BEFORE THE
COUNCIL OF THE CITY OF NEW ORLEANS

EXAMINATION OF OPPORTUNITIES
RELATED TO RENEWABLE ENERGY TECHNOLOGIES

DOCKET NO. UD-13-02

COMMENTS ON ENTERGY'S INITIAL REPORT AND SUGGESTED TOPICS
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INTRODUCTION

Solar Energy [SE] is most commonly exploited using solar panels that convert sunlight directly into electricity—called photovoltaics [PV]. BSI believes that whether the Council or ENO encourage or discourage PV in NO, PV installations will continue to increase in NO. PV can have positive effects on all of the following: the city's economy, ENO's profitability, cost of electricity to PV owners and non-PV-owners, causes of global warming, and employment. However, the chance of all of those benefits to happen, much less optimally, depends upon the Council's leadership to make the best decisions. This memorandum makes the following assertions:

1) SE is indispensable for a renewable energy future and the long-term future of New Orleans.*
2) Today, PV produces 1% of both US and NO's electricity and could/should produce 25% by 2020.*
3) PV is unnecessarily and inappropriately impeded.*
4) Although, community solar is preferable to rooftop solar because it taps into 10 times as much available demand for PV and allows PV installs at less than one half the cost, its economic model has come under attack because it is seen by some to be unfair to non-participants who cannot afford to participate.*
5) PV provides more value to the utility and city than the utility pays for Net Energy Metering.*
6) NEM looks like a subsidy to PV owners by non-PV owners because NEM uses the grid as a battery and it appears that NEM customers do not pay their fair share for grid-reliability.*
7) NEM does nothing to facilitate wind power, demand response, electric vehicles, energy-efficiency, performance-based incentives for innovation outside of PV design, or provide a market based means to incent electricity consumption when wholesale prices are low.
8) NEM does not solve the two critical problems of grid defection.*
9) Because of their demand charges and low kWh charges, NEM does not adequately compensate commercial customers.*
10) NEM does not compensate battery installations which themselves provide a wealth of benefits.*

and

11) The use of a dynamic time-of-use pricing tariff named "Customer Lowered Electricity Price, [CLEP]" ameliorates or solves the problems posed by the last eight [*] assertions.

DISCUSSION

1) SE is indispensable for a renewable energy future and the long-term future of New Orleans.

Sustainability Requires Solar Energy

"Within our lifetimes, [global] energy consumption will increase at least two-fold, from our current burn rate of 12.8 TW to 28 – 35 TW by 2050 (TW = 10^{12} watts). This additional energy needed, over the current 12.8 TW energy base, is simply not attainable from long discussed sources – these include nuclear, biomass, wind, geothermal and hydroelectric." … "Sunlight is by far the most abundant global carbon-neutral energy resource." Daniel G. Nocera, MIT.[1]

Only a renewable energy future can stop sea-level rise and protect New Orleans.

2) Today, PV produces 1% of both US and NO's electricity and could/should produce 25% by 2020.

PV's U.S. installed base (in MW) is expanding exponentially (doubling every year). Although during 2010-2013, the US PV installed base only increased by about 75%/year, grid side PV has increased by 160% per year each year on average since 2007.[2] Consumer side and grid side PV more than doubled in 2015, with the rate of growth on the consumer side eclipsing the grid side, perhaps for the first year since records have been kept. For the next five years, the IRS will continue to support PV with the Investment Tax Credit [ITC] at 30% of investment cost. Currently, PV accounts for just under 1% of US electricity production and if the past trends predict the future, in less than 5 years, i.e., by the end of 2020, PV could easily produce 25% of all US electricity. Because of a confluence of favorable factors: Louisiana's 50% residential solar tax credit; ITC; and NO's unlimited net metering rules, 36 MW of rooftop PV was installed in NO since Hurricane Katrina—about 4% of ENO's current total capacity. According to ENO's 2015 Draft IRP, only 25% of PV capacity can be expected to produce valuable electricity, so the 4% of capacity (MW) turns into about 1% of net generation (kWh). But, in consideration of the overall US statistics, even without any LA tax credit, 25% PV by 2021 can and should be planned for in New Orleans.

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[1] Slide 82 of [http://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf].

[2] Note $16^{(2.6*7)} = 15250$. [http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_01_a] In 2014 grid side PV, at just over 15 GW together with customer side PV of just under 10 GW was about 0.4% of US's total electricity production; grid side PV growth slowed to about 100%/year in 2015; and consumer side PV growth in 2015 was about 130%. [https://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3] Together, at the end of 2015 there is more than twice as much installed PV in the US than there was at the end of 2014, i.e., over 50 GW, (compared to less than 25 GW in 2014), i.e., over 0.8% of total US production. If this trend, doubling every year, were to continue for the next five years, PV would account for 50 GWH $*2^5$ = 50 GWH * 32 = 1.6 TWH, or 25% of US annual electricity production.

3) PV is unnecessarily and inappropriately impeded.

It is generally believed that once PV penetration hits a magic number in the range of 0.5% to 5% of total production sources of a utility, the utility will suffer economic damage by PV. However, this is not true or borne out by U.S. DOE studies; the right number is at least 10% and this can be raised to over 30% if the utility's generation pool is composed of a large numbers of small generators instead of small number of large generators.[3]

4) Although, community solar is preferable to rooftop solar because it taps into 10 times as much available demand for PV and allows PV installs at less than one half the cost, its economic model has come under attack because it seems by some to be unfair to non-participants who cannot afford to participate.[4]

Rooftop solar is not a good option for roughly 70% of buildings nationally and around 90% of buildings in New Orleans.[5]

Compare PV installation cost at a solar farm at $1.25/W to rooftop at over $3/W.

5) PV provides more value to the utility and city than the utility pays for Net Energy Metering.

The United States Congress recognizes the value of SE and PV, and that is why the 30% ITC was recently renewed. The German government also recognizes the value of SE and PV and that is why it has provided a feed-in tariff of over $0.50 / kWh for more than a decade.

The State of Maine also recognizes the value of PV because—despite Maine's $0.13/kWh retail price—a 2014 committee of their legislature determined that $0.33/kWh is the "Value of Solar" when all clear economic and societal costs are considered. The problem that Maine is currently grappling with is: How to provide as much benefit up to $0.33/kWh without "subsidizing one set of customers against another"? [6]

Jon Wellinghoff, past chairman of FERC likewise knows the value of SE because he explained CPUC's PV published value of 103% of retail. (These figures do not include any general societal, or environmental benefits.) He pointed out that PV's effect results in only a 3% net benefit because costs normally (and inappropriately) assigned to residential and commercial customers are 30% too high and NEM avoids much of this imbalance.[7]

> 'Cost-shifting' and 'not paying your fair share' are not the same thing. For example,
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> "In 2013, the California Public Utilities Commission (CPUC) published a study that projected a cost shift of $1.1 billion per year by 2020 due to NEM policy. NEM critics, including the

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[3] See slides, 83 through 91, of [http://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf].

[4] See explanations provided in BSI's Intervention into ENO's 2015 IRP, on pages: 38 & 39.

[5] BSI's Intervention regarding ENO's 2015 Draft IRP, page 29.

[6] [http://www.utilitydive.com/news/maine-lawmakers-propose-groundbreaking-way-out-of-net-metering-wars/400074/]

[7] [http://www.utilitydive.com/news/wellinghoff-and-tong-a-common-confusion-over-net-metering-is-undermining-u/355388/]

American Legislative Council (ALEC), Americans for Prosperity, and even some academics cited the study as proof that NEM customers were not paying their fair share. So they pushed harder for fixed fees for NEM customers, a policy that various states, including Wisconsin, Arizona, Kansas, and Oklahoma, have since either explored or enacted.

"The final report found California NEM customers were paying 103% of the full cost of service. One only need look to a study commissioned by the neutral Nevada Public Utility Commission that shows NEM customers provide a net present value benefit of $36M to non-NEM customers in Nevada. But critics (as well as NEM advocates) overlooked that the same CPUC report also found that NEM customers as a whole "appear to be paying slightly more than their full cost of service"—103% of their costs, to be precise. In other words, NEM customers were not zeroing out their bills and "free-riding:" on average, they were paying more to utilities in fixed-cost recovery than non-NEM customers.

…

"According to the CPUC study, before going solar, all NEM customers (commercial and residential) had paid 133% of their full cost of service. The residential segment alone paid 154% of its cost. By going solar, NEM customers were mitigating or reversing the subsidies they had traditionally been paying to support the grid. This is the crux of what is called cost-shifting.

"Cost-shifting should not be ignored. But the focus on NEM customers dangerously obscures more critical problems with the utility model, namely slowing demand, escalating costs, and disruptive innovations. In such an environment, any technology that reduces sales of electrons will challenge traditional practices of cross-subsidization."

6) **NEM looks like a subsidy to PV owners by non-PV owners because NEM uses the grid as a battery and it appears that NEM customers do not pay their fair share for grid-reliability.***

Despite the previous discussion based upon numerous analyses, that NEM pays more than its fair share, it is nonetheless quite true that NEM allows a PV owner to use the grid as a battery "for free" and even enjoy all of the reliability provided to non-PV owners at "apparently" much less contribution to maintaining the grid. This appearance of inequity plagues the industry and invites criticism with the eventual assertion that although NEM made sense at the onset, i.e., to jump-start a new technology, but after a few years to a decade, it is high time for NEM customers to pay their fair share. Most people will tend to think it is time to transition from NEM to a new and better payment system that resolves these concerns.

7) **NEM does nothing to facilitate wind power, demand response, electric vehicles, energy efficiency, performance-based incentives for innovation outside of PV design, or provide a market-based means to incent electricity consumption when wholesale prices are low.**

It is quite true that NEM is quite literally, narrowly focused upon finding a way to encourage PV installations owned by consumers and usually sited at their buildings. However, there are numerous other problems of utility design (as described in the assertion) which then become opportunities that one can imagine can be fixed or at least ameliorated by an alternative pricing scheme to NEM. For example, as good as NEM it, it can actually impede "classical energy efficiency" because a home that has more than adequate to almost adequate PV to completely avoid any energy purchases will have no incentive to even change to LED lighting. Wind energy can actually be much cheaper to install than PV but NEM does nothing to improve the economics of wind if that generator is located remotely from the home. Moreover, since the wholesale price of electricity often varies at ratios to 8 to 1 while the retail price is fixed, retail customers are inappropriately isolated from the opportunity to lower their cost of service and thereby innovate even better solutions.

8) NEM does not solve the two critical problems of grid defection.

A big problem in PV economics is grid defection which can happen when PV and battery quality go up and their purchase prices go down. In that case, customers have in the past and will tend to choose more and more to no longer buy electricity from the grid.[8]

- A considerable number of utility customers will likely see conditions favorable to defection economics within 10 years.
- Utilities will likely experience significant revenue decay before defection.
- The likelihood of conditions favorable to long-term customer defection signals the eventual demise of traditional utility regulatory models.

Grid defection also greatly increases the environmental footprint of homes. This is because a home with all of the PV and batteries necessary to reliably function off-grid must have excess generation capacity and energy storage needed to ride out the inevitable cloudy week. At other times, which are far more common, the surplus electricity generated will not be consumed at that home and will simply be wasted. If the same home were on the grid, that excess PV energy would displace some fossil fuel generation needed for nearby homes still on the grid. Moreover, the same batteries can be used to provide valuable services to the grid and move renewable energy generated by other sources (such as wind power) to peak hours. Therefore keeping the same home on the grid decreases its environmental footprint and lowers the cost of electricity to its neighbors. NEM does not provide a big enough payback to homeowners to clearly encourage them to make the better choice: stay on the grid.

9) Because of their demand charges and low kWh charges, NEM does not adequately compensate commercial customers.

Because NEM only pays for energy and does not compensate for drops in demand, commercial customers see less incentive to install PV.

[8] [http://www.rmi.org/electricity_grid_defection]

10) NEM does not compensate battery installations which themselves provide a wealth of benefits.

Batteries can solve a wealth of problems including problems caused by PV and problems unrelated to PV.

- As PV penetrations increase so does the need for spinning reserves to accommodate their rapid drops in supply which grossly degrades the net energy produced by PV.[9]

- Batteries move PV-generated electricity from 10 AM when PV supply can easily outstrip demand to 4 PM when this is far less likely.

- Batteries can provide essential services when the inevitable storm event arises and grossly improve outlet reliability.[10]

- Batteries can provide lucrative Frequency Regulation services that can be expected to generate $5/day for battery systems as small as 20 kWh.[11]

- Batteries can provide price arbitrage: buying cheap overnight electricity and selling 80% back to the grid at 4 PM with a price ratio commonly as high as 8 to 1 in September.[12]

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[9] See Bialek's explanation with the "Duck" curve, slide 88 of [http://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf].

[10] See slides 28, 29 & 39 of [http://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf].

[11] See slide 36 of [http://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf].

[12] See slides 47 and 49 of [http://www.eeba.org/Data/Sites/1/conference/2014/presentations/Katz-Inverted-Demand-Compliant-Construction.pdf].

11) Customer Lowered Electricity Price [CLEP] ameliorates or solves the problems posed by the last eight assertions.[13]

Customer Lowered Energy Price [CLEP] is an optional additional economic relationship (tariff) between a utility customer and his electricity utility. CLEP does not replace the retail rate or customer class which determines the cost of each kWh or monthly kW charge (if a commercial customer). CLEP payments (or charges when CELP is negative) are in addition to the monthly bill and accrue two ways: 1) every 5 minutes according to $CELP_5$'s formula: electricity purchases (i.e., in-coming electricity to the customer) or sales (i.e., out-going electricity from the customer) provide for an additional economic flow governed by the sum of energy flows for each 5-minute period and 2) every month according to $CELP_m$'s formula which pays $25 per month for each peak kW avoided. Thus, the complete formula is as follows:

A monthly CLEP payment = $CLEP_5$ (summed over a month) + $CLEP_m$

The $CLEP_5$ (summed over a month) is for energy flows; for each (ISO preset) 5-minute period:

$$CLEP_5 = p * n * (w - e),$$

where:

p = utility regulator determined, but arbitrarily chosen, "percent" where $0 < p < 2$.

n = during each ISO preset, 5-minute period, n is the number of kWh purchased by the customer; when the net electricity flow is outbound (i.e., sale) during that period, n is negative,

w = the more advantageous, real-time, marginal, wholesale cost of power between that experienced by the utility from its internal sources or available for purchase by the utility from external sources, and

e = utility bill published, monthly-average, marginal, cost of energy, a.k.a. fuel cost adjustment.

Notes:

1) For Entergy, ISO means MISO; for a utility in Maryland, ISO means PJM, etc. All ISO's designate the 5-minute time periods as starting on the hour or after any multiple of 5-minutes thereafter. If **w** were defined to be the ISO, real time, 5-minute price of electricity, during most months of any year, the average value of w over a month should be only slightly higher than e. When the utility's marginal cost of electricity is different than the ISO price, a CLEP purchase uses the lower price; a CLEP sale uses the higher price.

[13] See: [https://www.facebook.com/Customer-Lowered-Electricity-Price-CLEP-968877309871636/].

2) Because $CLEP_5$ is calculated 12 times an hour, a monthly aggregation of $CLEP_5$ payment to a customer is the sum of roughly 12 x 24 x 30 such addends.

3) A "standard", monthly electric bill is well approximated by N * Price/kWh = N * (s + e), where s is the average "cost of service" and e is last month's average marginal cost of electricity (whether generated by the utility or purchased from the wholesale marketplace) and N is the sum of the n's for each of the 12x24x30, 5-minute time periods corresponding to a monthly bill.

4) When p = 1, CLEP measures the "benefit" of an off-peak electricity purchase (or an on-peak electricity sale). If p < 1, CLEP is shared with customers who are not a party to the kWh purchase by the CLEP customer: non CLEP customers receive their benefit the next time e is calculated because e is lowered by every positive CLEP transaction. HENCE the name: CLEP; such transactions lower the cost and thus the price of electricity for all customers during the next month. One can posit reasons why a regulator may want to set p = 2 at first and then let p slowly decline to around 90% over 5 years. However, BSI thinks that p = 95% maybe the best, long-term choice for p.

The CLEP peak demand payment is:

$$CLEP_m = p * \$25 * \mathbf{d}$$

where **d** = number of peak kW avoided by a CLEP-enabled system. **d** is measured by inspection on any day without notice. Any battery and/or PV system must be able to be remotely disabled by the utility and when disabled, the home will continue to operate without interruption to any of the home's energy services except for use of the battery and/or PV system. During any day (determined by the utility's regulator) the customer's battery and/or PV systems will be disabled; **d** is the measured increase in the actual 15 minute peak demand experienced during the day the battery and/or PV system is disabled and what happens on other days of the same month. The "p' used for $CLEP_m$ need not be the same "p" used for $CLEP_5$.

$CLEP_m$ is available as an income stream to all customers whether or not that customer pays a demand charge.

A home connected to a well configured and controlled battery and/or PV system can have a negative peak demand; thus, $CLEP_m$ can reward such a system with a substantial payment for power in addition to the energy it provides.

CLEP is an <u>optional</u>, <u>additional</u> tariff that is open to all customers of a utility—much the same way NEM is an optional additional economic relationship a customer may choose to have with his utility.

CONCLUSIONS

BSI proposes that the following topics be addressed in this docket:

1) The establishment of community solar regulations which would make PV available to 90% of buildings, i.e., those for which rooftop solar is not an option.

2) The adoption of the Customer Lowered Electricity Price [CLEP] tariff which will increase PV usage, lower utility bills for all customers and discourage grid defection.

RESPECTFULLY SUBMITTED,

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CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing has been served upon "The Official Service List" via electronic mail and/or U.S. Mail, postage properly affixed, this 4th day of January, 2016.

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Myron B. Katz