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July 1, 2022

Via Electronic Delivery
Ms. Lora W. Johnson, CMC, LMMC
Clerk of Council
City Hall - Room 1E09
1300 Perdido Street
New Orleans, LA 70112

Re: IN RE: SYSTEM RESILIENCY AND STORM HARDENING
Council Docket No. UD-21-03

Dear Ms. Johnson:

Attached please find ProRate Energy, Inc's Resiliency and Storm Hardening Filing.
Please let me know if you have any questions or concerns.

Sincerely,

Myron Katz

Myron Katz, PhD.

cc: Official Service List (UD-21-03)

BEFORE THE

COUNCIL OF THE CITY OF NEW ORLEANS

SYSTEM RESILIENCY AND STORM	**)**	
HARDENING OF THE ENTERGY NEW	**)**	**DOCKET NO. UD-21-03**
ORLEANS (ENO) GRID	**)**	

DIRECT TESTIMONY OF

MYRON B. KATZ, PhD

ON BEHALF OF

PRORATE ENERGY, INC

JULY 1, 2022

Preface

The purpose of this proceeding is to investigate ways to cost-effectively increase system resilience and storm harden the Entergy New Orleans grid. ProRate Energy supports this purpose but believes that the public interest will benefit greatly if the scope of its review considers not only infrastructure investments, but also regulatory and rate design opportunities that can increase resilience by implementing various consumer-supported resiliency programs. These programs include rate designs that appropriately incentivize consumer-owned resources that can operate as islands during disasters, but more importantly, can be leveraged by the distribution system operator to optimize distribution circuit operations during normal periods. Such programs can "automatically" (or in response to price or other signals) increase storage, electric vehicle charging, pre-cooling, and similar uses during peak renewable energy periods, while decreasing such uses during the lull between daytime solar and nighttime wind energy. In periods of scarce supply like California recently experienced, the ability to control specific types of resources would be able to curtail energy use by water heaters or other less-than-essential loads from 0 to 100%, depending on the emergency. Shortages could be spread so wide and far, with varying duration, that no one might even realize that their loads were being cycled. During an extreme emergency, these devices could be completely taken offline, allowing available capacity to be delivered to essential loads.

Tomorrow's distribution grid will see the continued movement from a central-station-based model to one offering a variety of distributed energy resources (DERs), many of which will be consumer-owned. Optimizing this model in the public interest will require a new approach to regulatory oversight. Tomorrow's distribution grid will require three basic components:

- **Monitoring** each distribution circuit and the status of various DERs on that circuit (supply, storage and demand).
- **Coordinating** those distribution circuit resources with each other on that circuit and with the larger distribution system, and even the wholesale markets. Attempting to optimize individual homes or even mini- or micro-grids can ultimately result in the sub-optimization from the perspective of the entire distribution grid, resulting in increased costs that might have been easily avoided through better coordination of all available resources. Coordinating all distribution circuit resources can reduce costs, increase reliability, and most importantly for this proceeding, be available for leveraging in the broader public interest in times of emergencies, either natural or manmade.
- **Compensating** all parties appropriately in order to provide the right amount of incentive for economic investments by all parties to fulfill societal, reliability, and other regulatory policies.

Looking only at an infrastructure approach to reliability turns a blind eye toward other complementary approaches that can supplement infrastructure investments or just provide an alternative to dispatching emissions-producing generation to support all grid functions. Regardless of whether the Council of the City of New Orleans approves any distribution upgrade investments, this proceeding should consider other complementary approaches. Such approaches include the development of novel rate designs to appropriately compensate consumers for their roles in supporting resilience and the active coordination of all DERs on the distribution grid in a manner that avoids fossil-fired generation and optimizes distribution circuits.

Foreword

The increased frequency and severity of destructive storms demands that New Orleans finds a strategic and comprehensive approach to mitigate their effects. This testimony proposes adoption of the ProRate rate design. This puts batteries in reach of every home and puts them to effective use by rewarding customers for buying and storing electricity when it makes the most sense for everyone, thereby providing resilience, environmental, social, and economic benefits. ProRate accelerates consumer investments in renewable technologies and optimally supports utility goals and cost-effectiveness via:

- Load flexibility[1] (LF), making the distribution grid more efficient and electricity less expensive
- Resilience through the introduction of distributed energy resources (DERs)
- Equity for all customers
- A financing mechanism (utility bill savings) supporting DER/electrification adoption
- Enhanced utility revenues through beneficial electrification and cost-of-service reductions.

Business as Usual

Current utility regulation and cost-recovery procedures have long incentivized Entergy New Orleans (ENO) to increase its infrastructure investment to the detriment of resilience, environmental, social, and economic benefits. In today's world this is no longer acceptable and requires a rethinking of the compact between the City of New Orleans, ENO and most importantly, its citizens. The Regulatory Assistance Project, an independent, non-partisan, non-governmental organization dedicated to the energy transition to a clean, dependable, and efficient future, describes utility regulation as

> "Ensuring reliable service at reasonable cost while meeting societal goals while balancing the interests of utility investors, energy consumers, and the entire economy."[2]

To meet this ideal, building infrastructure that mostly helps the utility, and only tangentially the consumer, is not a path through the current crisis. Incremental changes via tiny pilot projects, typified by the recently proposed 30-home battery pilot, is not a path to a sustainable and resilient New Orleans. New Orleans needs to rethink utility regulation and rate design to an approach that effectively makes each New Orleans citizen an equal partner and enabler of change.

This testimony supplies a blueprint of a consumer-orientated rate design that supports not only ENO's efforts on the infrastructure side, but also consumers' need for sustainability, resilience, and cost-effectiveness. This testimony proposes adoption of a large-scale demonstration of ProRate that provides a financing mechanism for consumer investments in local resilience while supporting the utility, providing cost mitigation, and increasing revenues that benefit all New Orleans residents.

Advances in technology and dramatic cost declines are supplying new opportunities to improve the economic efficiency of the power sector while reducing environmental impact and improving customer benefits. The utility sector holds the key to cleaner and more customer-centric energy uses that are more resilient with the increased (DER) and beneficial electrification of space conditioning and

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[1] "**Demand flexibility**, also sometimes referred to as **load flexibility**, is the capability to reduce, shed, shift, or modulate electricity consumption in real time in a way that is beneficial to both consumers and the power system." https://activeefficiency.org/demand-flexibility-valuation/

[2] https://www.utilitydive.com/news/inside-the-new-guidebook-for-electric-utility-regulation/426597/

transportation. All that is needed to unlock these resources is an updated regulatory paradigm as suggested in this testimony and embodied by ProRate.

Load Flexibility

LF and DER are ***THE*** path to a resilient future. The Rocky Mountain Institute (RMI) studies suggest that LF is "The Key to Enabling a Low-Cost, Low-Carbon Grid."[3] By exploring a future of a highly renewable-energy saturated Texas power system, they found that LF:

- Reduced CO_2 emissions by 20%
- Lowered peak demand by 24%
- Lowered renewable curtailment[4] by 40%
- Lowered the magnitude of demand ramping[5] by 56%
- Increased renewable generation's value by 36%

RMI concluded that policymakers like the New Orleans City Council ***need*** to incorporate LF as a system asset.

Likewise, the Pacific Northwest National Laboratory (PNNL) in their newly released DSO+T study[6] found that LF provided:

- Peak demand reduction of 9-15%
- Wholesale electricity cost reduction of 7-14%
- Retail electricity cost reduction of 10-17%.

And these savings were not delivered only to the participants who had load flexible resources but to all utility ratepayers, thereby providing significant equity.

LF changes *when*, as opposed to *how many*, kilowatt-hours (kWhs) are bought. This does not decrease the number of kWhs consumed but instead when they are purchased — thereby saving consumers and utilities money. Current rates are poorly designed to supply customer savings for LF.

The Missing Piece

To implement LF, a financing method is necessary to enable consumer-side investments in innovative technologies that optimally support the utility's cost recovery and sustainability goals.

ENO customers already profit from energy efficiency investments; for example, when they change an incandescent lamp to a fluorescent or LED, the upfront costs of new equipment are more than "recovered" though the stream of energy-bill discounts. Today, energy efficiency investments do not lower energy bills as much as they would with a ProRate rate design.

ProRate *finances customer investments by lowering their customer bill,* not only with energy efficiency but also with LF. Consider that both RMI's and PNNL's reports show that LF is critical for future, greatly increased cost-effectiveness and resilience. Currently, ENO customers have no economic incentive to employ LF, and ENO has no current economic incentive to lower wholesale costs of electricity even

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[3] https://rmi.org/demand-flexibility-can-grow-market-renewable-energy/

[4] "Curtailment of generation has been a normal occurrence since the beginning of the electric power industry." https://www.nrel.gov/docs/fy14osti/60983.pdf

[5] "In locations where a substantial amount of solar electric capacity has been installed, the amount of power that must be generated from sources other than solar or wind displays a rapid increase around sunset and peaks in the mid-evening hours, producing a graph that resembles the silhouette of a duck." en.wikipedia.org/wiki/Duck_curve

[6] https://www.pnnl.gov/projects/transactive-systems-program/dsot-study

though it is more than 25% of the average customer's bill. ProRate unleashes wholesale price savings — splitting it between the utility and the consumer. These savings incentivize customers to invest in their homes' energy efficiency, install DER, promote LF, and engage in beneficial electrification.

The following testimony explains how ProRate benefits New Orleans citizens and specifies the implementation of a significant demonstration.

Executive Summary

ProRate is a coordinated pair of bidirectional, time-varying rates added to ENO's rate structure[7]:

1. High temporal resolution, Real-Time Pricing (RTP), called CLEP5, and
2. Seasonal Peak Pricing (SPP) replacing demand charges is called CLEPm; SPP is 2-step, time-of-use pricing AND a variant of Critical Peak Pricing (CPP) but spread over 500, predetermined hours.[8,9]

This testimony promotes ProRate, a.k.a., Customer Lowered Electricity Price (CLEP) rate design, to allow every ratepayer to choose to greatly and sustainably improve grid resilience and a host of extra benefits:

1. CLEP is fair in that it charges at industry standard rates and extinguishes three quite common and important adverse cross-subsidies between ratepayers.
2. CLEP provides a better and needed replacement to pay for rooftop and community solar.[10]
3. Finances deep investments in DER[11]. Since saving a kilowatt-hour (kWh) costs less than buying it, all electricity rates encourage buying more energy-efficient equipment, thereby tapping into one of the largest energy resources in the country: the energy inefficiency of U.S. homes. However, CLEP also rewards in two new and very lucrative ways: buying lower-wholesale-priced electricity and focusing electricity purchases away from peak demand times, i.e., load flexibility.
4. CLEP provides even more potential financial reward for energy-bill-saving retrofits for older homes — the older the home, the more the reward. These provide needed equity for less-affluent ratepayers and better focus the rewards on the most inefficient sites.
5. Such rewards from CLEP are performance-based, instead of cost-based.
6. CLEP provides a way to "finance" large battery purchases in all buildings.
7. CLEP provides for greatly improved and sustainable reliability and resilience in the face of grid failures, which are more common under blue skies than during storms.
8. CLEP improves US energy independence at negative costs to society, utility, and ratepayers.
9. CLEP speeds up electrification of buildings and transportation.
10. The cost to roll out and administer ProRate is projected to be less than $10 million.

CLEP may be the best way to ameliorate the electricity sector's contribution to climate change.

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[7] ProRate does not weave in the background, constant priced but requires the customer to pay that as well. Thus, CLEP5 is really a marginal or increment RTR. When switching to ProRate, the ratepayer accepts the smallest commercial rate except its demand charge is replaced by CLEPm = Seasonal Peak Pricing.

[8] CLEPm is zero except during about 500 hours a year when it is $0.50/kWh. ProRate Energy (PRE) recommends that to start, the City Council should set those hours to be only during May - Sept, Weekdays, and 2 PM to 7 PM.

[9] All homes get a discounted CLEPm, and older homes get a bigger discount. This only applies to charges but not to payments. The full explanation is found in the section entitled "Reference Demand". This provides some equity for older homes and, via that algorithm, to low-income customers.

[10] NEM is the default way to pay owners of rooftop solar: which means: "sales to the grid discount future purchases at retail". NEM has been curtailed in California and Louisiana because it creates an adverse cross-subsidy that requires low-income ratepayers to help pay for utility-bill discounts received by other, usually more affluent, rooftop solar owners – ProRate removes this cross-subsidy. By so doing, CLEP accelerates the growth of the solar energy industry, otherwise imperiled by NEM phaseouts, by securing renewable energy economics.

[11] Since saving a kilowatt-hour (kWh) costs less than buying it, all electricity rates encourage buying more energy-efficient equipment, thereby tapping into one of the largest energy resources in the country: the energy inefficiency of U.S. homes.

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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: WITH WHOM ARE YOU AFFILIATED AND IN WHAT CAPACITY?

A: I am currently Vice President of the Board of Directors of ProRate Energy, Inc. (PRE) and serve as chairperson of its Issues and Education committee. In this role, I oversee research, development, company method 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.

I am also Director of Research of Building Science Innovators (BSI). BSI is a for-profit building energy and moisture design consulting firm that also and not unusually advocates for better, cheaper, more sustainable improvements in local governance within the standard mantra of classical environmental organizations: ***think globally but act locally***.

Q3: HAS PRE OR BSI PARTICIPATED IN OTHER PROCEEDINGS BEFORE THE COUNCIL?

A: Yes. BSI has intervened in two utility dockets. In 2015, BSI intervened in the 2015 proceeding on the Entergy New Orleans (ENO) Integrated Resource Planning (IRP), and in 2018, BSI intervened in the 2018 ENO Rate Case. During the first Intervention, BSI introduced the Customer Lowered Electricity Price (CLEP) rate design and recommended three CLEP pilot projects. BSI also proposed CLEP in the 2018 ENO Rate Case. In each of 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.

PRE was explicitly formed to promote the CLEP rate in New Orleans and elsewhere. PRE is the primary intervenor for that project.

PRE's proposals are aimed to both improve and support current electricity utility systems and ease a transition to a cleaner energy future.

Q4: ON WHOSE BEHALF ARE YOU SUBMITTING THIS DIRECT TESTIMONY?

A: I am submitting this testimony before the Council of the City of New Orleans (Council) on behalf of PRE.

Q5: 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 in 1982, 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.[12] back to the Council in May, 1985. I then worked with Gary Groesch, Karen Wimpelberg, Betty Wisdom, and Thomas Lowenberg to inaugurate the Alliance for Affordable Energy. During 1986-1987, I served as the energy consultant to the Louisiana Attorney General, William Guste.

More recently, I earned professional credentials as a certified home energy rater and rater-trainer, an indoor air quality specialist, and a real estate agent. With other researchers, I have published in ASTM International'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.[13] I have also taken part in broader energy policy debates. After Hurricane Katrina (2005), I, along with Pres Kabakoff of HRI Properties and area architects and engineers, as members of the Council's New Orleans Energy Policy Taskforce, produced a report titled ***The Energy Hawk***[14], which made many sound public-policy recommendations, including community solar. However, only IRP was accepted. In 2008, the Council mandated that IRPs should happen every 3 years.

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[12] New Orleans Public Service, Inc (NOPSI) was later renamed to Entergy New Orleans (ENO).
[13] https://www.EEBA.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf
[14] http://www.theRegenGroup.com/docs/EnergyHawk.doc

Q6: WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A: In establishing this proceeding, the Council's order recognizes the harm to New Orleans caused by the recent and seemingly increasing number of hurricanes. In 2020 alone, New Orleans was hit by three hurricanes, and then Hurricane Ida struck the City as a Category 4 on August 29, 2021. The Council's order notes that these storms cause nearly $160 million in damages; the order is correct in stating that "this cycle of damage and repair is not sustainable for the Company or ratepayers."

The Order further instructs the following:

"WHEREAS, the Council desires to open a docket to increase resiliency and storm hardening on ENO's system, with a particular focus on reducing weather-related power outages; and

"WHEREAS, the Council directs stakeholders to propose for the Council's consideration an infrastructure resiliency and storm hardening plan; and

"WHEREAS, such proposed plans should include detailed explanations and, where appropriate, calculations of the benefits to reliability and resiliency that would be reasonably expected to be gained from the plans; and

"WHEREAS, the proposed plans should also include an estimate of the costs and timeframe of the plans and proposed cost recovery method…"

I applaud the Council's desire to address these concerns. However, there is an additional approach that ENO and the Council should consider. This approach involves harnessing the actions customers can take to manage their electricity purchases and sales through rate design reforms that customers can choose. For example, if customers choose them, these rate designs reward customers for shifting their load usage to less-expensive hours, thereby receiving a major financial benefit that greatly enhances grid reliability. The purpose of this testimony is to present ProRate, a new rate option that customers could use. My testimony introduces PRE's ProRate, formerly called CLEP, into the UD-21-

03 Resilience Docket. As the Council considers ways to improve resilience and storm hardening of ENO's system, I ask the Council to recommend that ENO pair rate reforms, such as ProRate, with new investment in these areas.

Q7: HOW DOES A REFORMED RATE DESIGN TIE INTO THIS PROCEEDING'S OBJECTIVES?

A: PRE submits that the goals the Council's order articulates are more cost-effectively reached with a better rate design. Previously called CLEP and now renamed ProRate, this rate design will "finance" the purchase of solar power, electric and thermal batteries, and improved energy efficiency – not as a cost to ratepayers, but at a profit. By "finance," we mean much the same as the idea that energy efficiency investments "finance" improvements by reduced electricity bills, where the investment is paid off by the stream of utility bill savings before the end of life of the improvement.

Q8: DID OUR EXPERIENCE WITH THE RECENT STORM OUTAGES IN NEW ORLEANS OFFER ANY LESSONS THAT SUPPORT THIS CONCEPT?

A: Yes. Small and uncommon fully sustainable pockets of resilience withstood the power outages. All had solar power and electric batteries.

ProRate will make it at first easier, then easy, then less costly, and then, in less than a few years, actually profitable to buy and install the bits and pieces of this kind of behind-the-meter resilience (further discussed in Q22). As additional benefits:

- Low-income customers will cut bills by more than 50% with a $50 one-time investment.

- With their property owners' help, some such customers will have programmable heat pump water heaters and electric batteries to decrease bills by more than 100%, and both rooftop and community solar will become more common. These are all parts of the broad class of distributed energy resources that have been lauded by numerous studies to provide resilience.[15, 16]
- ProRate allows rapid paybacks, at no cost to the utility or to other ratepayers.
- ENO will enjoy greater profits without burdening ratepayers with increased rates.
- The far more numerous "blue sky" outages – as many as 2000 a year in ENO's system – will not disrupt electricity to supply where it counts, at our outlets.

New Orleans will be able to step up and be a leader in the US and internationally to make a fully renewable energy future possible and increasingly probable, thereby decreasing the probability of disruption by future major storms and their growing intensities.

Q9: HOW DOES ProRate MAKE THE GRID MORE RESILIENT?

A: Among other things, ProRate facilitates customer investment in distributed energy resources, such as solar panels and batteries — the two key ingredients of a sustainable pocket of reliable electricity during a power outage. It also includes a utility

[15] https://www.pnnl.gov/projects/transactive-systems-program/dsot-study
[16] https://rmi.org/demand-flexibility-can-grow-market-renewable-energy/

bill/financing means to support customer investment in these products that increase sustained reliability.

Q10: HOW WOULD ENTERGY NEW ORLEANS BENEFIT FROM ProRate?

A: ENO would benefit in several ways. Notably:

- ENO's cost of energy would be less if customers shifted their purchases to times when the wholesale price is lower.
- ENO's cost of service would rise more slowly because demand during peak times would grow more slowly, thereby forestalling the need for distribution upgrades.
- ENO's profits would increase without any raise in rates or additional investments because a few percent of every ProRate transaction can easily be set to provide net income to ENO.

As explained in Exhibit 1, the 1000-home battery pilot project, proposed in 2016, shows a way to earn tens of millions of profits over a decade without any increase in rates.

Q11: PLEASE DESCRIBE THE RATES YOU ARE PROPOSING.

A: ProRate is an innovative design rate that encourages consumer-side investments while enhancing the utility's efforts at increased resiliency and storm hardening.

My testimony recommends a blueprint of what is needed to support the adoption of three ProRate rates within ENO's rate structure, including one each for residential, non-residential (i.e., commercial, industrial, and municipal), and community solar. I will also explain how ProRate helps provide low- to negative-cost ways to address the purposes and conform to the requirements of this docket.

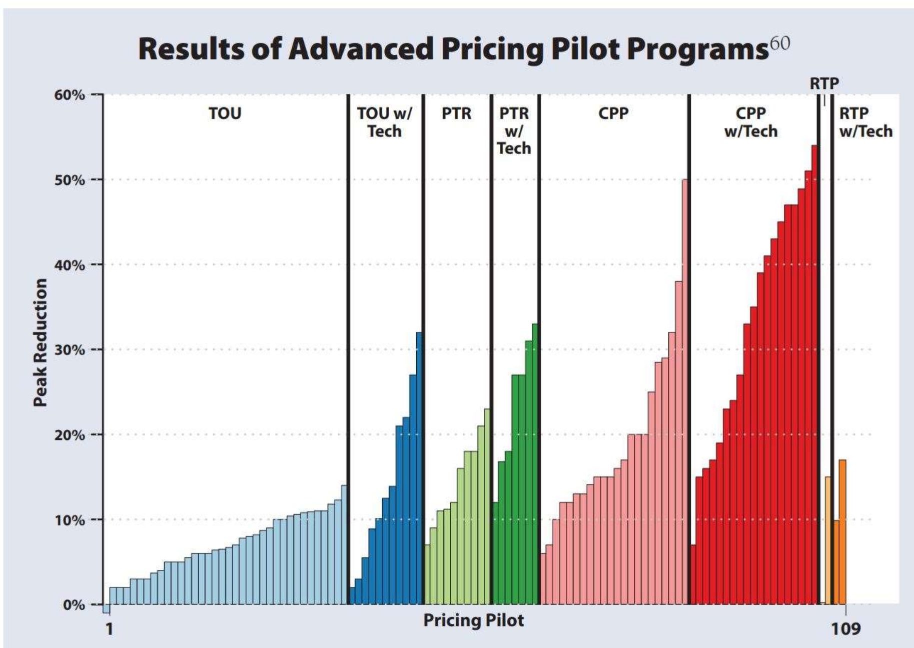
Q12: HAVE ProRate RATES BEEN REVIEWED BY OTHERS?

Yes. In 2017, what was then known as CLEP was submitted to compete in an international sustainable design competition and reached the semi-final round. CLEP was also 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. In 2021, ProRate was an integral part of a submission to the US Department of Energy in its "Connected Communities" Funding Opportunity. In that application, PRE collected written support from the New Orleans mayor's office, the president of the City Council and the leadership of the Sewerage and Water Board.

Moreover, the following (including the graph) comes verbatim from BSI's Direct Testimony submission of February 1, 2019 into the ENO 2019 Rate Case, DOCKET NO. UD-18-07. It clearly shows that many rates and methods proposed in this testimony, including load management, critical peak pricing and real time rates, are already commonly used in the utility industry and (as explained in the executive summary and again in Appendix B) are almost identical or precursors to key parts of ProRate. For example, CLEP5 is herein described as marginal or interval Real Time Rate, and CLEPm is very similar to the simplest form of a time of use rate, with only two steps set to seasonally adjusted predetermined hours. The following graph, published many years ago, shows the well-established effectiveness of many of ProRate's desegregated components.

"A: 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.[17]

These economic opportunities are largely unavailable to ENO consumers. If opportunities were available, customers will make economic choices that



[17] "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,[18] 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)."

Q13: WHAT ARE SOME OF THE BENEFITS OF ProRate?

A: ProRate greatly increases both the cost-effectiveness and the scope of investments of many of the technologies that are both very useful in helping to reach the goals of this docket and have only poorly penetrated New Orleans's homes or buildings.

Regarding cost-effectiveness, consider that today, without CLEP, energy-efficiency investments do not lower energy bills as much as they would with CLEP. Regarding investment scope, other kinds of investments, notably those facilitating load-flexibility[19], can also be "financed"[20] with CLEP, but not without a rate design similar to CLEP.

For example, ENO customers already receive a "payback" incentive for changing an incandescent lamp to a fluorescent or LED light bulb. This is an energy efficiency investment where the upfront cost of the new equipment is completely "paid back" through energy bill discounts when the number of kilowatt-hours (kWhs) needed to provide lighting is decreased. Over time, that process "finances" those investments.

[18] 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.

[19] The National Potential for Load Flexibility: Value and Market Potential Through 2030 (brattle.com), June 2019.

[20] An investment is "Financed by CLEP" in this document means that in the presence of electricity bills enhanced by adding the CLEP rate design, the first cost of the installation of equipment minus the present value of the stream of savings that equipment generates during its useful life is negative. CLEP by is not a funding mechanism, it is a payback mechanism.

However, ProRate also finances load flexibility investments that do not improve energy efficiency. The cheapest and most prevalent example is to fit a standard electric water heater with a timer or controller that keeps the water heater running ONLY when either the wholesale price is low or the near-peak-demand hours are avoided, or both. Such a retrofit will save more than 60% of the cost of operation of the water heater, even though it may actually increase the number of kWhs purchased.

Q14: WHAT IS THE OVERALL APPROACH OF ProRate?

A: ProRate encourages load flexibility. A customer who chooses ProRate can reduce his bill by changing WHEN, rather than HOW MANY, kWhs he uses. Load flexibility makes distribution far more efficient and electricity less expensive. Our current rates do not provide load flexibility savings and thus provide little to no payback for such investments. E.G., adding a timer on a standard electric water heater.

As suggested above, one example of load flexibility is controlling the time when an electric water heater heats water. If the consumer limits the time for heating water to between midnight and 6 AM, he does not decrease the number of kWhs consumed but does save money; the savings are in both the wholesale price of that electricity (as compared, for example, to the price in the afternoon) and the avoidance of near-peak-demand times. Customers currently have no economic incentive to lower the total wholesale cost of electricity, which is more than 25% of the retail price. ProRate unleashes this cashflow and helps funnel it to customers so they can make the investments needed to improve reliability and lower electricity bills.

However, for the purposes of this docket, the most important retrofit ProRate finances is the purchase of a large electric battery. Although such batteries were rare and far more expensive in 2016, when CLEP was first introduced, it is now quite feasible and quickly becoming common to buy a 10 kWh battery for your home and use it to buy electricity when it is cheap and sell it back to the wholesale marketplace when it is 10 times as expensive. This is called price arbitrage.[21] Exactly this kind of battery is needed for a sustainable pocket of resilience that, coupled with adequate solar panels, will long outlast a storm-related power outage.

Although a fossil-fueled generator can do much the same job, it cannot be financed by rates because it cannot reliably produce electricity that is cheaper than wholesale prices. Moreover, that approach is not sustainable or as cost-effective, and it will do nothing to help create a renewable energy future for New Orleans or our planet.

Q15: WHAT ARE THE UNDERLYING CONCEPTS AND DEFINITIONS OF ProRate RATES?

A: ProRate is proposed as three hybrid tariffs/rate 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.

0. The common cashflow is called the ***cost-of-energy***; this is the weighted monthly-average cost of ENO's generation of electricity from its own generators or its purchases of electricity from Midcontinental Independent System Operator (MISO). This price includes the cost of transmission to ENO's distribution system because

[21] https://www.economicshelp.org/blog/glossary/arbitrage-what-is-it/

MISO's energy marketing unit, the Locational Marginal Price, is location-dependent and changes every five minutes.

1. The first new cashflow is called **CLEP5**, so called because it accumulates customer transactions every five minutes and, every month, adds them up **(∑CLEP5**) to provide a utility bill reflecting these transactions as a credit or charge for buying or selling electricity from or to the utility. An individual five-minute CLEP5 transaction supplies **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. If neither of these conditions is met, the CLEP5 transaction generates an **expense** to the customer. For each transaction, 5% of the CLEP5 cashflow is used for other purposes and does not go to the CLEP customer.[22] 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 supplies a utility bill credit or charge for providing or demanding power at nearly the same times that the utility experiences it annual peak demand, respectively

   The target size of CLEPm is selected to generate an annual cashflow equal 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.

[22] The 5% value in this sentence is actually a variable; 5% is here presented because it is likely to be the value used in CLEP's first implementation. Later in the description of CLEP, the variable **p** is the percent a CLEP customer keeps from a CLEP5 transaction. The discussion in this paragraph is assuming the **p** = 95% and the residual, 5%, is allocated to the utility to first pay CLEP's administration costs and the rest goes to pay down the cost-of-energy for all customers.

Heretofore, ENO has always charged for a non-residential customers' peak demand once a month, at a fixed cost-of-service rate dependent only upon the highest measured (15-minute peak) number of KW demanded that month. The size of CLEPm for any home depends on the home's age and other factors. Older homes, which are less energy efficient, are often where tenants live, so tenants who choose CLEP may gain more than average access to lower energy bills. For a full explanation of CLEPm, see Appendix A.

3. CLEP is an optional, additional cashflow or charge that differs from net energy metering in that the price paid or credited for CLEP is not related to retail pricing but is the sum of CLEP5 and CLEPm. Calculations via the CLEP Dashboard using real 2018 MISO data found that CLEP rewarded rooftop solar almost 14% higher than retail.[23]
4. An ENO customer can choose to become a CLEP customer only after some metering technology, such as a smart meter, is deployed and directly connected to the customer's building so that energy consumption is tallied over a specified period of time. For New Orleans, ENO deployed this technology in 2020, tallying energy consumption at 15-minute intervals.
5. Any customer so connected to ENO can obtain a virtual CLEP bill before choosing CLEP, and ENO will provide energy consumption information broken down on a 5-minute and monthly basis for the previous year's energy consumption, using 15-minute temporal resolution.

[23] CLEP's calculated example using actual 2018 MISO prices is a feature of the story in the video at this link: CLEP Lowers Greenhouse Gas Emissions while Financially Benefiting all Ratepayers

Q16: 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.

1. CLEP's non-residential monthly rate is CLEPm + ∑CLEP5. Because there is no industry-standard way to predict reference demand for non-residential buildings, CLEPm provides a payment to a commercial customer only when that customer sells more electricity to the grid during peak times than the customer buys at the same times. Commercial customers with predictable electricity demand at mostly off-peak hours may also gain "demand charge" savings.
2. CLEP's residential rate is also expressed as CLEPm + ∑CLEP5. However, for residential customers, CLEPm can also pay for avoided demand, even when the customer has greater than zero demand. This payment is unique to CLEP and applies only to residential customers.
3. CLEP's community solar rate[24] is CLEPm + [Cost-of-energy * #kWh] + ∑CLEP5. [25] Because a community solar farm (CSF) must be separately metered and normally does not have net electricity consumption, a CSF normally needs an alternative rate or tariff not found in the rate structure; and because a CSF requires energy and

[24] Because a community solar contract always lowers a subscriber's ENO bill, the community solar rate always generates an income or credit for customers, i.e., each addend is positive, i.e., decreases the total cost of electricity bills that are otherwise negative.

[25] Since the last two addends equals = $\sum \{w_i * n_i\}$, where w_i is the i^{th} MISO price of the month, n_i is the number of kWh sold in the i^{th} 5-minute period of the month, if we redefine CLEP5 for community solar to = $w_i * n_i$, as explained on line 20 of page 20, then we can return to CLEP = CLEPm + ∑CLEP5.

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 are sales to the utility, and the income from energy is the sum of the last two addends: [Cost-of-energy * #kWh] + ∑CLEP5.[26] Unlike the Community Solar Resolution approved by the Council's utility committee on December 13, 2018, when CLEP provides the remuneration, neither the energy's nor the power's economic values are predetermined by some external formula.[27] 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, CLEP community solar subscribers are paid for both energy and power as two separate valuations, similar to the final assertions of the Community Solar

[26] 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.

[27] 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:

<u>Total CSG (Community Solar Generator)</u> Capacity is Limited to no more than 5% of the utility's peak demand.

<u>A CSG per kWh credit will be based upon avoided capacity and energy costs</u>.

(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, based on avoided energy and avoided capacity costs. The primary difference is that the utility committee resolution values community solar prospectively, whereas CLEP values community solar after performance. But the underlying premise of 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 net energy metering (NEM) valuation proposal, which is otherwise the current industry standard.[28]

Q17: HOW DOES CLEP LOWER EVERYBODY'S RATES?

A: CLEP payments benefit non CLEP customers as follows:

1. Every money-saving CLEP transaction will include a 5% service charge collected by the utility. Thereafter, some part of that service charge can be distributed to all ENO customers, effectively lowering the average wholesale price of energy for the month. CLEPm can also lower the future cost-of-service.
2. CLEP5 transactions are expected to supply a net monthly benefit to non-CLEP customers. When the CLEP customer uses the CLEP5 opportunities to lower his/her ENO bill as intended – by buying kWhs when the wholesale price is lower than the

[28] ***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.

monthly average or selling electricity to ENO when the instantaneous wholesale price is higher than the monthly average price – ENO's average cost of electricity would be lower, and ENO would pass some of those savings to all customers. Furthermore, when a CLEP customer makes purchases or sales at the "wrong" times, the CLEP5 contribution to the CLEP customer will increase only that customer's ENO bill.

3. CLEPm transactions provide long-term benefits to non-CLEP customers that lower ENO's true cost-of-service to supply power; CLEPm does it with enhanced reliability and carries out 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.

   For example, demand charges are designed to compensate the utility and assign higher costs to the customers who have higher than average demand.[29] Residential customers have traditionally been "forgiven" demand charges but pay substantially more for energy in the "cost-of-service" part of their charge, compared to commercial customers. This practice may work out on average, but it unfairly lumps all residential customers together. Indeed, some commercial customers, like churches, have only a negligible amount of demand during typical utility peak hours but are charged in the same way as higher-demand commercial customers.

[29] "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

4. CLEP also provides some payback to customers who have invested in "green" technologies but have received no economic benefit. These technologies include electric vehicles, energy storage, electric batteries, and orchestrated energy management for homes and properties.

Q18: WHAT ARE SOME EXAMPLES OF KEY CLEP APPLICATIONS?[30]

A: This answer illustrates the potential costs and savings associated with using energy efficient products and processes in the CLEP rate environment.

1. With a $0 investment in labor and materials, by setting a standard, programmable **dishwasher** to always run 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).[31]
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 early in the morning, thereby saving a CLEP customer $150 a year.[32] Given that residential electric water heaters typically consume about 5000 kWh/year, the CLEP incomes

[30] 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
[31] The previous assertions were calculated by hand by this researcher in January 2019 and done prospectively before the CLEP_Dashboard was assembled in March 2019 and did the full calculation. Following that work, and using real MISO 2018 data, the calculated value was roughly $50/yr.
[32] "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

are approximately $100 from lower-priced wholesale electricity (via CLEP5), and $50 savings on demand (via CLEPm). The payback period is about 4 months.

3. A $300 investment (with rebates)[33] or $700 (without rebates) in labor and materials that comes with an app-controlled timer lets a customer install and control a **heat pump water heater** with a tank to always heat water early in the morning. This approach is a tremendous energy saver even before the extra savings from CLEP, because the water heater is eligible for a $400 rebate from the utility. Setting it to be always in heat pump mode saves more than 2/3 of the total kWh consumption, or roughly $372, and even more in demand. In addition to these energy efficiency savings, a CLEP customer can save an added $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. The payback period with rebates is less than a year either way, and with no rebate, less than 2 years either way; the payback is roughly 20% faster with CLEP.

4. With a $3000 investment in an ice-making air conditioner (AC),[34] a customer can always make ice early in the morning. Because the cooling (i.e., ice-making) is done at night, this equipment is roughly 10% to 20% more efficient than a standard AC (operating at 3.5 KW instead of 4.3 KW).[35] This is especially useful in the southeast

[33] 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 estimates the installation cost of this water heater as $150 because it assumes simple replacement of a standard electric water heater.

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

[35] "… 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/

US, where residential AC consumes 3 times as much as water heating.[36] A standard 3-ton AC consumes approximately 15,000 kWh/year. At a price of $0.11/kWh, an ice-making AC with a 20% savings in kWh will save 15,000*$0.11*0.20 = $330/year. But a much bigger savings will come with 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 (multiplying by 5 instead of 12 because CLEPm provides income only during the five peak cooling months of May through September). Thus, the annual CLEP income = CLEP5 + CLEPm = $240 + $800 = $1040. Note that without CLEP, the energy efficiency benefit is $330/year and requires a 9-year payback. But with both 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,[37] a customer can store approximately 360 kWh/month, or 4300 kWh/year. This battery size is appropriate,[38] 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 early hours in the morning when the battery is charging. In this way, the residual energy needs of the home when the battery is not 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

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[36] https://www.EIA.gov/consumption/residential/

[37] “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

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

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. But the CLEPm income is much larger. The battery's 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, and it accrues whether the residential customer chooses to sell the energy back to the utility or use it all to reduce the demand of the other home appliances. This income supports a fairly long 16-year payback period ($686 is approximately 1/16th the initial cost of the battery), but it may be a satisfactory investment for residential customers who value reliability highly at $500/year — as was the average case in Maryland in 2011.[39] If the customer places such a high value on reliability, the payback period is roughly a decade, which is consistent with the battery's warranty.

6. Assuming a community solar farm (CSF) capital investment at less than $1 per watt[40], amortized over 20 years, a community solar subscriber should be able to buy in at roughly $7/KW-month.[41] The National Renewable Energy Laboratory's PVWatts program predicts that a 1 KW solar panel optimally tilted and not shaded but sited in

[39] 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

[40] "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

[41] 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

New Orleans will have average production of about 5 kWh/day,[42] or approximately 1800 kWh/year. Because all this energy is produced in the daytime, the average wholesale price will be over $0.06, so the CLEP5 income will be at least $110/KW-year. To estimate the CLEPm income, if solar were 100% reliable, each KW would yield a payment of $50/month, or $250/year (multiplying by 5 instead of 12 because CLEPm provides income only during the five peak cooling months of May through September). However, the December 13, 2018, utility committee's Community Solar Resolution identified the expected "capacity factor" of a solar farm as 50%, so the CLEPm income would be half of $250/year, or $125/year. Thus, the Community Solar subscriber would pay 7 *12 = $84/year to **rent** 1 KW but would be paid CLEP income for one KW = CLEP5 + CLEPm = $110 + $125 = $235, resulting in a net annual income per KW of roughly $235 - $84 = $151, assuming that the CSF is paid the full CLEP value and that the subscriber rents one KW of the solar farm **at cost**.

Q19: HOW DOES CLEP INCREASE RELIABILITY AND RESILIENCE AT NEGATIVE COST?

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

1. By application of parts 2 through 5 of the answer to Q19, one can see that a 12-kWh battery installation can be both right-sized and a ***cost neutral*** investment for a

[42] https://PVWatts.NREL.gov/

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.[43, 44]

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, a battery purchase as part of a 1000-residence Battery Pilot would yield roughly 37% profit paid to the utility over the 10-year pilot program, but by the end of the pilot program, it would result 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. Unlike the analysis in Exhibit 1, which uses only a straight-line depreciation over 10 years and has no additional tax credit available, if a small business (e.g., a property owner indirectly profiting from energy flows at his tenants' residences) purchased the batteries, then two additional benefits appear possible:
   a) All depreciation can be taken in the first year, and
   b) Bonus depreciation could range from 30% to 100% of the first costs.

   Chapter 179 appears to apply to electricity storage because electricity is a primary product of petroleum. its importance is explained in Exhibit 2.
4. Building on part 1 of this answer but, unlike part 1, also using the CLEP income derived from all these investments, control of dishwashers, heat-pump water heaters, and ice-

[43] www.MontgomeryCountyMD.gov/OPI/Resources/Files/pdf/mc_pepco_survey_finding.pdf

[44] 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 in the answer to Q19.

making AC, the annual cash flows for CLEP and energy efficiency for these three appliances exceed $1525/year. Including earnings from the battery alone (about $658/year), 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).[45]

Q20: HOW DOES CLEP SUPPORT TINY MICROGRIDS THAT IMPROVE RESILIENCE?

A: Many kinds of microgrids supplied fair to great resilience during the grid failures of Hurricane Ida. Here, we discuss batteries and solar power, which can be cheaply, or even completely, “financed” by CLEP, as well as some thoughts on fossil fuels.

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[45] 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 Q19 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

Batteries: An outage should change the pattern of electricity consumption. When a battery is used during an outage, extended reliability should continue until roughly 20% of its energy is gone. After than comes resilience mode, in which non-critical loads, such as electric water heaters, TVs, and whole-home ducted AC equipment, should be shut off until power is restored. As the outage persists and the battery becomes depleted, increasingly non-essential loads should be shed to keep the most critical load – the refrigerator and AC (if needed to sustain life in the sick or elderly) – running as long as possible.

Solar: During an outage, traditional rooftop solar, combined with an onsite or nearby battery and inverter system, has worked. “To carry this forward, Feed The Second Line, a 501c3, wants to keep small, neighborhood restaurants operational in the wake of a major hurricane. Providing solar and batteries for restaurants enables them to become micro-grids in a post-hurricane environment. This allows each restaurant to become a feeding center, a cooling center, a phone-charging center, and avoids food waste. It is using its non-profit status to solicit financial contributions to fund small restaurants' needs for solar panels and inverters at around $80,000 each.”[46]

Together New Orleans is trying to do much the same by building roughly the same infrastructure, but instead centering on a church’s physical plant and tying neighboring homes and businesses to it.

Fossil-fueled (FF) generators: These deserve some mention in the context of New Orleans. Although they have worked, they provided highly mixed results: some caused

[46] Private email communication, June 30, 2022 from Devin De Wulf.

deaths from CO poisoning, some would not start, and some would not work long enough because of inadequate gasoline supply. Even when FF generators work, they are extremely inefficient, wasting 30 to 80% of the electricity generated. However, they have been useful both before and during an outage, and New Orleans has a recently refurbished underground natural gas delivery system that hasn't failed since Hurricane Katrina.[47]

Pertinent to this discussion, FF generators work well in a microgrid within a mixture of assets that at least includes a relatively small battery array of at least 20 kWh, and a 4 KW inverter.[48] This setup allowed a much higher percent of the power from a 7KW natural gas-powered generator to provide enough electricity to meet the needs of its neighbors. One tiny microgrid, consisting of a natural gas generator, a small battery/inverter, and a 2012 Nissan Leaf enabled transportation for 4 days when other vehicles were stalled without gasoline.

All these microgrid investments except the FF generator can be "completely financed" with CLEP. Resilient hookup, defined in the answer to the next question, can add more than enough electricity bill savings to pay for the connections between homes on the same city block.

The net effect is much more ability to withstand not only the major storms like Ida, but also the thousands of power outages New Orleans experiences in pleasant weather each year. CLEP contributes by improving the market for "green" products, including

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[47] https://www.entergy-neworleans.com/gas/

[48] https://www.serdp-estcp.org/Program-Areas/Installation-Energy-and-Water/Energy/Microgrids-and-Storage/EW19-5163#factsheet-34460-benefit, Oct 2020.

microgrids, and making strides toward ameliorating the causes of climate change, not just the symptoms.[49]

Q21: HOW CAN BEHIND-THE-METER INVESTMENTS GIVE CHEAPER AND BETTER RESILIENCE?

A: Resilient hookup (RH)[50] is part of ***Power+*** in the rate structure of Holy Cross Energy (HCE), a utility cooperative operating in Pitkin County, CO.[51] Customers receive a discount to connect to that grid in return for the right of the utility to shed that load with little to no notice. Power+ supplies guidance and discounted access to equipment to help the customer qualify for RH. It provides resilience against extreme weather and reduces the wholesale energy cost, providing a benefit to all customers.

Currently RH is not strictly performance-based, because HCE's bill credit also requires installation of a 4 KW, Tesla Powerwall 2, battery/inverter that starts out as a utility asset.[52] And there are two caveats: first, the utility's cash flow for this does not cover all costs – that is, the customer must also contribute; and second, the price-arbitrage employed to help cover the battery installation costs uses the NEM paradigm, which appears to create an adverse cross-subsidy[53] that requires low-income ratepayers to help pay for utility-bill discounts received by other, usually more affluent, customers – that is, HCE charges no cost-of-service payments for round-trip transactions. These

[49] That is a feature of the story in the video at this link: [CLEP Lowers Greenhouse Gas Emissions while Financially Benefiting all Ratepayers]
[50] Coined by Amory Lovins and mentioned in a series of email posts to the Electricity Brain Trust in 2020.
[51] "https://www.holycross.com/powerplus/
[52] Although, there is talk among industry insiders that HCE will upgrade RH to be purely performance based in a few years.
[53] https://www.bing.com/search?FORM=MQ03DF&q=cross+subsidy+meaning&PC=MQ03

caveats make Power+ inferior to CLEP's means to finance battery installations. Still, both approaches are laudable because they provide the added enhanced reliability only possible by on-site battery inverter systems.

ProRate Energy asserts that a pure performance-based RH should be in ENO's rate structure. It would provide roughly the same size monthly bill credit as HCE ($10/kW) without requiring purchase of any specific equipment, though the utility can still control remotely so the home's load can be shed without notice. HCE may not have considered that the capability for remote-control shedding is already a built-in feature of smart meters that allows a utility to shed load a meter at a time.[54] Unfortunately, ENO's distribution grid controller also apparently did not know this on Mardi Gras night 2020, because when faced with the need to shed 80 MW within ENO to help the grid with the cold spell that devasted Texas a year ago, many full feeders were shed without adequate regard for avoiding various critical loads.[55]

Such a performance-based RH and CLEP would be symbiotic because a customer of one is more easily equipped through the "financing" provided by the other.

A colleague and proponent of CLEP pointed out that utilities are run like emergency rooms, ready to roll out the MUST BE IMMEDIATELY REPAIRED tools on a moment's notice.[56] However, if instead of relying on emergency rooms, we all go to "urgent care"

[54] Private communication by Bobby Jeffers, PhD who worked at Sandia Labs, in 2020.
[55] City Council president wants to launch independent audit into Entergy New Orleans after 'cascade of failures' https://thelensnola.org/2021/03/16/city-council-president-wants-to-launch-independent-audit-into-entergy-new-orleans-after-cascade-of-failures/
[56] Private communication by Thor Olson regarding a problem ameliorated in Australia years ago.

facilities or wait half a day to see our physicians during unexpected but acute issues, the cost of medical care would greatly decrease. Similarly, for an electric utility in Australia, avoiding the “emergency room” scenario had a significant impact to lower the average cost of electricity and its delivery.

Each hurricane should be teaching New Orleans residents that no infrastructure is secure against the forces of nature and that each homeowner and resident of New Orleans therefore needs to become more self-reliant for both safety and economic reasons. It is clearly uneconomic to expect ENO or any utility to be more than 99% reliable. Expecting more is both extremely expensive and extremely unlikely. Overall, it is better to expect less and learn how to make up the difference with behind-the-meter technologies like those discussed here and aim for high resilience instead of reliability.

Q22: IN LIGHT OF SCOTUS’s JUNE 30th DECISION TO STRIP EPA’S ABILITY TO REGULATE CO2 POLLUTION, HOW CAN WE RAPIDLY CLEAN UP OUR CLIMATE WITHOUT THAT TOOL?

A. RethinkX’s December 2021[57] report on reducing the carbon footprint in the utility sector produced a variety of assertions, including that we can get to a 100% carbon-free 2030 utility sector for less than $10 trillion in the US. But in the course of that analysis, the authors invented the term “super power” to mean the extra electricity generated beyond the needs of our country because the authors recognizes that THE MINIMUM investment in solar, wind and batteries needed to reach this goal produced more electricity than needed to get to a zero carbon footprint. Consequently, this energy had

[57] https://rethinkdisruption.com/how-to-achieve-rapid-cheap-energy-decarbonization-using-the-rethinkx-clean-energy-u-curve/

no market and thus would sell in the wholesale markets of the US at $0/kWh or perhaps less. Thus, super power (called superpower hereafter), has both a zero carbon footprint and zero economic value.

Via CLEP5, ProRate ratepayers are incentivized to buy wholesale electricity at the lowest wholesale price. I assert that there is already considerable evidence that lower priced electricity is generally lower in CO2 per kWh. The video referenced in this sentence explains how CLEP encourages the purchases of superpower and through that an intended side-effect of that effort: lowering the carbon footprint of the utility sector; namely, ProRate uses the marketplace to address climate change.[58]

Q23: WHAT DOES IT COST TO ROLL OUT AND/OR ADMINISTER ProRate?

On PRE's request, this communication was received on July 1, 2022.

Science Tools Corporation (ST), a C corporation, last year partnered with several other firms in a proposal to the U.S. Department of Energy (DOE) Connected Communities Funding Opportunity in proposing a pilot in New Orleans for implementation of ProRate. 59 ST was the organization designated to actually implement the ProRate rate design. ST is presently working on a new pilot proposal for the City but has not yet given a firm price estimate because planning is on-going. However, it is worth noting that last year's DoE application was endorsed by New Orleans's Mayor, Council President and the leadership of the Sewerage and Water Board.

[58] https://www.youtube.com/watch?v=zIfG5C9CyIs&feature=em-share_video_user
[59] https://1drv.ms/w/s!ArWcMIBqpfbViqoWKcx5Zbq4O6LOTA?e=fxdxft

In response to PRE's request for information needed to meet the requirements of the UD-21-03 docket, ST asserts that three different bundles of costs should be considered: (1) a pilot; (2) the core implementation of the rate design sufficiently suitable for implementation in any regime; and (3) a "full production implementation."

1. ST is not yet prepared to precisely estimate the cost of a pilot for the UD-21-03 docket because a pilot should include the installation of electric batteries to help promptly report and measure the effectiveness of the ProRate rate design, along with many other costs. Last year's proposal to DoE was also a pilot, but that submission included many things that arguably it should not have and also did not include things that DOE and ST thought were required. Still, the numbers generated in the DOE submission are in the right ballpark (total, including private and DOE funding about $17M) for a pilot of that size.

2. ST's conception of a cost estimate for "the core implementation" of this rate design considers only the core technology; this is estimated to be between $4 and $6 million.

   However, that estimate may be too low because the meter manufacturer ENO chose has not been adequately forthcoming in response to ST's data requests because it doesn't consider ST its customer and thus refuses to disclose all the capabilities of its meters in sufficient detail. Simply, knowing the meter's capabilities is vital to ensuring an accurate cost estimate.

If the meters that, ENO has installed provide monthly data, that contain 5-minute or at worst 15-minute interval resolution per meter, then there's no problem or extra cost. Otherwise, additional hardware must be installed at the meters. That approach would communicate via WiFi and the implementation costs would increase by an initial cost in the neighborhood of $50 to $100 per meter, with an on-going cost to support the additional hardware over time.

It should be noted that ENO may not presently be prepared to read the meters at this temporal resolution and volume. In that case, ENO is expected to ask to recoup the expense for making such adjustments in their operating procedures. If so, ST recommends that the Council put that cost out for bid rather than accept ENO's estimate because this happens to be an area of expertise for ST and states, "Surely ENO itself cannot do this, and it's unlikely ENO would hire-out for this at a price that is less than we [ST] would do it."

3. The estimate for the core implementation includes a modern, secure interface to ENO's billing and customer service systems; however, for a full "production implementation", in depth cooperation with ENO is required and recommended. Again, ST has both the needed expertise and the technology, but ENO’s existing informatics can be well or badly done. In the latter case, based on decades of experience, ST believes it can likely help ENO perform a full implementation with robust customer support services, for less than $10M.

APPENDIX A: A FULL EXPLANATION OF CLEPm

CLEPm is a cashflow that supplies a utility bill credit or charge for providing or demanding power at the near same times that the utility experiences it annual peak demand, respectively.

a. The target size of CLEPm, chosen to minimize cross-subsidies) is to generate an annual cashflow equal 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 $/KW-year. Heretofore, ENO has always charged for a non-residential customer's peak demand, once a month, at a fixed cost-of-service rate dependent only upon the highest measured (15-minute peak) number of KW demanded that month. "$/KW-year" means twelve times the average 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. For the rest of this discussion, that value is assumed to be $10/KW-m.[60]

[60] $10/KW-m appears to be the US national average demand charge. If the $10 value chosen matches the utility receiving CLEP's average demand charge, then for all intents and purchases, CLEPm does not cause a cross-subsidy between customers and is thereby right-sized.

b. CLEPm generates an income or expense only during near peak utility demand (NPD) times.[61] Demanding or supplying power outside of these times has no effect on CLEPm; in other words, CLEPm = 0 outside of these months and demand during these months, and time periods outside of the NPD days and hours are irrelevant to the calculation of CLEPm. CLEPm is paid monthly during the five months May through September, on weekdays and between 2 PM and 7 PM and is directly proportional to the average demand or supply of power by/for that customer during the roughly 105 to 120 NPD hours of that month. The number of CLEPm hours/month ~= (5 hours / day) * (5 days / week) * (4.25 weeks/month). CLEPm is charged/paid only five times a year. Because CLEPm is derived from a kind of 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 the months and times of highest demand noted above, 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 expected change in the designated NPD hours could come from the increase in utility-

[61] 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.

owned rooftop and community solar power in New Orleans — which may have effects like those currently observed in southern California. In fact, solar power is in such high supply in southern California at 10 AM that on many days, the wholesale price at that time is nearly zero. Similarly, the aggregated customer demand minus customer-supplied power curve in California has been causing a substantial decline in the need for utility-supplied power in the afternoon to less than half of what had been common heretofore, and then very rapidly rises as the sun sets.[62]

c. In a cooling-dominated climate, the monthly average demand (kW) measured the old way, namely for the highest 15 minutes of demand in a month, is roughly twice or more the average demand (in KW) measured every five minutes. This is because properly sized air conditioners normally run around 20 minutes an hour. Such equipment will see more than twice as much demand if usage is sampled only during the 15-minute monthly peaks, instead of averaging demand measured every 5 minutes during summer afternoons. Let D_A = the actual average demand during the NPD times for one month. Assuming this is not a home, and using the above assumptions, CLEPm is more than two times \$120/5 times D_A, which is negligibly different from CLEP = \$50 x D_A.

d. The size of CLEPm for any home is defined by use of a “reference demand,” defined below, that depends on the home’s age and other factors. Much like an energy rating as defined by RESNET, a home is considered more energy efficient

[62] Duck curve - Wikipedia

and then gets a better rating only by comparison to ***its*** reference home.[63] The reference home is defined to be one that is built on the same land; is minimally code compliant according to the building codes of the date the subject home was constructed; and has (as much as reasonably practicable) the same floorplan, ceiling heights, fenestration (window sizes and orientations) and "standard" occupancy. Using software much like that created for RESNET, a home's ***reference demand*** can be calculated to in any month to be the demand its reference home would have had during the same month. Let d_A be the actually-experienced average demand during NPD times of the subject home and d_R is the reference demand for that month. ThenCLEPm is proportional to $d_A - d_R$ or, using the assumptions and conclusions of the previous paragraph, CLEPm = $(d_A - d_R)$ * $50. Non-residential customers have reference demand set equal to 0. Note that older homes have higher reference demands than younger homes and therefore pay lower demand charges. Similarly, all homes have higher reference demands than non-residential buildings and similarly pay lower demand charges. Reference demand is used only for demand CHARGES but never for "negative demand" payments. That is, when any customer provides power to the grid or demands less power than that home's reference demand, that power generates

[63] "The reference home is the geometric twin of the rated home, configured to a standard set of thermal performance characteristics, from which the energy budget, that is the basis for comparison, is derived." Basically, the Reference Home is the same size and shape as the rated home and is also in the same location and IECC climate zone. The inputs for insulation R-values, window U-values, HVAC system efficiency, and similar factors are defined in the HERS Standards but are close to what's in the 2006 IECC. Everything You Ever Wanted to Know about the HERS Index - Energy Vanguard

remuneration by the utility valued at the same $/KW whether it comes from a commercial or residential customer, or an older or newer home.

e. Is setting reference demand greater than zero for any building fair, equitable, or wrong because it creates a cross-subsidy, or good because it lowers carbon footprint? And if so, do the burdens – associated with the complexity of its implementation and the rates -- exceed these benefits? Note:

1) Older homes are 30% less efficient,[64] so they would be more significantly burdened by CLEPm than newer homes; thus, CLEPm is more apt to deter the occupants of older homes from choosing CLEP. The resolution of this burden begins by recognizing that this burden is only experienced before retrofits made to exploit CLEP are installed; once installed, because of a large reference demand, the benefits arrive with a lower threshold drop in KW in older homes but come just as strongly past that threshold for older or newer homes or commercial buildings.

2) Because older homes are 30% less efficient, they have a larger carbon footprint and are more in need of CLEP benefits. Similarly, from Earth's point of view -- to slow climate change – occupants of older homes should choose CLEP, and the whole purpose of the reference demand paradigm was to help overcome this hurdle.

[64] https://www.eia.gov/todayinenergy/detail.php?id=9951

3) Older homes are often where tenants live. Thus, tenants who choose CLEP can often get a greater than zero reference demand, thus providing some equity in terms of gaining more than average access to lower energy bills.
4) Is deploying a reference demand greater than zero fair? This is much like the conundrum of whether it was fair to allow net energy metering a few decades ago. Although few may have thought about the cross-subsidy issue twice explained about NEM elsewhere in this testimony, many regulatory jurisdictions still keep NEM nevertheless because of its other benefits. For example, New Orleans still uses NEM, even though the Louisiana Public Service Commission has abandoned it.
5) Do reference demands greater than zero create cross-subsidies? The issue is strongly related to: (a) Is there is a cross subsidy? and (b) Who pays the subsidy? This is kind of like the questions, Does our society want to have historic homes? and What costs and benefits do they provide?[65] If we don't try to preserve our older homes, we will have to build more new ones, putting even greater stresses on our environment and economy. So, based upon Congress's decision to subsidize historic housing, if there is subsidy, it is in the right place.

[65] https://portal.ct.gov/DECD/Content/Historic-Preservation/02_Review_Funding_Opportunities/Tax-Credits/Historic-Homes-Rehabilitation-Tax-Credit/Program-Standards-for-Rehabilitation Clearly our government values old home.

APPENDIX B: HOW CAN CLEP BE IMPLEMENTED AS A VARIABLE PEAK PRICING RATE DESIGN?

This section explains that CLEP added to constant priced electricity produces a novel Variable Peak Pricing (VPP) rate design;[66,67]

CLEP is a VPP because it has both a novel Time-of Use (TOU) part and a novel Real Time Pricing (RTP) part.

1. CLEPm is like the most common kind of TOU rate: it increases the price of a kWh by a constant amount throughout the NPD hours of the year.[68]
2. CLEP5 plus the fixed price for electricity set by ENO's rates equals an RTP rate design.

However, CLEP is a bit more sophisticated than any other VPP in these ways:

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[66] “

- **Time-of-use pricing (TOU)** — typically applies to usage over broad blocks of hours (e.g., on-peak=6 hours for summer weekday afternoon; off-peak = all other hours in the summer months) where the price for each period is predetermined and constant.
- **Real-time pricing (RTP)** — pricing rates generally apply to usage on an hourly basis.
- **Variable Peak Pricing (VPP)** — a hybrid of time-of-use and real-time pricing where the different periods for pricing are defined in advance (e.g., on-peak=6 hours for summer weekday afternoon; off-peak = all other hours in the summer months), but the price established for the on-peak period varies by utility and market conditions.”

https://www.smartgrid.gov/recovery_act/time_based_rate_programs.html

[67] “Given these advances, the tariffs of tomorrow are likely to consist of three parts corresponding to the three elements that comprise electricity costs: a fixed monthly charge, a time-varying energy charge, and a demand charge. The fixed charge (sometimes referred to as a customer charge, service charge, or facilities charge) is expressed in dollars per month. It reflects the costs of servicing the customer, such as billing, metering, and customer service. The time-varying energy charge, expressed in U.S. dollars per kilowatt-hour, recovers energy costs, either in the form of a simple time-of-use (TOU), critical peak pricing (CPP), variable peak pricing (VPP), or real-time pricing (RTP) rate.

- A simple TOU rate defines peak periods during which prices are higher than in off-peak periods and is currently the most common form of time-varying rate. …
- RTP are considered purer forms of dynamic pricing in that they are based on actual market conditions and thereby a better signal of customer changes in the utility's costs.”

https://magazine.ieee-pes.org/wp-content/uploads/sites/50/2020/05/PE_MayJun_Faruqui.pdf

[68] CLEPm raises the price of electricity during the roughly 500 hours in a year which are most likely to be the peak hours of the utility. Presumed at first for New Orleans, to be weekdays, between 2 and 7 PM, May through Sept.

CLEPm charges every customer 50¢/kWh for purchases during NPD times and zero at other times; the novel ideas are: i) CLEPm pays for *delivered* electricity at the same rate, and ii) unlike all other customers, homes are given a credit against this charge that increases with the age of the home — so that for the same consumption (or production) during NPD times of these four kinds of customers will incur different charges or credits.[69]

CLEP5 is the 5-minute, marginal wholesale price; marginal means compared to the weighted average wholesale price the utility pays for electricity from the wholesale market.[70]

HOW IS CLEP A VPP?

The actual formula that defines the CLEPm payment/charge (payment if >0 and charge if <0) is:

CLEPm payment/charge is given by: CLEPm = $\mathbf{q} * \$50/kW * (\mathbf{d}_R - \mathbf{d}_A)$,

for any month within NPD where there are roughly 100 NPD hours in a month.

$\mathbf{d}_R$ = Reference Demand for a Home AND $\mathbf{d}_A$ = Actual Demand during NPD.

Only homes have non-zero $\mathbf{d}_R$, and older homes have larger $\mathbf{d}_R$ than newer homes.

For simplicity, since the number of NPD hours in a month are always a bit more than 100, we will assume it is exactly 100, but in practice the number of NPD hours may be as many as 110.

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[69] Given the same net consumption during the peak hours of any month, depending on the age of the home when it was new, the resident could be “charged” a CLEPm $.50/kWh ***electric bill decrease*** if the home is 50 years old and a charged a CLEPm $.25/kWh price increase if the home is new; the CLEPm charge could be $.50/kWh for a business and payment for sales or production to the grid by this same $.50/kWh amount. See a full worked out example on the next page.

[70] Assume that the weighted-average price ENO pays MISO for electricity is $0.03, and during some 5-minute period, the MISO price at the New Orleans node is $0.04. This means the marginal price is $0.01 at that time and CLEP5 would be $0.01. When the MISO Price is $0.01, CLEP5 would be -$0.02 for a kWh purchased during that time.

And we will assume that **q** = 1, but in practice **q** = near 95%.

In the following examples, all four customers use (or alternatively produce) 100 kWh during the 100 NPD hours of this month. This means that average demand (or production) is 1 kW.

1. By definition of CLEPm, a business has a 0.0 kW reference demand, and

CLEPm = 1*$50/kW*(0.0 kW – 1 kW) = -$50.

Because the number of hours used to observe average demand was 100, the average charge /kWh = $50/(100 hours) = $.5/hour; during that time the average wattage was 1 kW which is equivalent to $.50/kWh. So, the customer will be charged 50¢/kWh for purchases during NPD.

CLEPm = 1*$50/kW*(0.0 kW – 1 kW) = [$50/kW*0.5 kW] - [$50/kW*1 kW] = $0 - $50. thus

A business starts with $0 credit and is charged for purchases and paid for sales @ 50¢/kWh.

2. Let us assume that an older home has a 2 kW reference demand, then

CLEPm = 1*$50/kW*(2 kW – 1 kW) = [$50/kW*2 kW] - [$50/kW*1 kW] = $100 - $50. thus

A home with 2 KW reference demand can earn as much as a $100 credit against CLEPm charges[71] and is charged @ 50¢/kWh for purchases during NPD hours in excess of $100/m and paid for lower consumption than $100/m at the rate of 50¢/kWh.

3. Let's assume that a new home has a 0.5 kW reference demand.

Then CLEPm = 1*$50/kW*(0.5 kW – 1 kW) = -$25.

[71] What is meant by "A home with 2 KW reference demand can earn as much as $100 credit against CLEPm charges" is explained at the end of this section.

CLEPm = 1*$50/kW*(0.5 kW – 1 kW) = [$50/kW*0.5 kW] - [$50/kW*1 kW] = $25 - $50. thus

<u>A home with 0.5 KW reference demand starts with $25 credit</u> <u>against CLEPm charges</u> and is charged @ 50¢/kWh for purchases during NPD hours in excess of $25/m and paid for lower consumption than $25/m at the rate of 50¢/kWh.

4. By definition, a solar farm has a 0.0 kW reference demand and this month's consumption was a negative 1 kW and **q** = 1. Then CLEPm = 1*$50/kW*(0.0 kW – [-1 kW]) = $50. thus

<u>A solar farm starts with $0 credit</u> and gets paid @ 50¢/kWh for its production during NPD.

What does "A home with 2 kW reference demand can earn as much as $100 credit against CLEPm charges" mean?

- 2 & 3 explain how reference demand determines the maximum bill credit.
- A customer can earn a future bill credit by comparing current to past performance by:

A baseline demand is established using a previous year's CLEPm charges that demonstrate X kW of average demand during the NPD hours of that year. Let Y be the average demand in the last billing month of this cooling season's NPD hours, and Z be the home's reference demand, then the bill credit for the next month will be based upon the smaller of Z kW and (X – Y) kW.

A specific example is Z = 2, X = 4, and Y =2.5. In that case, notice that X-Y < Z so that means X-Y determines the bill credit, i.e., 1.5 kW determines the bill credit size = $75 for next month.

The first baseline is good for 5 years. Thereafter it is set at the average demand over the previous two years.

Exhibit 1: CLEP BATTERY PILOT AS PROPOSED IN THE 2015 ENO IRP

The details of the CLEP battery pilot project proposed in 2015 are provided on the next two pages.

Exhibit 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 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 2: IRS Chapter 179 May help 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 property owner to indirectly profit from energy flows happening at the residences of his tenants), then two benefits are possible:

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

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

See the sections highlighted with yellow background for a more detailed discussion of depreciation.

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[72]

The Tax Cuts and Jobs Act of 2017 (also known as 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." 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.

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.

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

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 Section 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 for which a tax professional may be helpful.

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, see the IRS instructions for completing this form.

2018 Instructions for Form 4562[73]

Section 179 property is property that you acquire by purchase for use in the active conduct of your trade or business:

- 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

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

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.

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

Exhibit 2: IRS Chapter 179 May Provide for a Negative Cost for a Battery Purchase

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…