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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INTRODUCTION

Q1. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

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

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

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

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

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 NOPSI 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 (NOPSI) was later renamed to Entergy New Orleans (ENO).

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

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

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[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; and
https://www.facebook.com/Customer-Lowered-Electricity-Price-CLEP-968877309871636/

[5] https://www.researchgate.net/publication/321181279_CustomerLoweredElectricityPrice-PitchFor12Apr2017

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

> "Ensuring reliable service at reasonable cost while meeting societal goals involves balancing the interests of utility investors, energy consumers and the entire economy."[6]

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

CUSTOMER LOWERED ELECTRICITY PRICE CLEP = CLEPm + ∑CLEP5

Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

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

[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

Q6. WHAT IS THE MEANING OF COST-OF-SERVICE, RATE, RATE STRUCTURE, AND TARIFF?[8,9]

A. As discussed in Question 8, each CLEP "rate" is actually a hybrid of a tariff and a rate. What follows here is our understanding of the meaning of these several terms.

For all customers, the price of a kWh is the sum of the "**cost-of-energy"** parameter, a.k.a. energy cost, energy price and fuel price, and a "**cost-of-service**" parameter. In addition to being charged for energy (measured in kWh), all customers, except residential customers, are also charged for power, called "demand," measured in KW, from a meter reading taken once a month. This "demand charge" employs another "cost-of-service" parameter, but this one is multiplied by the metered KW demand.[10] Thus a "rate" is at least the specification of these two parameters, using a formula like: Customer's utility bill = #kWh * (energy price + first cost-of-service parameter) + #KW (second cost-of-service parameter). For residences, KWs are not measured, or equivalently, the second cost-of-service parameter is zero. This explanation of two parameters is the minimal description of a rate.

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

[9] The terms of **rates** and **tariffs** are used inconsistency**.** 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.

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

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

Indeed, a rate case is all about establishing these "cost-of-service" parameters for the whole utility[12] and then allocating them to each rate. This process is complicated but is explained in the following website link for the State of Michigan: https://www.michigan.gov/documents/energy/Cost_of_Service_Ratemaking_Industrail_Rates_3-24-2014_451558_7.pptx. ("Industrail" [sic]) Michigan's approach to establishing the cost-of-service for each customer class (or rate) appears to be substantially identical to that of ENO. The energy price used for each utility for most of the U.S. is re-established monthly and is set as the average wholesale price during that month.[13] The following website link provides a sample residential electric bill and some explanations about the relationship between the wholesale and the retail price of electricity. https://www.iso-ne.com/about/what-we-do/in-depth/wholesale-vs-retail-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

ENO makes electricity using its own generators or purchases these kWh's from its wholesale marketplace called Midcontinental Independent System Operator (MISO). The quoted electricity bill example in New England, located within the above link, is for a residential customer who consumed 650 kWh in a certain month; the cost-of-service was $33.42 while the energy charge was $28.80. While the cost-of-service parameter is normally only reestablished during a rate case that generally happens every few years, the energy charge is recalculated each month from data observed within the previous month. For that month, the cost-of-service per kWh for this residential customer was about $0.051/kWh, while the cost-of-energy was about $0.044/kWh. Thus, the price per kWh was about $0.095. For this utility, the price of energy, namely $0.044/kWh, will apply to all customers, but the cost-of-service will depend on the customer class or rate. Each rate is assigned a cost-of-service for energy and power, which is usually different from those chosen for other rates in the same rate structure.

Tariffs are extra charges or discounts that are typically calculated without cost-of-service considerations. A prominent example of this is Net Energy Metering (NEM). A typical application of NEM occurs when a solar panel is installed on a roof, a.k.a., rooftop solar. Sometimes the reverse energy flow is separately metered. NEM results in a one-for-one retail bill credit for kWh's sent back to the utility. Typically, the credit is not monetized in dollars but in prepaid kWh's consumed and thus *only* discounts future consumption.

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

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

Q8. WHAT ARE THE UNDERLYING DEFINITIONS OF CLEP RATES?

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

0. The common cashflow is called the ***cost-of-energy***; this is the monthly-average cost of buying electricity from MISO or making electricity using ENO's generators. This price includes the cost of transmission to ENO's distribution system because MISO's energy marketing unit, the "Locational Marginal Price" (LMP), is location-dependent and changes every five minutes. MISO's data is available at the following website 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. The first new cashflow is called **CLEP5**; this cashflow provides a utility-bill credit or charge for buying or selling electricity from or to the utility that is proportional to the sum of the differences between the instantaneous and monthly-average, wholesale price for making electricity by ENO or purchasing from MISO. CLEP5 accumulates every five minutes throughout the year but is paid monthly. A five-minute, CLEP5 transaction provides **income/savings** to a CLEP customer if either: a) electricity is purchased by the customer when the current MISO price is **lower** than the cost-of-energy; or b) energy is sold by the customer when the current MISO price is **higher** than the cost-of-energy. Otherwise, a CLEP5 transaction generates an expense to the customer using the same formula; in that case, a) electricity is purchased by the customer when the current MISO price is **higher** than the cost-of-energy; or b) energy is sold by the customer when the current MISO price is **lower** than the cost-of-energy. CLEP5 is set proportional to this difference instead of being equal to this difference because 5% of the CLEP5 cashflow is used for other purposes and does not go to that CLEP customer. Technically, CLEP5 is a tariff, because it does not depend upon any cost-of-service considerations.
2. The second new cashflow is called **CLEPm**; this cashflow provides a utility bill credit or charge for providing or demanding power at the nearly the same times that the utility experiences it annual peak demand, respectively. 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. Heretofore, ENO has always charged for a customer’s

peak demand once a month at a fixed rate dependent only upon the measured (15-min peak) number of KW demanded that month. “$/KW-year” means twelve times the monthly charge / KW. For example, if the average monthly demand charge is $10/KW, this is equivalent to $120/KW-year pricing. This “average” cost of power, the magnitude of the average demand charge of the rest of the rate structure, will be resolved in the current rate case and can be updated at least annually by Council rulemaking. Because demand charges are probably not the same for all rates and the total demand for all customers using one rate is not likely to be the same for all customers using every other rate, an “average” demand charge would have to be a “weighted” average. 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. CLEPm is paid monthly during these five months and is directly proportional to the average demand or supply of power by/for that customer during the roughly 105 to 120 hours of that month. The number of CLEPm hours/month ~=

[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.

(5 hours / day) * (5 days / week) * (4.25 weeks/month). CLEPm is only paid five times a year. Because CLEPm is derived from a weighted average of "cost-of-service" values provided elsewhere in the rate structure, CLEPm is much more like a rate than a tariff. 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. An example of an anticipated change is the increase in utility owned, rooftop and community solar power in New Orleans — which may have effects like those currently observed in southern California. Solar power is in such high supply in southern California at 10 AM on many days, that the wholesale price/cost-of-energy is often near or below zero. Similarly, the aggregated customer demand minus customer-supplied power curve in California is causing a substantial decline in the need for utility supplied power in the afternoon to less than one-half of what had been common heretofore and, then, very rapidly rises as the sun sets.

3. CLEP is an optional, additional cashflow or charge, and is much like NEM which effectively pays owners of rooftop solar at the retail rate for energy produced. CLEP complements but does not replace a retail customer's bill and otherwise has no effect on the cashflow or cost-of-energy, i.e., for kWh's, between the customer and the utility — as determined by the primary or specific rate that customer had previously chosen. However, when a customer later becomes a CLEP customer, all demand charges (if any) set by the previously chosen rate for this customer are

removed and replaced by CLEPm. In the case of residential customers, who conventionally do not pay demand charges, that “advantage” goes away and, instead, changes to accepting the obligations and opportunities provided by CLEPm.

4. Just like non-CLEP customers, CLEP customers only pay for consumption. That is, customers only pay the full retail price, the sum of the energy price and the cost-of-service, if that kWh is consumed. Put another way: if x = the number of kWh’s bought, and y = the number of kWh’s sold, a CLEP customer only pays full retail for electrical energy (kWh’s) for the amount $x – y$ when $x – y > 0$. Where the full retail cost per kWh for that customer = “monthly average wholesale price of electricity” + “cost-of-service” where cost-of-service for energy for that customer is set by his or her primary electricity rate.
5. Unlike NEM, however, which only accumulates prepaid kWhs that can only provide value to the customer in some future month and never provides monetary income when the credits exceed costs during any month, when CLEP’s cashflow exceeds the costs of energy and power for a month, the customer is rewarded during that month: as dollars paid to the CLEP customer.
6. ENO customers can only choose to become a CLEP customer after some metering technology, such as smart meters, a.k.a., Advanced Metering Infrastructure (AMI), is deployed and directly connected to the customer’s building so that energy consumption is tallied every 5 minutes (or whatever is the temporal resolution of ENO’s AMI).

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

Q9. WHAT ARE THE CLEP RATES YOU PROPOSE?

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

1. CLEP's non-residential rate is CLEPm + ∑CLEP5. 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. But, CLEPm can provide a major "demand charge" savings to any commercial customers: i) like churches whose demand peak on Sunday morning, and make little to no demand during the utility's near peak hours; or ii) commercial customers who invest in technologies like those described in the answer to question 11. CLEPm is proportional to the amount of demand for power and, equivalently, the amount of production of power during the utility's near peak hours — and provides costs and payments, respectively.

2. CLEP's residential rate is CLEPm + ∑CLEP5. However, for residential customers, CLEPm can also pay for avoiding demand, even when the customer has greater than zero demand. This payment is unique to CLEP, is only applicable to residential customers, and is 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.[16] For example, let us assume that RESNET's energy rating software applied to the actual home's characteristics predicts that the "reference" home's peak electricity demand will be 5 KW. This 5 KW projected peak demand for the reference home will vary depending upon the home's age, location, size, orientation, number of windows, etc., i.e., the 30 or so normal inputs used by RESNET's software. The difference between the actual demand of the real home from the calculated demand of the reference home is used to calculate CLEPm for any month. If the home's demand exceeds this 5 KW value, CLEPm establishes an extra charge for this CLEP customer; if less than 5 KW, CLEPm results in a savings or income.
3. CLEP's community solar rate is CLEPm + [Cost-of-energy * #kWh] + ∑CLEP5. Because a community solar farm (CSF) must be separately metered and will normally not have net electricity consumption, a CSF needs an alternative rate or tariff not found in the rate structure. Because a CSF requires energy and power distribution as well as customizable accounting services provided by ENO, a CSF must have a "cost-of-service" parameter. Unless the CSF has an onsite battery bank, all CSF transactions

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

are sales to the utility, the income from energy is the sum of the last two addends: [Cost-of-energy * #kWh] + ∑CLEP5.[17] Neither the energy's nor power's economic values are predetermined by some formula as is the current plan in the Community Solar Resolution approved by the Council's utility committee on December 13, 2018.[18] Instead, the economic value of both the energy and power produced is provided by CLEPm + [Cost-of-energy * #kWh] + ∑CLEP5 and is paid *only after performance*. Nevertheless, Community Solar is paid for both energy and power as two separate valuations in a manner like the final assertions of the Community Solar

[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:

Avoided Capacity Cost = (CV*0.5)/AEE 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).

resolution passed by the Council's utility committee on December 13, 2018, i.e., Community Solar remuneration is based upon avoided energy and avoided capacity costs. As stated above, the primary difference regarding the valuation of a CSF between the utility committee's resolution and CLEP is that the utility committee resolution values community solar "prospectively" whereas CLEP values CS "after performance". But the underlying premise between the both valuation approaches is that the remuneration to a CSF comes from both avoided energy and avoided power valuations, which makes them similar to each other but different from a NEM valuation proposal, which is otherwise the current industry standard.[19]

Q10. HOW IS EACH CLEP RATE CALCULATED?

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

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

A Monthly CLEP Payment = CLEPm + ∑ CLEP5

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

p = Utility-regulator determined, "percent" and $0 < p < 2$;

n = Number of kWh purchased by the customer.

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

[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.

w = instantaneous Wholesale cost of power; [20]

e = Monthly average cost-of-energy;

where: **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)

q = Utility-regulator determined "percent" and 0 < q < 2.

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****.***

When used to finance *Community Solar*,

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

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

Notes:

a. *The "$50" factor in CLEPm's definitions may be adjusted to optimally encourage CLEP acceptance but not undermine: CLEP transactions lower the electricity price for all customers. Its choice is consistent with and proportional to the assumption that "the*

[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.

weighted average demand charge is $10/KW each month, where this average is calculated over an entire year and over all non-residential customers". Thus, if ENO's average monthly demand charge is determined to be $20/KW, this $50 factor should be replaced by $100.

b. *The negative demand charge paid to a residential customer viewed in $/KW-y should not exceed 2x the highest demand charge paid by a non-residential, non-CLEP customer.*

c. *If a customer does not have air-conditioner-dominated demand, then replace $50 with $50/2. However, CLEP for Community Solar should keep this $50 factor.*

d. *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.*

e. *CLEPm generates a payment whenever **average demand during peak hours** is negative.*

f. *Avoided demand only applies to homes and can be calculated two ways: by comparison to the RESNET reference home's projected demand or by* real-time *comparison to the performance of a large set of homes of similar age, size, and location. The former approach can/should be used to inaugurate CLEP, while the latter is preferable in the mature deployment of CLEP when hundreds of similar homes can be sampled.*

g. *"p" and "q" are extra controls to allow the utility regulator to ensure that goals are met. A 5% service charge is described more fully below. These two ideas are compatible and generate the same effect by setting p = q = 95%. However, these p & q values can be chosen to be smaller or bigger and different from each other — to incent the utility to cooperate and/or encourage CLEP use and, thereby, earn a profit on multi-million-dollar cashflows that heretofore only serve to increase customer bills but do not affect utility* *profit. By choosing p different from q, more or less emphasis is placed on CLEP5 vs. CLEPm.*

Q11. HOW DOES CLEP LOWER EVERYBODY'S RATES?

A. CLEP payments benefit non CLEP customers as follows:

1. Every CLEP transaction will include a 5% service charge to be collected by the utility. Thereafter, some portion of the 5% service charge can be distributed to all ENO customers after deducting ENO's administrative costs according to the Council's rulemaking. This distribution will effectively lower the average wholesale price of energy in the case of CLEP5 and the future cost-of-service in the case of CLEPm.
2. In addition to a portion of the 5% service charge mentioned in the previous paragraph, CLEP5 transactions provide a net monthly benefit to non-CLEP customers because they lower the average wholesale cost-of-energy thereby providing a benefit to all ENO customers in these ways:
    a. In the **intended** case that the CLEP customer "appropriately" uses the CLEP5 opportunities to lower his/her ENO bill by, i) buying kWh's when the wholesale price is lower than the monthly average or ii) selling electricity to ENO when the instantaneous wholesale is higher than the monthly average price. Both kinds of transactions will lower the average cost of electricity ENO incurs and thereby passes some of those savings to all customers. Let [A] denote this cashflow.
    b. However, when a CLEP customer makes purchases or sales at the wrong times, these transactions will have the opposite effect. In that case, the CLEP5

contribution to the CLEP customer will only cause an increase in the ENO bill only for that CLEP customer. Let [B] denote this cashflow.

c. Before the sum of (roughly 2300/month) CLEP5 transactions change the monthly bill, they are added together; by this addition, the CLEP customer receives a net benefit from CLEP5 transactions only when [A] exceeds [B]. If, on the other hand, [B] exceeds [A], the CLEP customer must pay more for electricity than the same non-CLEP customer, and thereby avoids burdening non-CLEP customers because by payment for [B] the CLEP customers avoids raising the average wholesale cost-of-energy normally done by non-CLEP customers onto each other. In that case, the entire excess monthly CLEP5 burden: "[B] **-** [A]" is held by ENO and thereafter indirectly disbursed to non-customers because that income is used to lower ENO's monthly cost-of-energy and thereby indirectly disburses lower electricity prices to all customers.

3. CLEPm transactions provide long-term benefits to non-CLEP customers that lower ENO's true cost-of-service to supply power, does it with enhanced reliability, and accomplishes these effects at lower cost than alternative approaches already established or among those that have been proposed. In this manner, CLEPm lowers the current or future "cost-of-service" part of ENO's rates.

a. Demand charges are designed to compensate the utility and attempt to equitably distribute increasing costs to customers proportional to their increased demand relative to "standard" customers so that the costs of generation, transmission and distribution that are proportional to "demand for power" are appropriately assigned to those customers who have higher than average demand.[21]

b. 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.

c. 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.

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

e. Electric vehicle owners see no discount for kWh purchases which are most often done when the wholesale price is low. This shortcoming in fair electricity rates suppresses the transition to electric vehicles.

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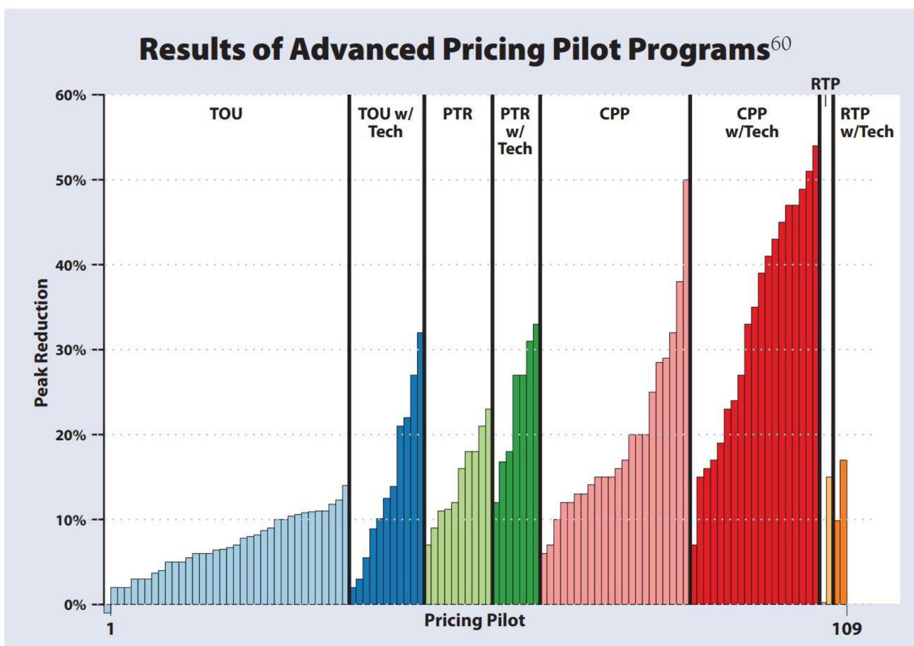
[21] "Utilities and public service commissions around the country have determined that the most equitable way to cover the cost of this equipment is to have those customers who create this demand and the need for power during the [utility] peaks pay for its availability. For this reason, utilities spread the costs of this extra equipment among all commercial and industrial customer as a separate charge for demand." https://www9.nationalgridus.com/niagaramohawk/non_html/eff_elec-demand.pdf

f. The current rate structure provides no financial incentives to install batteries in homes — much less a way to fully finance them. This shortcoming in fair electricity rates suppresses the ability for a building owner to both take full responsibility for electricity reliability and accomplishes this feat better and far more cheaply than can be provided by the utility.

g. Many utilities apply **load management** by orchestrating the use of electric water heaters and/or conventional AC equipment to shift demand out of peak hours but do not equitably share the savings it generates with their customers.[22]

h. These economic opportunities are largely unavailable to ENO consumers. If 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

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

Q12. WHAT ARE ILLUSTRATIONS OF KEY CLEP APPLICATIONS?[24]

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

[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.

[24] Additional illustrations of how CLEP lowers electric bills and decreases CO_2 production are found in the video and short PowerPoint file at: https://www.buildingscienceinnovators.com/customer-lowered-electricity-price.html

1. With a $0 investment in labor and materials, by setting a standard, programmable **dishwasher** to always operate very early in the morning, a CLEP customer will earn $26 per year: $6 from lower priced wholesale electricity (via CLEP5) and $20 savings on demand (via CLEPm).
2. With a $50 investment in labor and materials for installing a timer, a **standard, electric water heater** with a tank can be set to always heat water very early in the morning, a CLEP customer can save a $150 a year.[25] This same reference implicitly asserts that residential electric water heaters typically consume about 5000 kWh/ year. The CLEP incomes are approximately a) $100 from lower priced wholesale electricity (via CLEP5) and b) $50 savings on demand (via CLEPm). The payback period is about 4 months, i.e., 1/3 year.
3. With a $300 investment (net of rebates)[26] or $700 (with no rebates) in labor and materials that comes with an App-controlled timer, a customer can install and control a **heat pump water heater** with a tank to always heat water very early in the morning. Because it is a tremendous energy saver even before the extra savings from CLEP, this water heater is eligible for a $400 rebate from the utility; this energy savings is assured by setting the water to be always in heat pump mode and thereby save more than 2/3 of the total kWh consumption or roughly $372 that way and

[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

[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.

even more so in demand. In addition to the just mentioned **energy efficiency** savings, a CLEP customer can save an additional $80/year, roughly $30 from lower priced wholesale electricity (via CLEP5) and $50 savings on demand (via CLEPm). The annual payback cashflow is $372 from Energy Efficiency and $80 from CLEP. If rebates were used, the payback period is less than a year either way; with no rebate, the payback period is less than 2 years either way. The payback is roughly 20% faster with CLEP.

4. With a $3000 investment in an ice-making AC[27], a customer can always make ice very early in the morning. Because the cooling (i.e., ice-making) is done at night, this equipment will have a roughly 10% to 20% higher efficiency than a standard AC; thus, compared to the average AC, an ice-making AC will operate at 3.5 KW instead of 4.3 KW.[28] Residential AC energy consumption is 3 times water heating consumption in the southeast.[29] Thus, a standard 3-ton AC will consume approximately 15,000 kWh/year. Using a $0.11/kWh price and a 20% savings in kWh, just using an Ice-making AC will save 15,000*$0.11*0.20 = $330/year. But, in addition, a much bigger savings will come from CLEP. CLEP5 income will be roughly 80% of 15,000 times $0.02 = $240. CLEPm income will be roughly 4 KW of avoided demand * $50/month * 5 months = roughly $800/year. Thus, the annual CLEP income = CLEP5 + CLEPm = $240 + $800 = $1040. Note, that without CLEP, the

[27] https://www.greentechmedia.com/articles/read/ice-energy-will-launch-residential-thermal-storage-in-first-quarter-2017#gs.F3tOl3bT

[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/

Energy Efficiency benefit is $330/year and requires a 9-year payback. But, with CLEP and Energy Efficiency, the benefit is $1370 per year and pays back in less than 3 years.

5. With a $10,000 (using 2016 prices) investment in a 12-kWh whole-home battery[30], a customer can store approximately 360 kWh/month or 4300 kWh/year. This battery size is appropriate,[31] if the same homeowner has either deeply invested in making the home very energy efficient, or has already shifted all demand for water heating and AC energy and demand to the very early hours in the morning when the battery is charging (by installing the equipment like those described in parts 1 - 4 of this answer). In this way, the residual energy needs of the home outside of the time the battery is charging can be cut by more than 50%. This reduction of residual energy needs will help to economically "right-size" the whole-home battery to 12-kWh. If all the battery does is buy for later consumption on the same day, CLEP5 pays 4300 * $0.02 = $86/year. If the energy stored in the battery is never needed, that energy can be sold back to the wholesale market at an average profit of at least $0.04/kWh. In this case, the CLEP5 income exceeds 3 times $86 or $258. However, the CLEPm income is much larger. Note that those 12 kWhs will spread over five hours at an average rate of 2.4 kW. Thus, the CLEPm income is 2.4 * $50 * 5 = $600/year. Note, that this $600/year CLEPm income accrues to residential customers whether the battery is used to sell back to the utility or is only used to reduce the demand of the

[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.

homeowner's other appliances by the same amount. The minimal CLEP income is $86 from CLEP5 and $600 from CLEPm. Although this income supports a (long) 16-year payback period, because $686 is approximately 1/16th the initial cost of the battery, it may be a satisfactory investment to those residential customers who value reliability at $500/year — as was the average case in Maryland in 2011.[32] If so, this speeds up payback to roughly a decade which is in-line with the battery's warranty.

6. Assuming a CSF capital investment at less than $1 per watt[33], if this investment were amortized over 20 years, a community solar subscriber should be able to buy-in at roughly $7/KW-m.[34] NREL's PVWatts program predicts that a 1 KW solar panel optimally tilted and not shaded in New Orleans will produce about 5 kWh/day.[35] This production results in approximately 1800 kWh/year. Because this is all daytime production, it will see an average wholesale price of over $0.06. So, the CLEP5 income will be at least $110/KW-y. If solar were 100% reliable, each KW will be paid $50/m or $250/year. However, as noted above regarding the **prospective** payment approach described in the community solar income footnote about the December

[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

[33] 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. Thus, a 1-megawatt solar farm would cost around $1 million to install.

[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/

13, 2018 utility committee's Community Solar Resolution, the expected "capacity factor" of a solar farm is 50%. Therefore, the CLEPm income should be expected to be not $250/year but approximately $125/year. Thus, the Community Solar subscriber will be paying 7 *12 = $84/year to **rent** 1 KW, but will be paid CLEP income for one KW = CLEP5 + CLEPm = $110 + $125 = $235. Thus, the net annual income per KW will be roughly $235 - $84 = $151. These numbers assume the CSF is fairly and completely paid the full CLEP value, and the subscriber rents one KW of a solar farm **at cost**.

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

[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.

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

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

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

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

[38] A joint investment in all four of:

1. Dishwasher control

2. new Heap 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 (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

EXHIBITS

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

Exhibit MBK-1 **CLEP** *Battery Pilot as Proposed in 2016 during 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

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

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).

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

Unlike the analysis in Exhibit MBK-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 business (like a landlord to indirectly profit from energy flows happening at the residences of his tenants), then two benefits are possible:

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

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

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

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

Updated Section 179 Tax Deductions for Businesses[39]

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

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

What are Section 179 Deductions?

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

[39] https://www.thebalancesmb.com/what-is-a-section-179-deduction-397650

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

Qualified Business Property for Section 179 Deductions

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

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

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

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

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

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

Use IRS Form 4562 to Elect a Section 179 Deduction

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

2018 Instructions for Form 4562[40]

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

[40] https://www.irs.gov/pub/irs-pdf/i4562.pdf

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

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

Part II. Special Depreciation Allowance and Other Depreciation Line 14

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

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