choices and investments at a profit or savings as measured in Internal Rate of Return (IRR).

- i. The 2018 Council decision to build the New Orleans Power Station (NOPS) set a standard that peak power costs more than \$1/W. However, CLEP lowers demand at a net cost to ENO’s customers far below \$1/W; for example, in Exhibit 1 an application of CLEP shows that the first cost of such power is 2/3 of \$1/W but the ultimate cost to the ratepayer in “contribution to cost of service” after ten years is \$0.
- j. The Council has made many requests of ENO to improve electricity-reliability, which is really **distribution reliability**. Although ENO has proposed spending tens

²³ Figure 10-7 from Jim Lazar’s Guide: where TOU means Time of Use Pricing, PTR means Peak Time Rebates, CPP means Critical Peak Pricing and RTP means Real Time Pricing.

1 of millions of ratepayer funds to improve reliability, ENO has not provided a
2 quality metric which provides a cost-benefit analysis, namely how many dollars
3 buys how much reliability. As noted below in the answer to Q13, BSI will show
4 that CLEP can improve electricity reliability faster than ENO's proposals and at a
5 negative cost.

6

7 Q12. WHAT ARE ILLUSTRATIONS OF KEY CLEP APPLICATIONS?²⁴

8 A. Some of this explanation is found in the answer to a previous question.

- 9 1. With a \$0 investment in labor and materials, by setting a standard, programmable
10 **dishwasher** to always operate very early in the morning, a CLEP customer will earn
11 \$26 per year: \$6 from lower priced wholesale electricity (via CLEP5) and \$20 savings
12 on demand (via CLEPm).
- 13 2. With a \$50 investment in labor and materials for installing a timer, a **standard,**
14 **electric water heater** with a tank can be set to always heat water very early in the
15 morning, a CLEP customer can save a \$150 a year.²⁵ This same reference implicitly
16 asserts that residential electric water heaters typically consume about 5000 kWh/
17 year. The CLEP incomes are approximately a) \$100 from lower priced wholesale

²⁴ Additional illustrations of how CLEP lowers electric bills and decreases CO₂ production are found in the video and short PowerPoint file at:

<https://www.BuildingScienceInnovators.com/customer-lowered-electricity-price.html>

²⁵ "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."

<https://homeguides.sfgate.com/much-hot-water-heater-affect-electric-bill-88704.html>

- 1 electricity (via CLEP5) and b) \$50 savings on demand (via CLEPm). The payback
2 period is about 4 months, i.e., 1/3 year.
- 3 3. With a \$300 investment (net of rebates)²⁶ or \$700 (with no rebates) in labor and
4 materials that comes with an App-controlled timer, a customer can install and
5 control a **heat pump water heater** with a tank to always heat water very early in the
6 morning. Because it is a tremendous energy saver even before the extra savings
7 from CLEP, this water heater is eligible for a \$400 rebate from the utility; this energy
8 savings is assured by setting the water to be always in heat pump mode and thereby
9 save more than 2/3 of the total kWh consumption or roughly \$372 that way and
10 even more so in demand. In addition to the just mentioned **energy efficiency**
11 savings, a CLEP customer can save an additional \$80/year, roughly \$30 from lower
12 priced wholesale electricity (via CLEP5) and \$50 savings on demand (via CLEPm). The
13 annual payback cashflow is \$372 from Energy Efficiency and \$80 from CLEP. If
14 rebates were used, the payback period is less than a year either way; with no rebate,
15 the payback period is less than 2 years either way. The payback is roughly 20% faster
16 with CLEP.
- 17 4. With a \$3000 investment in an ice-making AC²⁷, a customer can always make ice
18 very early in the morning. Because the cooling (i.e., ice-making) is done at night, this

²⁶ <https://www.Lowes.com/pd/GE-GeoSpring-50-Gallon-Regular-10-year-Limited-Warranty-4500-Watt-Double-Element-Electric-Water-Heater-with-Hybrid-Heat-Pump/50335967>; this estimate of the installation cost of this water heater is \$150 because it assumes a simple swap out of a standard electric water heater.

²⁷ <https://www.GreenTechMedia.com/articles/read/ice-energy-will-launch-residential-thermal-storage-in-first-quarter-2017#gs.F3tOI3bT>

1 equipment will have a roughly 10% to 20% higher efficiency than a standard AC;
2 thus, compared to the average AC, an ice-making AC will operate at 3.5 KW instead
3 of 4.3 KW.²⁸ Residential AC energy consumption is 3 times water heating
4 consumption in the southeast.²⁹ Thus, a standard 3-ton AC will consume
5 approximately 15,000 kWh/year. Using a \$0.11/kWh price and a 20% savings in kWh,
6 just using an Ice-making AC will save $15,000 * \$0.11 * 0.20 = \$330/\text{year}$. But, in
7 addition, a much bigger savings will come from CLEP. CLEP5 income will be roughly
8 80% of 15,000 times \$0.02 = \$240. CLEPm income will be roughly 4 KW of avoided
9 demand * \$50/month * 5 months = roughly \$800/year. Thus, the annual CLEP
10 income = CLEP5 + CLEPm = \$240 + \$800 = \$1040. Note, that without CLEP, the
11 Energy Efficiency benefit is \$330/year and requires a 9-year payback. But, with CLEP
12 and Energy Efficiency, the benefit is \$1370 per year and pays back in less than 3
13 years.

14 5. With a \$10,000 (using 2016 prices) investment in a 12-kWh whole-home battery³⁰, a
15 customer can store approximately 360 kWh/month or 4300 kWh/year. This battery
16 size is appropriate,³¹ if the same homeowner has either deeply invested in making
17 the home very energy efficient, or has already shifted all demand for water heating
18 and AC energy and demand to the very early hours in the morning when the battery

²⁸ "... the average residential kWh cost is 12.55. Our 3-ton air conditioner that uses 4.32 kWh multiplied by the kWh cost of 12.55 equals 54.216. This is \$0.54216. This is the cost to run an air conditioner for an hour." <https://www.HVAC.com/blog/much-cost-run-ac-units/>

²⁹ <https://www.EIA.gov/consumption/residential/>

³⁰ "a Whole Home Battery [is] one that can store all of a home's daily needs in four hours." <https://www.BuildingScienceInnovators.com/buildings-without-diapers.html>

³¹ will work for 10 years even if deep cycled three times a day. Sonnen warranty.

1 is charging (by installing the equipment like those described in parts 1 - 4 of this
2 answer). In this way, the residual energy needs of the home outside of the time the
3 battery is charging can be cut by more than 50%. This reduction of residual energy
4 needs will help to economically “right-size” the whole-home battery to 12-kWh. If all
5 the battery does is buy for later consumption on the same day, CLEP5 pays $4300 * \$0.02 = \$86/\text{year}$. If the energy stored in the battery is never needed, that energy
6 can be sold back to the wholesale market at an average profit of at least $\$0.04/\text{kWh}$.
7 In this case, the CLEP5 income exceeds 3 times $\$86$ or $\$258$. However, the CLEPm
8 income is much larger. Note that those 12 kWhs will spread over five hours at an
9 average rate of 2.4 kW. Thus, the CLEPm income is $2.4 * \$50 * 5 = \$600/\text{year}$. Note,
10 that this $\$600/\text{year}$ CLEPm income accrues to residential customers whether the
11 battery is used to sell back to the utility or is only used to reduce the demand of the
12 homeowner’s other appliances by the same amount. The minimal CLEP income is
13 $\$86$ from CLEP5 and $\$600$ from CLEPm. Although this income supports a (long) 16-
14 year payback period, because $\$686$ is approximately $1/16^{\text{th}}$ the initial cost of the
15 battery, it may be a satisfactory investment to those residential customers who
16 value reliability at $\$500/\text{year}$ — as was the average case in Maryland in 2011.³² If so,
17 this speeds up payback to roughly a decade which is in-line with the battery’s
18 warranty.
19

³² <https://www.EEBA.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf> explained that a 2011 Pepco survey found $\$520$ was the average value residential customers assigned to reliability; that survey is found at www.MontgomeryCountyMD.gov/OPI/Resources/Files/pdf/mc_pepco_survey_finding.pdf

1 6. Assuming a CSF capital investment at less than \$1 per watt³³, if this investment were
2 amortized over 20 years, a community solar subscriber should be able to buy-in at
3 roughly \$7/KW-m.³⁴ NREL's PVWatts program predicts that a 1 KW solar panel
4 optimally tilted and not shaded in New Orleans will produce about 5 kWh/day.³⁵ This
5 production results in approximately 1800 kWh/year. Because this is all daytime
6 production, it will see an average wholesale price of over \$0.06. So, the CLEP5
7 income will be at least \$110/KW-y. If solar were 100% reliable, each KW will be paid
8 \$50/m or \$250/year. However, as noted above regarding the **prospective** payment
9 approach described in the community solar income footnote about the December
10 13, 2018 utility committee's Community Solar Resolution, the expected "capacity
11 factor" of a solar farm is 50%. Therefore, the CLEPm income should be expected to
12 be not \$250/year but approximately \$125/year. Thus, the Community Solar
13 subscriber will be paying $7 * 12 = \$84$ /year to **rent** 1 KW, but will be paid CLEP
14 income for one KW = CLEP5 + CLEPm = \$110 + \$125 = \$235. Thus, the net annual
15 income per KW will be roughly $\$235 - \$84 = \$151$. These numbers assume the CSF is
16 fairly and completely paid the full CLEP value, and the subscriber rents one KW of a
17 solar farm **at cost**.

³³ "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 range 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>

³⁴ 20-year, \$150,000 Loan at 5% Interest Rate requires a \$989.93 monthly payment
<https://www.saving.org/loan/loans.php?loan=150,000&rate=5>

³⁵ <https://PVWatts.NREL.gov/>

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Q13. HOW CAN CLEP INCREASE RELIABILITY AND RESILIENCE AT A NEGATIVE COST?

A. This question is answered incrementally, each answer building on the previous answer.

1. By application of parts 2 through 5 of the answer to Q11, one can see that a 12-kWh battery installation can be both right-sized and a **cost neutral** investment for a homeowner with a deep interest in reliability or resilience... i.e., someone like the average residential customer of Pepco in 2011 who asserted that reliability was worth over \$500 per year.^{36, 37}
2. However, the same battery can be provided by the utility which retains ownership as part of its rate-base, while depreciating it over ten years. As explained in Exhibit 1, if this battery purchase were part of a 1000-residence Battery Pilot, this would result in a roughly 37% profit over that time, paid to the utility, but will result by the end of the 10-year pilot program, in a \$0 **contribution to cost-of-service** for ENO's customers.
3. As explained in Exhibit 2, the 2017 federal tax bill enhanced IRS Chapter 179 for depreciating and rewarding small business investments. Highlights of that exhibit are repeated here:

Unlike the analysis in Exhibit-1, where only a straight-line depreciation over 10 years is used and no additional tax credit is available, if the batteries were purchased by a small

³⁶ www.MontgomeryCountyMD.gov/OPI/Resources/Files/pdf/mc_pepco_survey_finding.pdf

³⁷ Assume that the only cashflow used to support the battery investment comes from the CLEP income from the battery but not from the CLEP income coming from the dishwasher, water heater or ice-making AC. All four cash flows are used together in part 4 of the answer to Q13.

1 business (like a landlord to indirectly profit from energy flows happening at the
2 residences of his tenants), then two additional benefits appear possible:

- 3 a) All depreciation can be taken in the first year, and
- 4 b) A bonus depreciation ranging from 30% to 100% of the first costs.

5 Chapter 179 appears to apply to electricity storage because electricity is a primary
6 product of petroleum.

7 4. Assume everything applied in part 1 of this answer but, unlike part 1, also use **the CLEP**
8 **income** derived from all these investments, control of dishwashers, heat-pump water
9 heaters, and ice-making AC, then the annual cash flows for CLEP and energy efficiency
10 for these three appliances exceed \$1525/year. As explained in answer 6 to question 12,
11 the battery alone will earn about \$658/year. Together, this income exceeds \$2180/year
12 and thus allows the payback period for the total ensemble of retrofits to be roughly 6.2
13 years = $(\$50 + \$300 + \$300 + 10000)/(\$2180/\text{year})$.³⁸

³⁸ A joint investment in all four of:

- 1. Dishwasher control
- 2. new Heat Pump water heater -- appropriately controlled
- 3. new Ice-Making AC -- appropriately controlled
- 4. a new Whole-Home Battery -- appropriately controlled

has a payback of about 6 years which is much shorter than the 16-year payback period of the battery income alone described in the 5th part of the answer to Q13 which assumed that the battery is installed by itself. This may seem hardly noteworthy, but this is counter to standard energy efficiency design which works in a “ZERO-SUM” game. CLEP is not so constrained. This a big deal because it is commonly the case of applying a series of energy efficiency improvements to a building, that each retrofit diminishes the opportunity to save energy for the next retrofit. As explained by this report from the Alliance to Save Energy: “Interactive effects – Many EE measures will affect other energy-using systems. Replacing incandescent lamps with CFLs, for example, can increase heating needs and reduce air conditioning loads. Installing a more energy efficient heating, ventilation and air conditioning

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(HVAC) system will reduce the energy saving associated with an energy management control system. Better insulation or windows can reduce HVAC loads. Occupancy sensors will lower savings attributable to new light fixtures. Understanding and modeling these relationships in a single building presents significant engineering challenges. Accounting for interactive effects for many projects or within or between programs is even more difficult.”

https://www.ASE.org/sites/ase.org/files/energy_measurement_challenge_0.pdf

1 **EXHIBITS**

2 Exhibit MBK-1 CLEP Battery Pilot as Proposed in 2016 in ENO's 2015 IRP

\$ in thousands		CLEP Battery Pilot Cashflow Over 10 years										First & last years are 6 months long	
Year		1	2	3	4	5	6	7	8	9	10	11	SUMS
SOLD UNITS	Mid-Year Convention	300											
	Cumulative # Units Sold	300	600	600	600	600	600	600	600	600	600	600	
	# Sold under Direct Control	200	400	400	400	400	400	400	400	400	400	200	
LEASED UNITS	Total # Units Leased	400	400	400	400	400	400	400	400	400	400	400	
	Mid-Year Convention	200	400	400	400	400	400	400	400	400	400	200	
SALES	Retail Revenue	\$10,920											\$10,920
	Wholesale Costs of sold units	\$8,400											\$8,400
	Sales Tax	\$840											\$840
	Bill Credit for Control by Utility	\$285	\$570	\$570	\$570	\$570	\$570	\$570	\$570	\$570	\$570	\$285	\$5,700
	CLEP = Power Supply benefit from control	\$300	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$300	\$6,000
	Undepreciated Leased Assets	\$3,080	\$5,852	5,236	4,620	4,004	3,388	2,772	2,156	1,540	\$924	\$308	\$0
	Lease Revenue	\$106	\$211	\$211	\$211	\$211	\$211	\$211	\$211	\$211	\$211	\$106	\$2,112
	Depreciation	\$308	\$616	\$616	\$616	\$616	\$616	\$616	\$616	\$616	\$616	\$308	\$6,160
	Return on Rate Base	\$339	\$644	\$576	\$508	\$440	\$373	\$305	\$237	\$169	\$169	\$34	\$3,727
	Marketing	\$5											
	Other O & M	\$100	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$200
	Contribution to Cost of Service	\$1,349	\$429	\$361	\$293	\$225	\$157	\$90	\$22	\$46	\$114	\$69	\$0

FROM PROTOTYPE to IMPLEMENTATION: CLEP's 10-year, BATTERY PILOT's business model is based on Rutland, VT's 2015, utility-initiated & -funded pilot.

It will deploy 12 MWH among 1000 residences.

If you look at the numbers, highlighted in yellow —

the utility's **out-of-pocket cost** (Undepreciated Leased Assets) peaks at \$5.8 million in the 2nd year and goes to ZERO in ten years using 4 cashflows:

1. \$2.5 (million) profits from sales;
2. \$6 (million) from depreciation,
3. \$3.7 (million) for rate of return profit;
4. \$6 (million) from CLEP-associated savings

ALL without burdening non-participants i.e. Contribution to Cost of Service goes to \$0.

This distributed power plant supplies 8 MW for 1.5 hours and can be 100% cycled, 3 times daily, for a decade.

(That's thrice daily for 250 fortnights — if you're British!)

So, for 3/4 the \$1/W price of a 200 MW peaking plant — it pays back 3X faster and has tiny operating costs.

Deploying 25,000 batteries matches the peaking plant's capacity but with a 10 X **higher** capacity factor.

But, in fact, peak demand **WILL** drop by **much more** than 200 MW, because CLEP pays in the 4 more ways already described (2 slides back).

17

18

1 Exhibit MBK-2 IRS Chapter 179 may Provide for a Negative Cost for a
2 Battery Purchase

3
4 Unlike the analysis in Exhibit MBK-1, where only a straight-line depreciation over 10 years is
5 used and no additional tax credit is available, if the batteries were purchased by a small
6 business (like a landlord to indirectly profit from energy flows happening at the residences of
7 his tenants), then two benefits are possible:

- 8 1. All depreciation can be taken in the first year, and
- 9 2. A bonus depreciation ranging from 30 to 100% of the first costs.

10 Moreover, Chapter 179 applies to storage of primary products of petroleum.

11 To discern all of this, read the following but be sure to read the sections **highlighted with yellow**
12 **background**.

13 Consequently, the battery pilot can be run at a large profit to its investors and thereby at
14 negative cost if shared with the utility.

15

16 **Updated Section 179 Tax Deductions for Businesses**³⁹

17 The [Tax Cuts and Jobs Act of 2017](#) (AKA The Trump Tax Cuts) increased the Section 179 benefit
18 for businesses that buy assets and start using them. A good thing about these benefits is that
19 they will stay the same (although [indexed for inflation](#)) over the next few years.

20 Effective for tax years beginning January 1, 2018, businesses can immediately deduct up to \$1
21 million for qualifying purchases of capital property, with a limit of \$2.5 million. After 2018, the
22 limits are indexed to inflation. Businesses can now also take this deduction for nonresidential
23 real property (buildings) improvements. ...

24

25 **What are Section 179 Deductions?**

26 [Section 179 of the IRS Code](#) was enacted to help small businesses by allowing them to take a
27 depreciation deduction for certain assets ([capital expenditures](#)) in one year, rather than
28 depreciating them over a longer period of time. Taking a deduction on an asset in its first year is
29 called a "Section 179 deduction." You can see that there is a benefit to taking the full deduction
30 for the cost of the item immediately, rather than being required to spread out the [deduction](#)
31 [over the item's](#) useful life.

³⁹ <https://www.theBalancesMB.com/what-is-a-section-179-deduction-397650>

1 For example, if you buy a computer or other [office equipment](#) for your office, under Section
2 179 you can deduct the full cost of that computer in one year. This also makes sense, because
3 we all know that computers have a short lifetime or useful life.

4 **Qualified Business Property for Section 179 Deductions**

5 So what types of business property does Section 179 apply to? The IRS has two general
6 requirements:

7 1. The property (called "**qualified property**") must be "tangible, depreciable, [personal property](#)
8 which is acquired for use in the active conduct of a trade or business." Vehicles, and (starting in
9 2018) land and buildings are included.

10 2. The property must be purchased and put into service in the year in which you claim the
11 deduction. Putting an asset into service means that you have it set up and working and you are
12 using it in your business. Buying a piece of property and then letting it sit and gather dust
13 doesn't count.

14 Business property purchases that may qualify for Section 179 deductions include:

- 15 • Machinery and equipment
- 16 • Business vehicles with gross vehicle weight over 6,000 lbs
- 17 • [Business personal property](#), which is basically any type of property that isn't attached
18 physically to a building. It's basically everything from office furniture and equipment to
19 computers to free-standing shelves - it's sometimes called "contents."
- 20 • [Listed property](#) that can be used for both business and personal purposes. The 179
21 deduction is based only on the percentage of time you use this property for business
22 purposes.
- 23 • Costs of improvements to business buildings for fire suppression, alarms and security
24 systems, HVAC, and roofing.

25 There may be some restrictions and exclusions on this list, and there may be some other items
26 that you aren't sure about. Check with your tax professional....

27 **Use IRS Form 4562 to Elect a Section 179 Deduction**

28 The form used to report information for a Section 179 deduction is [IRS Form 4562](#). This form
29 collects information on business property acquired and put into service (see above). For more
30 details on completing Form 4562, see the [IRS instructions](#) for this form.

31 **2018 Instructions for Form 4562⁴⁰**

32 Section 179 Property Section 179 property is property that you acquire by purchase for use in
33 the active conduct of your trade or business, and is one of the following.

⁴⁰ <https://www.IRS.gov/pub/irs-pdf/i4562.pdf>

1 Qualified section 179 real property. For more information, see Special rules for qualified section
2 179 real property, later.

- 3 • Tangible personal property, including cellular telephones, similar telecommunications
4 equipment, and air conditioning or heating units (for example, portable air conditioners
5 or heaters). Also, tangible personal property may include certain property used mainly
6 to furnish lodging or connection with the furnishing of lodging (except as provided in
7 section 50(b)(2)).
- 8 • Other tangible property (except buildings and their structural components) used as: 1.
9 An integral part of manufacturing, production, or extraction or of furnishing
10 transportation, communications, electricity, gas, water, or sewage disposal services; 2. A
11 research facility used in connection with any of the activities in (1) above; or 3. A facility
12 used in connection with any of the activities in (1) above for the bulk storage of fungible
13 commodities.
- 14 • Single purpose agricultural (livestock) or horticultural structures.
- 15 • Storage facilities (except buildings and their structural components) used in connection
16 with distributing petroleum or any primary product of petroleum.
- 17 • Off the shelf computer software.

18 **Part II. Special Depreciation Allowance and Other Depreciation Line 14**

19 For qualified property (defined below) placed in service during the tax year, you may be able to
20 take an additional special depreciation allowance. The special depreciation allowance applies
21 only for the first year the property is placed in service. The allowance is an additional deduction
22 you can take after any section 179 expense deduction and before you figure regular
23 depreciation under the modified accelerated cost recovery system (MACRS). Qualified property.
24 You can take the special depreciation allowance for certain qualified property acquired before
25 September 28, 2017, certain qualified property acquired after September 27, 2017, qualified
26 reuse and recycling property, and certain plants bearing fruits and nuts. Certain qualified
27 property acquired before September 28, 2017. **Certain qualified property acquired before
28 September 28, 2017, and placed in service in 2018, is eligible for a 40% special depreciation
29 allowance. Property with a long production period and certain aircraft acquired before
30 September 28, 2017, and placed in service in 2018, is eligible for a 50% special depreciation
31 allowance.** Qualified property is: • Tangible property depreciated under MACRS with a recovery
32 period of 20 years or less. • Water utility property (see 25-year property, later). • Computer
33 software defined in and depreciated under section 167(f)(1). Qualified property also must be
34 placed in service before January 1, 2020 (or before January 1, 2021, for certain property with a
35 long production period and for certain aircraft). The original use of the property must begin
36 with you. Certain qualified property acquired after September 27, 2017. **Certain qualified
37 property (defined below) acquired after September 27, 2017, and before January 1, 2023, is
38 eligible for a special depreciation allowance of 100% of the depreciable basis of the property.**
39 Qualified property is: • Tangible property depreciated under MACRS with a recovery period of
40 20 years or less. • Computer software defined in and depreciated under section 167(f)(1). •

Exhibit MBK-2 IRS Chapter 179 may Provide for a Negative Cost for a Battery Purchase

1 Water utility property. • Qualified film, television, and live theatrical productions, as defined in
2 sections 181(d) and (e). Qualified property also must be placed in service before January 1,
3 2027 (or before January 1, 2028, for certain property with a long production period and for
4 certain aircraft), and can be either new property or certain used property. See Pub. 946 for
5 more information. Also, see section 168(k). Qualified reuse and recycling property. **Certain**
6 **qualified reuse and recycling property (defined below) placed in service after August 31, 2008,**
7 **is eligible for a 50% special depreciation allowance.** Qualified reuse and recycling...