BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Ohio Power Company for Authority to Establish a Standard Service Offer Pursuant to §4928.143, Ohio Rev. Code, In the Form of an Electric Security Plan	)))))	Case No. 16-1852-EL-SSO
In the Matter of the Application of Ohio Power Company for Approval of Certain Accounting Authority	)))	Case No. 16-1853-EL-AAM

DIRECT TESTIMONY OF KARL R. RÁBAGO ON BEHALF OF ENVIRONMENTAL LAW AND POLICY CENTER

Filed: May 2, 2017

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INTRODUCTION AND OVERVIEW

Q. Please state your name, business name and address, and role in this proceeding.

A. My name is Karl R. Rábago. I am the principal of Rábago Energy LLC, a New York limited liability company, located at 62 Prospect Street, White Plains, New York. I appear here in my capacity as an expert witness on behalf of the Environmental Law and Policy Center ("ELPC").

Q. Please summarize your experience and expertise in the field of electric utility regulation and the renewable energy field.

A. I have worked for more than twenty-five years in the electricity industry and related fields. I am actively involved in a wide range of electric utility issues across the United States as an expert witness, in my capacity as Executive Director of the Pace Energy and Climate Center, as a party in New York rate cases and in Reforming the Energy Vision proceedings. My previous employment experience includes Commissioner with the Public Utility Commission of Texas, Deputy Assistant Secretary with the U.S. Department of Energy, Vice President with Austin Energy, and Director with AES Corporation, among others. My experience includes making hundreds of decisions on the record in cases involving avoided costs, rates, tariffs, certificates of need, rulemakings, and other proceedings. I have also held executive responsibility for managing public and private budgets ranging to the hundreds of millions of dollars. A detailed resume is attached as Exhibit KRR-1.

Q. Have you ever testified before the Public Utility Commission of Ohio ("Commission" or "PUCO") or other regulatory agencies?

A. Yes. I filed testimony and testified on behalf of ELPC and other parties in PUCO Case Nos. 14-1693-EL-RDR and 14-1297-EL-SSO. In the past four years, I have submitted testimony, comments, or presentations in proceedings in Maryland, New Hampshire,

Michigan, Virginia, New York, Hawaii, Iowa, Indiana, Ohio, Rhode Island, Georgia, Minnesota, Missouri, Louisiana, North Carolina, Kentucky, Arizona, Florida, Wisconsin, California, and the District of Columbia. A full listing of my recent previous testimony is attached as Exhibit KRR-2.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to review and respond to the proposal by Ohio Power Company ("AEP Ohio" or the "Company") to increase and restructure residential rates.

Q. What information did you review in preparing this testimony?

A. I reviewed relevant prefiled testimony of Company witnesses, filed Company schedules and tables, and relevant Company responses to information requests. I also reviewed the Company's application to amend its Electric Security Plan, Ohio Revised Code ("ORC") §4928.02, and a position paper authored by AEP on the issue of straight fixed variable rates.

Q. What are your recommendations to the Commission?

A. Based on my review of the evidence in this case, I make several recommendations to ensure that the Company's residential rates are fair, just, and reasonable:

- The Commission should not approve the Company's proposal to shift demand-related distribution fixed costs to customer charges for residential customers and should direct that such demand-related distribution fixed costs continue to be recovered through the volumetric distribution energy charge.
- The Commission should order the Company to conduct a thorough and detailed analysis of its low use and low-income customer base so that it can evaluate future rate and service impacts on these customers.
- The Commission should order the Company to study the impacts of changes in energy prices on energy consumption—demand elasticity—among each of its rate

classes and major subclasses (e.g., residential customers, single-family home owners, apartment renters, low income customers, elderly customers, etc.).

- The Commission should order the Company to conduct a thorough and detailed evaluation of the impacts of a wide range of alternative residential rate design approaches on customer usage, the economics of energy efficiency and demand response, the economics of distributed generation, and other potential services, and in light of the emerging PowerForward dialogue.

SUMMARY OF FINDINGS

Q. What are your findings regarding the Company's fixed customer charge proposals?

A. My findings are summarized as follows:

- The Company's proposal to shift recovery of demand related fixed costs from the volumetric energy rate to the customer charge is at odds with long-established principles of regulatory ratemaking practice.
- The Company views *all fixed* costs associated with demand-related distribution investments as a *sunk* cost to be assigned to the customer charge, and therefore to be unaffected by variation in customer demand. This confusion of "sunk" and "fixed" costs ignores the impact that customer demand has on fixed costs *going forward*.
- The Company proposal to treat all fixed costs as sunk costs eliminates any price signal for residential customers—sending them the very wrong economic message that there is nothing they can or need to do to help keep *future fixed costs* from rising.
- Having labeled a large portion of fixed distribution costs as sunk, and having chosen to characterize the costs as "customer costs" as a result, the Company proposes to recover those costs in the fixed customer charge without explanation that the result is just and reasonable.

- The Company implies that its characterization of fixed distribution charges as customer costs reflects the principle of "cost causation," but does not further explain how this *cost-causation* finding leads to the *rate design* recommendation of recovering the costs in a fixed charge.
- The Company has offered a deeply flawed, wholly unsubstantiated, and inadequate justification for its request to ultimately increase the customer charge by more than 119%.
- The Company has not adequately considered the potential regressive impacts of its rate redesign proposals.
- The Company has not considered the adverse impacts of its rate redesign proposal on the economics of energy efficiency, demand response, distributed generation, and other products and services that could enhance the overall economic efficiency of and strengthen the economy and electric system in Ohio.
- The Company's proposed rate redesign fails when evaluated in light of Ohio state energy policy, reflected in ORC §4928.02. The Company proposes inefficient, discriminatory, and unreasonably priced electric service for residential customers, and rates that will impair customer choice and competition, energy efficiency, and distributed generation.

THE COMPANY'S FIXED CUSTOMER CHARGE AND ENERGY CHARGE PROPOSAL FOR RESIDENTIAL CUSTOMERS

Q. What is the Company's rate redesign proposal for residential rates?

A. The Company proposal is to raise the residential fixed customer charge by $5 when the order in this case goes into effect, and to further increase the charge by $5 in 2018. The Company proposes to also reduce the distribution energy charge by $.0048501/kWh,

from $.0182747/kWh to $.0134246, in 2017, and by an additional $.0048501, down to $.0085745, in 2018.[1]

Q. How did the Company decide the proposed levels for the rate redesign?

A. The Company states that its goal is to collect all costs labeled as distribution system fixed costs in its last cost of service study—Case No. 11-351-EL-AIR—through the customer charge. That amount is equal to $18.84 per customer per month.[2] The Company proposes to implement this cost shift in stages, with a $5.00/month shift in 2017 and an additional $5.00 month shift in 2018. The Company provides no analysis or evidence on why the $5 and $10 levels were chosen. The Company did not evaluate any alternative rate designs to its current proposal.[3] The Company does not state when it proposes to shift the remaining $8.84 in fixed costs to the customer charge.[4] The Company proposes to use what it calls a revenue neutral adjustment to implement the change, meaning that the increased revenues collected through the customer charge will be subtracted from the rate calculation for the distribution energy charge.[5]

Q. What are the high-level results of the Company's proposed cost shift through rate redesign?

A. In total, the Company proposes a 119% increase in the residential customer charge and a 53% reduction in the distribution energy charge, effective January 1, 2018.

Q. How does the Company proposal for revenue neutrality in its rate redesign work?

A. The Company proposal is revenue neutral only for the residential class of customers as a whole. Only for relatively high users of energy would the impact of the rate redesign

[1] Company witness Gill testimony, Exhibit DRG-6.
[2] Calculated as the difference between $27.24 (total of demand-related fixed distribution costs plus customer-related costs) and customer-related costs of $8.40.
[3] Company response to ELPC-RPD-1-005. All cited discovery responses are attached as Exhibit KRR-5.
[4] The Company is ambiguous about whether and/or when it intends to propose an increase to customer charge of $27.24/customer/month. See Company response to ELPC-INT-1-006.
[5] Company witness Moore testimony at p. 13.

leave a customer with the same bill before the change as after. Low use customers would bear a disproportionate share of the cost shift imposed by the rate design. Looking solely at the customer charge and distribution energy rate, the breakeven point is 1,031 kWh in average monthly consumption. That is, the savings due to the reduction in the kWh rate for distribution energy equals the added monthly cost shifted to the customer charge at 1,031 kWh.[6] The net impact is a Robin Hood effect in which low use customers who are often low income customers must pay for bill savings for very high use customers who are often well-to-do. In economics, this effect is described as "regressive."

THE IMPACTS OF THE COMPANY'S PROPOSED RATE REDESIGN AND COSTS SHIFT ON LOW USE AND LOW-INCOME CUSTOMERS.

Q. Can you quantify the impacts of the Company's proposed cost shift to low use customers?

A. Not precisely. The Company produced tables that show changes in customer bills at various consumption levels in Company Exhibit DRG-7. However, this table combines all proposed rate and rider changes into the calculations in such a way that obfuscates the effects of the customer charge change and the distribution energy charge change. When the Company was asked to make the table available in a disaggregated form, it refused, reporting that it had never conducted such an analysis.[7]

Q. Does the data provided in Company Exhibit DRG-7 reveal the regressive effect of the proposed rate redesign?

A. Yes. Although the Company has no data or analysis relating to the income level of its residential customers as a whole,[8] I have extracted a few pieces of the data in Company

[6] Calculated as $5.00 / $.0048501/kWh = 1,031 kWh, and $10.00 / $.0097002 = 1,031 kWh.
[7] Company response to NRDC-RPD-1-031.
[8] Company response to ELPC-RPD-1-010.

Exhibit DRG-7 to create Table 1, below. Table 1 shows how very low users face steep increases in monthly bills. The *increase* is 10% and more for customers using fewer than 500 kWh per month. Twenty to thirty percent of all customer monthly bills are for less than 500 kWh in use; nearly half of all customer monthly bills are for less than 800 kWh.[9] At the same time, the proposed rate design would provide *discounts* of 5% and more for customers using 1,500 and more kWh each month.

[9] Company response to NRDC-RPD-1-005 Attachment 1.

Table 1: Bill Impacts of Proposed Company Rate Increases and Redesign

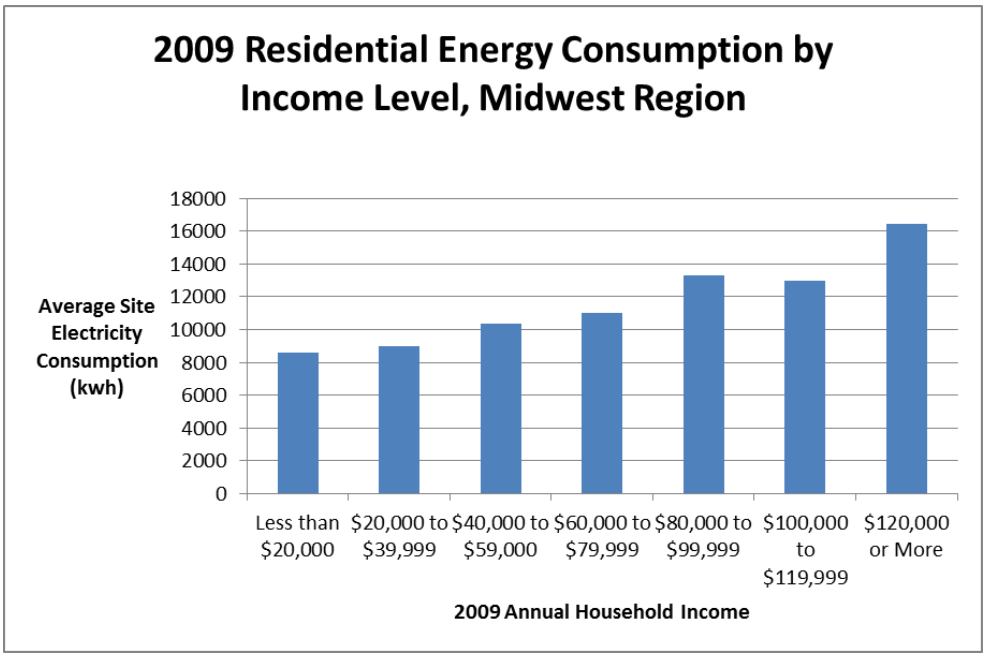
Ohio Power Rate Zone				
Level of Usage	**June 2018 Bill**	**Nov. 2016 Bill**	**Change in Bill**	**Percent Change in Bill**
0	$29.71	$12.91	$16.80	130%
200	$51.86	$38.67	$13.19	34%
500	$85.08	$77.31	$7.77	10%
800	$115.95	$118.30	$(2.35)	-2%
1500	$195.83	$206.11	$(10.28)	-5%
2000	$251.20	$270.51	$(19.31)	-7%
Source: AEP Ohio Gill, Exhibit DRG-7, p. 2				

Columbus Southern Power Rate Zone				
Level of Usage	**June 2018 Bill**	**Nov. 2016 Bill**	**Change in Bill**	**Percent Change in Bill**
0	$29.71	$12.91	$16.80	130%
200	$50.25	$37.07	$13.18	36%
500	$81.08	$73.31	$7.77	11%
800	$111.90	$109.54	$2.36	2%
1500	$183.81	$194.10	$(10.29)	-5%
2000	$235.18	$254.49	$(19.31)	-8%
Source: AEP Ohio Gill, Exhibit DRG-7, p. 9				

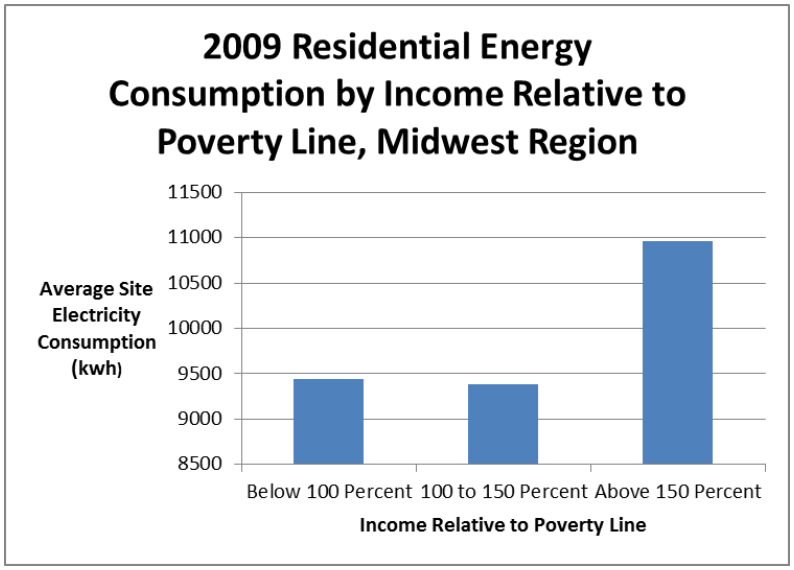
Q. What evidence do you have that low-income customers use less energy than higher income customers?

A. The U.S. Energy Information Administration ("EIA") regularly conducts a Residential Energy Consumption Survey ("RECS") to gather data regarding residential energy consumption and expenditures nationwide. As shown in Figure 1, this data indicates that, across the Midwest, lower income customers on average use less electricity than higher income customers.

Figure 1:[10]



This difference in consumption levels is particularly evident when comparing Midwest consumers above and below 150% of the poverty line, shown in Figure 2:[11]



[10] EIA, 2009 RECS, Table CE2.3, available at https://www.eia.gov/consumption/residential/data/2009/index.php?view=consumption#fuel-consumption.
[11] *Id.*

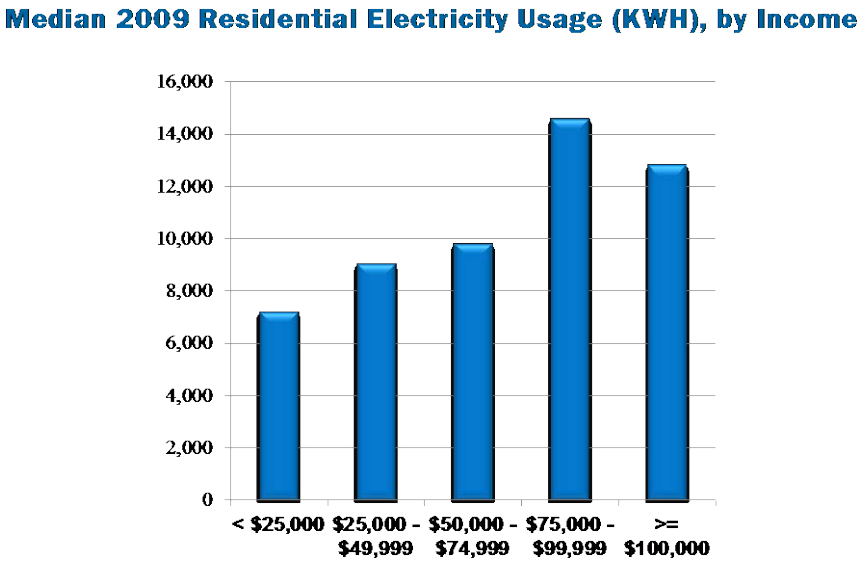
This data is notably relevant to AEP, which in 2015 categorized 33.2% of its residential customers as "low income" customers living below 200% of the poverty line.[12]

Q. What evidence do you have that low-income customers use less energy than higher income customers in Ohio?

A. The National Consumer Law Center ("NCLC") has presented additional data from the 2009 EIA RECS for Ohio and Indiana showing that, on average, households with lower incomes, and who are African American, Latino, or older, use less electricity and natural gas than higher-income households. [13] According to the data collected by EIA and presented by NCLC, in 2009 the average household annual electricity consumption of homes with household income of less than $25,000 is 7,234 kWh, or about 600 kWh per month. By comparison, average household electricity consumption in homes with household income of $50,000 is 9,846 kWh, or 820 kWh per month. For all household income categories studied, electricity use increases with income.[14] Figure 3, below, depicts median 2009 residential electricity usage by income and confirms the correlation between low-income and low energy use, and the associated data in Figure 4 further confirms lower electricity use in households headed by people of Asian and African American ethnicity, as well as households headed by people age 65 or older.

[12] Company witness Jon F. Williams direct testimony in Case No. 16-0574-EL-POR, Exhibit JFW-1, "Action Plan, Volume 1," at 53-54.
[13] As described at https://www.nclc.org/images/pdf/energy_utility_telecom/rate_design/methodology.pdf, NCLC's analysis uses EIA microdata available at https://www.eia.gov/consumption/residential/data/2009/index.php?view=microdata.
[14] NCLC, "Utility Rate Design: How Mandatory Monthly Customer Fees Cause Disproportionate Harm (U.S. Region Indiana, Ohio)," available at: http://www.nclc.org/images/pdf/energy_utility_telecom/rate_design/IN-FINAL2.pdf.

1 Figure 3:[15]



2 Figure 4:[16]

2009 Residential Energy Consumption by Income, Race/Ethnicity, & Age

HOUSEHOLD INCOME	MEDIAN ELECTRICITY USAGE (KWH)
< $25,000	7,234
$25,000 - $49,999	9,060
$50,000 - $74,999	9,846
$75,000 - $99,999	14,621
>=$100,000	12,858

HOUSEHOLD RACE	MEDIAN ELECTRICITY USAGE (KWH)
Asian	7,196
African American	7,900
Caucasian	9,846
Latino	12,593

HOUSEHOLD AGE	MEDIAN ELECTRICITY USAGE (KWH)
65 years or older	6,976
Less than 65 years	10,351

Source: U.S. Energy Information Administration's Residential Energy Consumption Survey, 2009 (most recent data available)

[15] *Id.*
[16] *Id.*

Q. Is there any data to support the idea that a rate increase would affect low-income households more significantly than higher income households?

A. Yes. The same 2009 RECS data discussed above shows that low-income households tend to use a much greater percentage of their resources on electricity bills than higher-income households. For example, Midwestern households below 150% of the poverty line spent on average about $1,000 on electricity in 2009, while higher income households spent just $150 more.

Figure 5:[17]

Income Relative to Poverty Line	Average Electricity Expenditures per Household
Below 100 Percent.....	$995
100 to 150 Percent.....	$1,000
Above 150 Percent.....	$1,150

While not surprising, this data confirms that low-income households in the Midwest are already spending a much more significant proportion of their resources than higher-income households on electricity. Accordingly, adding to that amount will only exacerbate that burden.

Q. Is there any other data to support the idea that low-income households in Ohio will be more greatly impacted by a fixed charge increase than higher income customers?

A. Yes. The American Coalition for Clean Coal Electricity ("ACCCE") analyzed U.S. Census and EIA data regarding household energy consumption in a report entitled "Energy Cost Impacts on Ohio Families, 2015."[18] The ACCCE report reveals important facts about the income and other characteristics of Ohio households, and how the Company's proposals would impact customers. I have summarized this information in

[17] EIA, 2009 RECS, Table CE2.8, available at https://www.eia.gov/consumption/residential/data/2009/index.php?view=consumption#fuel-consumption.
[18] Eugene M. Trisko, "Energy Cost Impacts on Ohio Families, 2015," American Coalition for Clean Coal Electricity, available at http://www.americaspower.org/wp-content/uploads/2016/02/OH-Energy-Cost-Analysis-116R.pdf.

Table 2, below:

Table 2: Ohio Household Data and Rate Increase Impacts, by Income Group

Pre-Tax Annual Income:	Less than $30,000	$30,000 - less than $50,000	Less than $50,000	Equal to or more than $50,000	Total/ Average
Estimated After-Tax Income	$ 15,381	$ 33,962	$ 23,178	$ 81,606	$ 55,308
Number of Households	1,415,000	906,000	2,321,000	2,321,000	4,591,000
Percent of Total Households	30.8%	19.7%	50.6%	50.6%	100.0%
Estimated Annual Energy Costs	$ 1,835	$ 2,096	$ 1,937	$ 2,760	$ 2,360
Estimated Annual Electricity Costs	$ 1,172	$ 1,372	$ 1,250	$ 1,745	$ 1,504
Energy Burden: Electricity Costs as % of Income	7.6%	4.0%	5.4%	2.1%	2.7%
Energy Burden Impact: $120 Increase as % of Income	0.8%	0.4%	0.5%	0.1%	0.2%

Source: Trisko, "Energy Cost Impacts on Ohio Families," American Coalition for a Clean Coal Economy (Jan. 2016)

The data from the ACCCE report shows that customers with after-tax income of less than $16,000 per year have 22% lower electricity bills than the average Ohio household, and yet they still spend nearly three times the percentage of their household income on electricity.

Q. Does the ACCCE study reveal anything about household energy burdens for Ohio families and how the Company's proposed rate redesign raises those household energy burdens?

A. As shown in Table 2, electricity bills impose a household energy burden—the percentage of household income that must go to pay those bills—that is nearly four times higher for families with after-tax household income of $15,381 per year than for the average Ohio family household. As a result, the added cost of the increased customer charge has a four times greater impact on household energy burden for these customers. Some of this impact would be offset by the reduction in the distribution energy charge, but that impact cannot be assessed give the information provided and analysis conducted by the Company.[19] More than 50% of the Company's monthly residential customer bills for

[19] Company responses to NRDC-RPD-1-027, NRDC-RPD-1-028.

customers with twelve full months of billing were for consumption levels of 900 kWh or below. As a result, it is all but certain that the Company's propose rate redesign imposes an added burden on Ohio's already challenged low-income population.

Q. Does the ACCCE study provide any more detail about the demographics of low-income households in Ohio?

A. Yes. The ACCCE report also reveals the following:[20]

- Ohio average pre-tax household income in 2014 was $49,308, or 8% below the national median household income.
- The pre-tax income of Ohio's African-American households is $26,747, 50% below the national median household income and 45% below the Ohio average, making them even more vulnerable to the bill increases that would result from the Company's rate redesign.
- The pre-tax income of Ohio's Hispanic households is $38,794, 28% below the national median household income and 21% below the Ohio average, making them even more vulnerable to the bill increases that would result from the Company's rate redesign.
- Ohio households with an occupant of age 65 or older amount to 24% of all Ohio households and have a median income that is 32% below the national median household income and 26% below the Ohio average, making them even more vulnerable to the bill increases that would result from the Company's rate redesign.

Q. Did the Company address these issues to ensure that the impacts of the proposed rate redesign would be just and reasonable?

A. The Company did not conduct any analysis or provide any evidence of consideration of the issues associated with the impacts of its proposed rate redesign on low use and low

[20] *Id.* at 6.

income customers. Given the regressive impacts of the Company's proposals, the failure to consider these impacts is neither just nor reasonable. Company witness Moore does assert that the average usage level of Percentage of Income Payment Plan ("PIPP") customers is slightly over the 1,031 kWh/month level, the "break even" level of use above which the Company's proposed rate redesign yields bill savings, implying a resulting slight reduction in demand on Universal Service Fund budgets.[21] This observation and result is neither material nor satisfactory as evidence that the Company considered and took steps to address the regressive impacts of its proposed rate redesign.

Q. Do Universal Service Fund budget savings mean benefits for low-income customers?

A. If all other facts remained equal, Universal Service Fund budget savings should mean more benefits for more customers. However, the Company is proposing bill increases for all customers using, on average, less than 1,030 kWh per month. This population includes a great many low income customers not represented in the count of PIPP customers.

Q. Is PIPP data a good indicator of impacts on low income customers?

A. The Company has no information on the correlation between PIPP customers and the class of low-income customers in general.[22] PIPP customers enroll in the program precisely because their bills have grown too large for them to pay. The PIPP program participation demographics, therefore, are not an accurate reflection of those for low income customers in general. The Company does not maintain information about PIPP or low income customers that would allow a comparison between the two groups.[23]

Q. What information does the Company provide about the number of low-income customers that it serves through its energy efficiency programs?

A. As I previously stated, testimony and responses to interrogatories from Company

[21] Company witness Moore direct testimony at 13, lines 14-18.
[22] Company response to NRDC-INT-1-013.
[23] Company response to ELPC-INT-1-008, 009.

witnesses Moore and Gill do not detail the demographic and consumption levels of all residential low-income customers that the Company serves. There is high-level data available about energy efficiency program participants in the Company's Proposed 2017-2019 EE/PDR Program Portfolio Plan[24] that confirms the general truth that low-income customers use less energy than higher income customers. According to the Company's filing in the EE/PDR Plan case, for customers participating in Company energy efficiency programs, household energy consumption in low-income households is about 5% lower than that in non-low income households.[25] In addition, average monthly household consumption in participating low-income households is 958 kWh per month, about 72 kWh per month lower than the "break even" level of consumption cited by witness Moore. What witness Moore did not point out, then, is that about half of all its low-income customers (at least accounting for those that participate in energy efficiency programs) will see bill increases along with price signals diluting the benefits of participation in energy efficiency programs.

Q. Do increases in fixed charges pose problems for low-income, low usage customers?

A. Yes. Increasing fixed charges can have disproportionate impacts on low usage customers (who are often low-income customers), customers on fixed incomes (who are frequently seniors), students, and customers who have aggressively pursued green building and energy efficiency.[26] This is an area where the Company needs to demonstrate definitively that low-income customers will not be unfairly affected, but the Company fails to address

[24] Company witness Jon F. Williams direct testimony in Case No. 16-0574-EL-POR, Exhibit JFW-1, "Action Plan, Volume 1."
[25] *Id.* at 54, Table 18.
[26] As an illustration, public hearings on this proposal included testimony in opposition to the fixed charge increase from low and fixed income customers, customers who had installed energy efficiency measures and solar, and one student. See Public Hearing Transcript at 23-24, 25-26 (Apr. 13, 2017) (testimony of Lynn Wise and Dawn Wittberg); Public Hearing Transcript at 27-29 (Apr. 17, 2017) (testimony of Alistair Bradley); Public Hearing Transcript at 26-27, 37-39 (Apr. 13, 2017) (testimony of Tim Wagner and Jed DeBruin).

the issue adequately in any of its testimony. Alleging that *some* low-income customers use more energy than the residential class average is not proof that low-income customers as a group use more than average.

THE COMPANY'S JUSTIFICATION FOR ITS PROPOSAL TO SHIFT COSTS TO THE CUSTOMER CHARGE

Q. How does the Company justify its proposal to shift costs from the distribution energy charge to the customer charge?

A. The Company offers a completely superficial and inadequate justification for its proposal to redesign residential rates, especially given the gravity and magnitude of that proposal. In testimony, Company witness Moore states that the Company's ideal rate design would use a residential demand charge to recover demand-related fixed costs.[27] But the witness does not connect this wishful thinking with the proposed rate redesign structure in any way.[28] The total of the Company's justification for its proposal to shift demand-related fixed costs from the volumetric energy charge to the customer charge is as follows:

> *The cost of providing distribution service do not vary with volumetric usage. [sic] Generally, the distribution system costs are affected by either peak demand imposed on the distribution facilities or by the number of customers served. If these costs are primarily recovered through an energy charge, the customer is sent a price signal that by lowering their usage they are lowering the cost imposed on the system even though they have not necessarily lowered the costs imposed on the system.*[29]

[27] Company witness Moore testimony at 13.
[28] The Company does propose a voluntary demand charge for customers as advanced meters are deployed. Residential demand charges are particularly difficult for most residential customers to understand and respond to. Time varying rates, such as peak time rebates with in-home information systems, offer superior performance in reducing peak.
[29] Company responses to NRDC-INT-1-014, OCC-INT-2-276.

Q. Is the Company's statement of justification adequate and reasonable?

A. The Company's justification for its residential rate redesign is not adequate or reasonable. First, the Company appears to confuse fixed costs and sunk costs. Sunk costs do not vary with levels of usage; they are, by definition, not subject to change with usage of the associated asset. Once the money is spent to install a conductor of a certain size, that investment is fixed no matter how much, or how little, electricity is carried over it. Sunk costs are historical, or embedded. Given that usage of almost every asset impacts its useful life and the ultimate replacement costs for that asset, very few fixed cost investments involve truly sunk costs.

Fixed costs are costs, like sunk costs, that *tend* not to vary with level of use over the short term. Over the long term, fixed costs do change with the level of use. An increasing number of utilities are also recognizing, with so-called Non-Wires or Non-Transmission Alternatives projects, that some future fixed costs can be cost-effectively deferred or avoided in the mid- and short-term as well.

In the past, electric utilities did not worry about over-forecasting demand and incurring excessive demand-related fixed distribution costs. If the system was overbuilt, year-over-year growth in energy sales and accompanying demand quickly caught up with any over-building. As Warren Buffet commented in a letter to Berkshire Hathaway investors, "[h]istorically, the survival of a local electric company did not depend on its efficiency. In fact, a 'sloppy' operation could do just fine financially."[30] In recent years, utilities have experienced decreasing sales growth, flat sales, and even negative sales growth. At the same time, demand has increased, loads have become peakier, and load

[30] Warren Buffet, Chairman's Letter, Berkshire Hathaway 2015 Annual Report, available at: http://www.berkshirehathaway.com/2015ar/2015ar.pdf

factors have declined. Peakier system loads can be addressed in three ways: (1) aggressively pursuing peak reduction programs for all customers, (2) spending more on the system to meet peaks, and/or (3) implementing rate structures that immunize the utility from the consequences of increased demand-related fixed cost investment through non-bypassable rates that ensure utility revenues remain constant regardless of customer usage. The Company's residential rate proposals focus on the rate redesign approach, with the likely result that they will have to spend more money on distribution system infrastructure.

It is understandable that the Company would try to fix its larger problems with rate restructuring, but it is not reasonable. If a utility company forecasts greater demand for energy than it ends up experiencing, it will have an overbuilt system and experience a situation where sunk fixed costs are potentially stranded—not subject to recovery under current rates. The economically efficient solution is good price signals that do not undermine the economics of demand response and energy efficiency, better forecasting, and a smarter grid that leverages the potential benefits of all manner of distributed energy resources. As explained previously in the section discussing impacts on energy efficiency and distributed generation, the Company residential rate proposals not only constitute the bad choice, they frustrate the good ones.

For example, if the utility forecasts that demand on a particular feeder will be heavy, it may install a larger, more expensive transformer. The money spent on that transformer is a historical or sunk cost. Since the money is for a transformer, the costs will be treated as a fixed cost, and allocated accordingly. If demand does not match the forecast, the utility will face problems recovering the cost of the too-large transformer through volumetric rates. Of course, if the utility is guaranteed recovery of the costs through fixed charges, it will have no incentive to improve the accuracy of its forecasts.

Importantly, the size of the *next* transformer and associated cost is a fixed cost that can be impacted by customer demand *in the future.* Energy efficiency, demand response, and other factors can reduce the fixed cost requirements in the future, and perhaps even allow for the installation of smaller replacement equipment. These measures can also extend the useful life of the installed fixedcost assets. For these reasons, the price signal impacts of rate design can and do impact fixed costs on a going forward basis.

Second, even if demand and customer connection costs are the primary drivers of distribution costs, this does not compel or even justify the allocation of demand-related fixed costs to the customer charge. The Company offers no evidence to support the leap of logic that because demand-related fixed costs are, like customer connection costs, a driver of distribution costs, they should therefore be collected as a customer cost.

Third, the statement about price signals is illogical in the extreme. The Company assertion is that recovery of fixed costs through the volumetric energy is a false price signal because a change in usage cannot reduce demand-related costs. Again, the Company confuses fixed costs with sunk costs. It is widely accepted—and a strong justification for grid modernization investments—that customers can reduce the requirement for expensive infrastructure investments by reducing their usage during particular times of the day. These reductions arise as a result of reduction in system loading so to avoid upgrades, as well as reduction in wear and tear (temperature-related degradation) and resultant capital cost deferrals for replacement. Higher volumetric charges for on-peak usage can support demand response programs and energy storage deployment with similar results.

Q. Does the Company offer any other explanation for its proposal?

A. The Company hints at, but does not fully articulate a recapitulation of its justification:

The revenue neutral rate design proposed assures that all customers pay a fair

share of the system. The amount collected for base rates by the Company will be the same, the way the dollars get collected will differ. This rate design more closely aligns with the full-based customer charge the Company calculated in Case No. 11-351-EL-AIR.[31]

Q. Does this argument address the inadequacies and logical failures of the Company's other justifications?

A. No. The rate design proposed, whether revenue neutral or not, has not been demonstrated to be more fair. Indeed, at the heart of the proposed rate redesign is an effort to impose charges on customers that violate cost causation principles by failing to properly recognize that customers with different demand impose differing costs on the system. No unfairness is demonstrated or substantiated in the record in this case. The Company has made no showing that the proposed rate redesign and resulting cost shifts to low users and low-income customers is fairer than the status quo or any other rate design alternative. I have never heard the term "full-based customer charge," but I assume for this testimony that it means the customer charge plus the demand-related fixed costs assigned to the residential customer class in the most recent cost of service study. Whatever "full-based customer charge" means, there is no evidence that economic efficiency or fairness is increased by conflating demand-related fixed costs with the costs related to connecting a residential customer. The Company seems enthralled by an alliterative but false belief that fixed costs should be collected through fixed charges. Placing the word "fixed" in both the subject and object of a sentence does not imbue the notion with correctness or the capacity to induce economic efficiency.

[31] Company response to OCC-INT-1-046.

Q. Does the Company address the consequences to efficient price signals associated with increasing the proportion of revenue requirement recovered through fixed customer charges?

A. In response to an interrogatory from NRDC, the Company asserted that its proposed shift of demand-related fixed distribution costs to customer charges would "maintain the opportunity for plenty of savings for lowering energy usage."[32] This response and the Company's position are misleading. In other parts of this case, the Company is making additional proposals to shift recovery of variable costs into fixed charges. The Company proposes to shift recovery from EE/PDR to the EDR rider.[33] Since the EDR rider is set as a percentage of the base distribution charge, the increase in the fixed distribution charge means that more of the EDR rider will be fixed as well. This same effect results from other rides that are set as a percentage of the base distribution charge, including the Deferred Assert Phase-In Rider, the Enhanced Service Reliability Rider, and the Distribution Investment Rider. The Company also proposes a new fixed charge for various grid modernization projects, called the DTR rider.[34] I address impacts of the proposed rate redesign on energy efficiency and demand response programs later in this testimony.

Q. Do you believe that economic efficiency and equity are advanced when rate design mimics cost structure?

A. No. In my 25-plus years' experience in the electricity industry, I have never found any article, text, treatise, or other reputable source to support the notion that rate design must mimic cost structure in order to achieve or advance economic efficiency. Witness Moore

[32] Company response to NRDC-INT-1-012; NRDC-INT-1-012 Attachment.
[33] Company witness Gill testimony at 6; Company witness workpaper DRG-4.
[34] Company witness Gill testimony, Exhibit DRG-5.

did not offer such evidence.

Q, Is the inclusion of costs not directly caused by the addition of new customers to the system consistent with long-established principles of electric utility regulation and ratemaking?

A. No. For example, Bonbright, attached as Exhibit KRR-3, defines the fixed customer charge on pages 347-349 as follows:

> *These are those operating and capital costs found to vary with the number of customers regardless, or almost regardless, of power consumption. Included as a minimum are costs of metering and billing along with whatever other expenses the company must incur in taking on another consumer.*

Simply stated, Bonbright's definition ensures that the charge for the customer connection to the grid is limited to the cost of connecting the customer to the grid. Adhering to this principle advances other rate making principles such as equity and cost-causation, because it preserves the power of volumetric charges as a price signal. Residential customers can see a direct correlation, both positive and negative, between their level of usage and their contributions to cost creation when energy- and demand-related costs are recovered through these volumetric charges. Allocating demand-related costs to the fixed customer charge eliminates, or at least severely weakens, the price signal impact.

Q. Are established practices for setting the customer charge better and fairer?

A. Yes. Best practices assign to the customer cost category those costs that directly vary with the number of customers. Again, these costs would include a portion of the meter, service drop, meter reading, billing, and collection costs.

Q. How much cost does a new customer cause?

A. Costs directly related to new customers include a portion, but not all, of the cost of a meter, billing and metering services, and collection costs. These costs would likely sum

to about $5-$10 per customer per month, depending on local costs, billing period used, and other factors.[35] New customers do not add all the costs that the Company would assign to the customer component when those customers take service from the Company.

Q. Does limiting the customer charge to costs caused by new customer connections properly address fixed costs already incurred to build the distribution system that the customer connects to?

A. Yes. The volumetric charge can fully recover those sunk fixed costs, preserve cost-causation features, and send more rational price signals to residential customers. As stated by noted utility economist, Severin Borenstein:

> *[T]he mere existence of systemwide fixed costs doesn't justify fixed charges. We should get marginal prices right, including the externalities associated with electricity production. We should use fixed charges to cover customer-specific fixed costs. Beyond that, we should think hard about balancing economic efficiency versus fairness when we use additional fixed charges to help address revenue shortfalls.*[36]

Q. Is the Company's approach the only one that it could have used to design residential charges?

A. No. Other methods are appropriate, and, in light of the unjust discrimination and economic inefficiency that results from the Company proposal and the existence of other reasonable approaches, the Company proposal is unreasonable. I will discuss these impacts and alternatives in more detail.

[35] See Lazar & Gonzalez, "Smart Rate Design for a Smart Future," Regulatory Assistance Project (July 2015), at Appendix D. Available at: http://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-gonzalez-smart-rate-design-july2015.pdf

[36] Borenstein, "What's So Great about Fixed Charges," Nov. 3, 2014 blog post, available at: https://energyathaas.wordpress.com/2014/11/03/whats-so-great-about-fixed-charges/.

Q. What could the Company have learned by reviewing similar proposals from other utilities in the United States?

A. A review of similar requests by other utilities and action taken in regulatory proceedings reveals that the Company's request is wildly outside of the range of experience in the United States. Exhibit KRR-4, attached, provides information about customer fixed charge requests over the past several years. It shows that the Company's proposed 119% increase in fixed customer charges for residential customers is an extreme outlier compared to what has been requested and approved when compared to nearly 100 cases from across the United States. The average increase in those other cases was only 19%, less than one-sixth of the Company proposal. About one-third of the cases resulted in no approved increase to the fixed customer charges at all.

Q. Does the Company proposal reduce volatility by keeping bills level through high-use months?

A. Company witness Moore asserts that under the Company's proposed rate redesign, some customers will see less volatility in their bills. Simple arithmetic suggests that differences in monthly bills are reduced when more of the bill is fixed. However, this reasoning is a somewhat cynical justification for extracting monopoly rents when the Company performed no analysis to demonstrate whether cost-effective energy efficiency and conservation could similarly and more affordably reduce month-to-month bill variability and reduce bills, and when the Company's own analysis shows that the price of this reduced monthly bill variability is an average bill increase heavily weighted on low users and low-income customers.

Q. Does the Company's approach gradually change the structure of rates and bills?

A. No. The Company proposes a 119% increase in the fixed customer charge for residential

customers between now and January 1, 2018. The Company proposes a monthly bill increase of more than 10% for any customer using fewer than 500 kWh per month. These are not gradual changes.

Q. In summary, is the Company's proposal to restructure its residential rate design with increased customer fixed charges sound economics, regulation, and policy?

A. No. Peter Kind, known as the author of the Edison Electric Institute's "Disruptive Challenges" paper, recognized in a paper published in November of 2015 that "many utilities have been seeking to increase fixed charges, while customers and policymakers are vehemently opposed to such action. An evolved approach would focus on common ground with win4 (i.e. beneficial to customers, policy, competitive providers and utilities) perspective."[37] As Kind further explained:

> *Adopting meaningful monthly fixed or demand charges system-wide will reduce financial risk for utility revenue collections for the immediate future, but this approach has several flaws that need to be considered when assessing alternatives through a win4 lens, by which all principal stakeholders benefit.*
>
> *Fixed charges:*
>
> - *do not promote efficiency of energy resource demand and capital investment;*
> - *reduce customer control over energy costs;*
> - *have a negative impact on low- or fixed-income customers; and*
> - *impact all customers when select customers adopt [distributed energy resources] and potentially exit the system altogether, if high fixed charges are approved and the utility's cost of service increases.*[38]

The Company's proposed residential rate approach and fixed customer charge proposal is

[37] Peter Kind, "Pathway to a 21st Century Utility," CERES (Nov. 9, 2015), at p. 12.
[38] *Id.* at 30.

bad for customers, policy, competitive providers, and even itself. As a recent report published by Consumers Union details, fixed charge proposals like the one put forth by the Company in this case harm customers in several ways, violate fundamental principles of rate design, are unsupported by sound argument, and are inconsistent with regulatory trends around the country.[39]

Q. Is the Company's residential rates redesign proposal consistent with American Electric Power's ("AEP") position on straight fixed variable ("SFV") rate design?

A. No. The Company's proposal is a major step toward a straight fixed variable rate design. AEP has stated on record that there are several concerns with SFV rate design, including that:

> *Under this design, all users within a rate class are charged the same amount for fixed costs, instead of a proportional one. This has the potential to adversely affect small users if their usage characteristics are not in line with others in the group. Another challenge that results from this mechanism is the weakening of the price signals received by customers.*[40]

IMPACTS ON ENERGY EFFICIENCY AND CLEAN ENERGY

Q. How does increasing fixed customer charges specifically impact customer investment in energy efficiency and conservation?

A. Increases in fixed customer charges create powerful price signals ***against*** investment in

[39] M. Whited, T. Woolf, J. Daniel, "Caught in a Fix: The Problem with Fixed Charges for Electricity," prepared for Consumers Union (Feb. 9, 2016).

[40] American Electric Poswer, "Issues in Electricity: Straight Fixed Variable," (2014) at p. 2. The document was formerly available at AEP's "Issues and Positions" web page, but has been removed. AEP does not explain whether it has changed its position on straight fixed variable rate design. A search for the term "straight fixed variable" on the AEP web page reveals no content. An archived version of the original page is available at: https://web.archive.org/web/20160809084412/http://aep.com/about/IssuesAndPositions/Financial/Regulatory/AlternativeRegulation/StraightFixedVariable.aspx.

energy efficiency, which is inconsistent with Ohio policy goals.

Q. Did the Company consider the impact of its proposed increase in the fixed customer charge on energy efficiency, conservation, and renewables?

A. As I previously stated, Company witness Moore asserted that its proposed shift of demand-related fixed distribution costs to customer charges would "maintain the opportunity for plenty of savings for lowering energy usage."[41] In fact, the evidence shows that for a customer with average monthly usage of 1,000 kWh, the Company's rate redesign proposal increases fixed charges as a percentage of the total customer bill by 11%, or $14.02.[42] This means that in the Ohio zone, such a customer would have to save about an extra 137 kWh each month to offset the impact of the increase in fixed charges; in the Columbus Southern zone, such a customer would have to save an extra 146 kWh each month.[43] The Company proposal violates the rate making principle of gradualism with such a dramatic change in the relative allocation of costs.

Q. How does the Company analyze this potential impact on the cost effectiveness of energy efficiency and other demand-side measures such as demand response and distributed generation?

A. The Company offers no evidence that it evaluated the impacts of it proposed residential rate design on energy efficiency programs. This is particularly troubling in light of the success of those programs in reducing energy use and peak demand—for example, AEP's 2015 efficiency programs lowered peak demand by 377.5 MW, or almost 3% of the total system peak of 12,712 MW for that year.[44] The Company's residential rate redesign

[41] Company response to NRDC-INT-1-012; NRDC-INT-1-012 Attachment.
[42] *Id.*
[43] *Id.* Calculated as the increase in the fixed charge divided by the average of the total kWh charges for each zone.
[44] See Company response to NRDC-INT-1-004 Attachment; and 2015 Annual Portfolio Status Report Under Rule 4901:1-39-05(C), Ohio Administrative Code, by Ohio Power Company, Case No. 16-1099-EL-EEC.

proposal will likely have several adverse impacts on these programs: First, the proposed increase in fixed charges and the reduction in per kWh charges means that the incentive to invest in efficiency and the paybacks associated with energy savings are dramatically reduced. Second, the overall bill impacts send a price signal that, in comparison to current rates, extremely high consumption will yield bill savings. Third, the proposal to lock demand-related fixed costs into customer charges means that residential customers have no financial incentive under proposed default rates to reduce their demand. In addition, the Company has no studies or process with which to determine whether distributed energy resources such as demand response, energy efficiency, distributed generation, or energy storage may be utilized to defer or avoid distribution investment costs.[45]

Q. Why should the Commission be concerned about approving a rate design that is detrimental to energy efficiency, conservation, and renewables?

A. Energy efficiency, conservation, and renewables offer many benefits to the people and State of Ohio, and are therefore supported by Ohio law and policy. These benefits include resource diversification, grid resiliency, future cost reductions associated with increased volume of deployment (economies of scale), job creation, system-wide cost reductions, and leveraging of non-utility investment dollars, among others.

Q. How do energy efficiency and conservation, in particular, produce these benefits?

A. Energy efficiency and conservation generate benefits to the utility, ratepayers, and society in general in many ways, including lower cost than traditional generation and infrastructure investments, downward pressure on rates over the mid- and long-term, persistent and consistent savings, nearly endless resource potential due to economies of manufacturing scale and technological innovation, broad availability to all classes of

[45] Company response to ELPC-INT-1-014.

customers, and significant externalized benefits often not accounted for in ratemaking.

Q. Can affected customers avoid fixed charges with more efficient energy use under the Company's proposal?

A. No. The proposed increase in fixed charges cannot be avoided by customer reductions in energy use. Given the magnitude of the proposed increase in the fixed customer charge, and the significant reduction in the distribution energy rate, it is also practically impossible for the average residential customer to offset the bill increases with energy efficiency investments.

Q. Do these proposed changes impact customers who plan to invest in energy efficiency improvements?

A. Yes. Fixed charges are "unavoidable" and reduce the marginal value and the ultimate bill value to those customers who have taken action to reduce their energy consumption. These changes will also have a chilling impact on customers who are contemplating such energy efficiency investments.

Q. How does a change to higher fixed charges and lower volumetric charges impact prior customer investments in energy efficiency?

A. Allocation of costs to fixed, non-bypassable charges imposes an extraordinary burden and destroys investment-backed savings expectations on energy users who have made significant prior investments in order to lower their bills. Customers and communities that invested in weatherization, equipment improvements, and building remodeling did so both to save money at the then-existing rates as well as to reduce exposure to future rate increases.

By breaking with best practices (as voiced by Bonbright and others) that have been long considered settled matters, the increased fixed charges and decreased volumetric rate is like a regulatory taking. Customers who have made good faith

investments in greater efficiency based on established rates and ratemaking practices would experience significant and unfair bill increases under the Company's proposal.

The Company's proposal is like taking kWh per year out of the planned savings stream for customers, extending the payback period they had planned upon, and frustrating their investment economics. The proposed reduction in the volumetric energy charge further compounds this problem by reducing the value of each saved kWh. This is irreversible damage to the customers that could be avoided without harm to the Company by simply allocating the revenues associated with the fixed charge increase to volumetric rates as in the past.

Q. What is the ultimate impact of reduced energy efficiency, conservation, and development of renewable energy?

A. Inefficient use means uneconomically high levels of energy consumption. These in turn lead to demand for more expensive infrastructure. The costs of these investments are levied on consumers and raise their rates. Following the Company's logic in this rate application, a significant share of these costs would be allocated to fixed charges, creating higher non-bypassable charges. And so on. The Company proposal seems likely to start and accelerate a death spiral of electric service unaffordability.

THE OPTION OF RECOVERING REVENUES THROUGH VOLUMETRIC RATES

Q. Does the Company have alternatives to allocating increased costs to fixed customer charges?

A. Yes. A fixed customer charge is not the only mechanism for recovering fixed costs. Precisely because of the concerns that I summarized, utilities and regulators throughout the country have typically allocated a large proportion of fixed costs to volumetric rate elements for residential and small commercial customers. This process starts with a more

reasonable basic customer cost approach to cost classification. The Company already uses a volumetric energy distribution charge that could help carry whatever demand-related distribution system revenue requirement is properly allocated to residential customers.

Q. Does the use of volumetric rates to carry fixed costs present a financial integrity risk to the utility that should be remedied with higher fixed charges?

A. No. First, the ratemaking principle is that rates should reflect costs, not be perfectly aligned with cost structure. There is no statistical likelihood of any real risk to the Company's financial integrity due to some customers using less energy than the utility had forecast in the interval between rate cases. The Company also operates under a full revenue decoupling regime.[46] The adverse impact on low use, low-income, and fixed income elderly customers, as well as the economics of efficient use of energy, outweighs any hypothetical risk to the Company's earnings.

Q. Why is it appropriate to continue recovering fixed costs through volumetric rates?

A. It is appropriate because of the price signal function of properly designed rates. Properly designed rates *reflect* properly allocated costs *and* send signals for efficient consumption in the future. Sunk fixed costs, the focus of the Company's concern in its customer charge proposal, can be reflected in *either* the fixed charge or a volumetric charge. An efficient price signal relating to future fixed costs can *only* be communicated with a volumetric charge. That is why a volumetric charge is the optimal rate design in this case for demand-related distribution fixed costs.

Q. Does volumetric charge recovery of fixed costs violate principles of ratemaking or sub-optimize the economic efficiency of rates?

A. No. Sound ratemaking is based on ensuring that costs are properly allocated to customer

[46] See Case Nos. 11-351-EL-AIR, *et al.*, Opinion and Order at 9-10 (Dec. 14, 2011).

classes based on cost causation. I know of no ratemaking or economic principle that finds that cost *structure* must be replicated in rate *design*, especially when significant negative policy impacts are attendant to that approach. Traditional ratemaking limits customer charges to certain basic customer connection costs—the meter, billing services, and other similar general and administrative costs. These are fixed costs that vary by customer count and typically form the basis and limit for fixed customer charges. Even so, when the policy impacts discussed above are considered, some of these costs are collected through variable charges.

Q. When costs associated with distribution systems are classified as fixed, should they be collected through the fixed customer charge?

A. Not necessarily, and not if the result is that lowusage customers are disproportionately impacted or that adverse impacts on energy efficiency, conservation, and renewables also result. Recently in other states, some utilities have argued that increased fixed customer charges secure revenue recovery in a world where customers have more options to reduce their level of usage. I am not aware of any evidence or analysis, and see none in this record, that increasing fixed customer charges improves system-wide economic efficiency or the efficiency of *customer* decisions. Absent evidence of system-wide or customer efficiency benefits, fixed customer charges should not be increased and costs should instead be allocated to variable charges. Again, the differences in costs that lead to labeling them as fixed or variable do not, standing alone, tell us anything about the rate design that should be used to recover them.

Q. What is the key difference between fixed and variable costs?

A. The key discriminator for labeling a cost as fixed or variable is the element of time. It is important to remember that over the long term, all costs are variable; just as over the very short term, one could argue all costs are fixed. For example, distribution transformers are

typically treated as a fixed cost because of their relatively long life. Loading on a transformer, especially during periods of high demand, will impact its useful life. As a result, demand reductions can extend the useful life of transformers.

Q. How do residential customers exercise control over their variable and fixed costs?

A. With volumetric rates to recover fixed and variable demand and energy costs, residential customers have meaningful, practical, and realistic opportunities to exercise control over their energy bills and costs. Reductions in use—through efficiency, conservation, or self-generation—all contribute to reductions in variable energy costs. Moreover, these behaviors also reduce high peak demand, and by doing so customers directly contribute to reduced fixed costs going forward. Efficiency, demand response, west-facing solar, and other options allow customers to contribute to fixed cost reduction, and all of these are frustrated by shifting cost recovery from volumetric to fixed charges, as proposed by the Company.

Q. If the utility has costs that it classifies as fixed, should the charge to recover those costs be a fixed charge, in order to send a price signal to customers?

A. No. There is no meaningful price signal in charging a rate that few if any customers can effectively respond to with modification in behavior. As explained previously, the Company's proposed residential rate redesign increases the amount of fixed charges in the bill for a customer using 1000 kWh per month by 11% as a fraction of the total bill, rendering an additional $14.02 per monthly bill beyond response through energy efficiency or peak reduction behaviors. The percentage increase is even higher for the likely majority of customers who use less than this amount. Residential and small commercial customers have only limited options for changing their demand independently of their energy use, and this is especially true of renters; so volumetric energy rates are the best rate design option for sending price signals for both energy and

demand cost causation on a going-forward basis. A customer's demand, especially for low-income and lowuse customers, is a function of the energy performance of their home, which is often rented; their major appliances, which are often expensive to replace or upgrade; and the weather. Imposing high fixed charges on these customers is the economic regulation equivalent of suggesting to customers, "Let them eat cake."

Q. What is your recommendation for a rate design that would recover increased costs that the Company proposes to collect through increased fixed customer charges?

A. The prudently incurred demand-related fixed costs that the Company proposes to allocate to fixed customer charges should be allocated to volumetric rate elements unless and until the Company demonstrates the reasonableness of its proposed rate design in light of the potential adverse impacts discussed, and after consideration of the relative impacts of alternative rate designs.

THE COMPANY PROPOSAL IN LIGHT OF OHIO STATE ENERGY POLICY AND THE POWERFORWARD PROCEEDING

Q. Have you reviewed the Company's residential rate redesign proposals in comparison to Ohio's energy policy articulated in ORC §4928.02?

A. Yes. The Company's proposal is fatally inconsistent with Ohio state energy policy. My analysis reveals the following (emphasis added):

- ORC §4928.02(A) Ensure the availability to consumers of adequate, reliable, safe, *efficient*, *nondiscriminatory*, and *reasonably priced* retail electric service;

As explained, the proposed residential rate design creates inefficient price signals by treating customers with differing demands the same and by creating a non-bypassable charge that cannot be reduced with changes in consumption behavior. I have demonstrated that the proposed rate design unjustly discriminates against low use and

low-income customers. As a result, the proposed rates are not reasonably priced.

- ORC §4928.02(C) Ensure diversity of electricity supplies and suppliers, by giving consumers effective choices over the selection of those supplies and suppliers and by encouraging the development of distributed and small generation facilities;

The proposed residential rate design unjustly undermines the economics of distributed generation investments, both historical and in the future. Moreover, by allocating demand-related fixed costs to a non-bypassable customer charge, the proposed rates eliminate any incentive to customer-generators to invest in demand-reducing distribution generation.

- ORC §4928.02(D) Encourage innovation and market access for cost-effective supply- and demand-side retail electric service including, but not limited to, demand-side management, time-differentiated pricing, waste energy recovery systems, smart grid programs, and implementation of advanced metering infrastructure;

The proposed rate redesign also undermines the economics of energy efficiency investments, both historical and in the future. The proposed rates eliminate any opportunity for customers and the electricity system to realize the benefits of demand-side actions and investments aimed at reducing marginal (future) fixed costs.

- ORC §4928.02(E) Encourage cost-effective and efficient access to information regarding the operation of the transmission and distribution systems of electric utilities in order to promote both effective customer choice of retail electric service and the development of performance standards and targets for service quality for all consumers, including annual achievement reports written in plain language;

The proposed residential rate redesign obfuscates any price signal relating to customers' contributions to demand-related distribution fixed costs. By ignoring marginal fixed cost causation and treating all those fixed costs as customer charges based on class averages,

customers are denied valuable rate information concerning their contributions to demand-related cost causation.

- ORC §4928.02(L) Protect at-risk populations, including, but not limited to, when considering the implementation of any new advanced energy or renewable energy resource;

As discussed, the Company's proposed residential rate design is unjustified, economically regressive, unsubstantiated, and imposes significant burdens on at-risk populations. By design, the Company's proposed bill increases cannot be avoided or mitigated. The proposed rates redesign undermines the economics of all kinds of distributed energy resources, including efficiency, demand response, distributed generation, and distributed energy storage.

Q. What implications does the Company's proposed residential rates redesign have for the Commission's new PowerForward initiative?

A. The Company's proposed residential rates redesign would pre-decide and limit the exploration envisioned for the PowerForward initiative. As explained, the Company's proposals would undermine the economics of energy efficiency and other distributed energy resources, and establish an unjust and uneconomic model for rate making impacts on low users and low-income customers. The PowerForward initiative appears to be the ideal forum in which to explore alternative rate designs as well.

CONCLUSION

Q. What are your findings regarding the Company fixed customer charge proposals?

A. My findings are summarized as follows:

- The Company's proposal to shift recovery of demand related fixed costs from the volumetric energy rate to the customer charge is at odds with long-established

principles of regulatory ratemaking practice.

- The Company views *all fixed* costs associated with demand-related distribution investments as a *sunk* cost to be assigned to the customer charge, and therefore to be unaffected by variation in customer demand. This confusion of "sunk" and "fixed" costs ignores the impact that customer demand has on fixed costs *going forward*.
- The Company proposal to treat all fixed costs as sunk costs eliminates any price signal for residential customers—sending them the very wrong economic message that there is nothing they can or need to do to help keep *future fixed costs* from rising.
- Having labeled a large portion of fixed distribution costs as sunk, and having chosen to characterize the costs as "customer costs" as a result, the Company proposes to recover those costs in the fixed customer charge without explanation that the result is just and reasonable.
- The Company implies that its characterization of fixed distribution charges as customer costs reflects the principle of "cost causation," but does not further explain how this *cost-causation* finding leads to the *rate design* recommendation of recovering the costs in a fixed charge.
- The Company has offered a deeply flawed, wholly unsubstantiated, and inadequate justification for its request to ultimately increase the customer charge by more than 119%.
- The Company has not adequately considered the potential regressive impacts of its rate redesign proposals.
- The Company has not considered the adverse impacts of its rate redesign proposal on the economics of energy efficiency, demand response, distributed generation, and other products and services that could enhance the overall economic efficiency of and strengthen the economy and electric system in Ohio.

- The Company's proposed rate redesign fails when evaluated in light of Ohio state energy policy are reflected in ORC §4928.02. The Company proposes inefficient, discriminatory, and unreasonably priced electric service for residential customers, and rates that will impair customer choice and competition, energy efficiency, and distributed generation.

Q. Why does it matter that the Company has not justified its rate design proposals regarding fixed customer charges?

A. The decisions about how to allocate class costs to rates through rate design involve important concerns relating to affordability, price signals, and congruence with state energy policy. The Company's foundation for its residential rate proposals is inadequate in light of the significant repercussions for customers and the State generally, and it is therefore neither just nor reasonable. In my opinion, the Company's proposals fail to meet the legal and regulatory burden the Company faces, and should be disapproved.

RECOMMENDATIONS

Q. What are your recommendations to the Commission?

A. Based on my review of the evidence in this case, I make several recommendations:

- The Commission should not approve the Company's proposal to shift demand-related distribution fixed costs to customer charges for residential customers and should direct that such demand-related distribution fixed costs continue to be recovered through the volumetric distribution energy charge.
- The Commission should order the Company to conduct a thorough and detailed analysis of its low use and low income customer base so that it can evaluate future rate and service impacts on these customers.
- The Commission should order the Company to study the impacts of changes in

energy prices on energy consumption—demand elasticity—among each of its rate classes and major subclasses (e.g., residential customers, single-family home owners, apartment renters, low income customers, elderly customers, etc.).

- The Commission should order the Company to conduct a thorough and detailed evaluation of the impacts of a wide range of alternative residential rate design approaches on customer usage, the economics of energy efficiency and demand response, the economics of distributed generation, and other potential services, and in light of the emerging PowerForward dialogue.

Q. Does this conclude your testimony?

A. Yes.

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing Direct Testimony of Karl R. Rábago submitted on behalf of the Environmental Law & Policy Center was served by electronic mail, upon the following Parties of Record on May 2, 2017.

/s Madeline Fleisher
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Summary

Nationally recognized leader and innovator in electricity and energy law, policy, and regulation. Experienced as a public utility regulatory commissioner, educator, research and development program manager, utility executive, business builder, federal executive, corporate sustainability leader, consultant, and advocate. Highly proficient in advising, managing, and interacting with government agencies and committees, the media, citizen groups, and business associations. Successful track record of working with US Congress, state legislatures, governors, regulators, city councils, business leaders, researchers, academia, and community groups. National and international contacts through experience with Pace Energy and Climate Center, Austin Energy, AES Corporation, US Department of Energy, Texas Public Utility Commission, Jicarilla Apache Tribal Utility Authority, Cargill Dow LLC (now NatureWorks, LLC), Rocky Mountain Institute, CH2M HILL, Houston Advanced Research Center, Environmental Defense Fund, and others. Skilled attorney, negotiator, and advisor with more than twenty-five years of experience working with diverse stakeholder communities in electricity policy and regulation, emerging energy markets development, clean energy technology development, electric utility restructuring, smart grid development, and the implementation of sustainability principles. Extensive regulatory practice experience. Nationally recognized speaker on energy, environment and sustainable development matters. Managed staff as large as 250; responsible for operations of research facilities with staff in excess of 600. Developed and managed budgets in excess of $300 million. Law teaching experience at Pace University School of Law, University of Houston Law Center, and U.S. Military Academy at West Point. Post-doctorate degrees in environmental and military law. Military veteran.

Employment

PACE ENERGY AND CLIMATE CENTER, PACE UNIVERSITY SCHOOL OF LAW

Executive Director: May 2014—Present.

Leader of a team of professional and technical experts in energy and climate law, policy, and regulation. Secure funding for and manage execution of research, market development support, and advisory services for a wide range of funders, clients, and stakeholders with the overall goal of advancing clean energy deployment, climate responsibility, and market efficiency. Supervise a team of employees, consultants, and adjunct researchers. Provide learning and development opportunities for law students. Coordinate efforts of the Center with and support the environmental law faculty. Additional activities:

- Co-Director and Principal Investigator, Northeast Solar Energy Market Coalition (2015-present). The NESEMC is a US Department of Energy's SunShot Initiative Solar Market Pathways project. Funded under a cooperative agreement between the US DOE and Pace University, the NESEMC seeks to harmonize solar market policy and advance best policy and regulatory practices in the northeast United States.
- Chairman of the Board, Center for Resource Solutions (1997-present). CRS is a not-for-profit organization based at the Presidio in California. CRS developed and manages the Green-e Renewable Electricity Brand, a nationally and internationally recognized branding program

for green power and green pricing products and programs. Past chair of the Green-e Governance Board (formerly the Green Power Board).

- Director, Interstate Renewable Energy Council (IREC) (2012-present). IREC focuses on issues impacting expanded renewable energy use such as rules that support renewable energy and distributed resources in a restructured market, connecting small-scale renewables to the utility grid, developing quality credentials that indicate a level of knowledge and skills competency for renewable energy professionals.

RÁBAGO ENERGY LLC

Principal: July 2012—Present. Consulting practice dedicated to providing expert witness and policy formulation advice and services to organizations in the clean and advanced energy sectors. Recognized national leader in development and implementation of award-winning "Value of Solar" alternative to traditional net metering. Additional information at www.rabagoenergy.com.

AUSTIN ENERGY – THE CITY OF AUSTIN, TEXAS

Vice President, Distributed Energy Services: April 2009—June 2012. Executive in 8th largest public power electric utility serving more than one million people in central Texas. Responsible for management and oversight of energy efficiency, demand response, and conservation programs; low-income weatherization; distributed solar and other renewable energy technologies; green buildings program; key accounts relationships; electric vehicle infrastructure; and market research and product development. Executive sponsor of Austin Energy's participation in an innovative federally-funded smart grid demonstration project led by the Pecan Street Project. Led teams that successfully secured over $39 million in federal stimulus funds for energy efficiency, smart grid, and advanced electric transportation initiatives. Additional activities included:

- Director, Renewable Energy Markets Association. REMA is a trade association dedicated to maintaining and strengthening renewable energy markets in the United States.
- Membership on Pedernales Electric Cooperative Member Advisory Board. Invited by the Board of Directors to sit on first-ever board to provide formal input and guidance on energy efficiency and renewable energy issues for the nation's largest electric cooperative.

THE AES CORPORATION

Director, Government & Regulatory Affairs: June 2006—December 2008. Government and regulatory affairs manager for AES Wind Generation, one of the largest wind companies in the country. Manage a portfolio of regulatory and legislative initiatives to support wind energy market development in Texas, across the United States, and in many international markets. Active in national policy and the wind industry through work with the American Wind Energy Association as a participant on the organization's leadership council. Also served as Managing Director, Standards and Practices, for Greenhouse Gas Services, LLC, a GE and AES venture committed to generating and marketing greenhouse gas credits to the U.S. voluntary market. Authored and implemented a standard of practice based on ISO 14064 and industry best practices. Commissioned the development of a suite of methodologies and tools for various greenhouse gas credit-producing technologies. Also served as Director, Global Regulatory Affairs, providing regulatory support and group management to AES's international electric utility operations on five continents. Additional activities:

- Director and past Chair, Jicarilla Apache Nation Utility Authority (1998 to 2008). Located in New Mexico, the JAUA is an independent utility developing profitable and autonomous utility services that provides natural gas, water utility services, low income housing, and energy planning for the Nation. Authored "First Steps" renewable energy and energy efficiency strategic plan.

HOUSTON ADVANCED RESEARCH CENTER

Group Director, Energy and Buildings Solutions: December 2003—May 2006. Leader of energy and building science staff at a mission-driven not-for-profit contract research organization based in The Woodlands, Texas. Responsible for developing, maintaining and expanding upon technology development, application, and commercialization support programmatic activities, including the Center for Fuel Cell Research and Applications, an industry-driven testing and evaluation center for near-commercial fuel cell generators; the Gulf Coast Combined Heat and Power Application Center, a state and federally funded initiative; and the High Performance Green Buildings Practice, a consulting and outreach initiative. Secured funding for major new initiative in carbon nanotechnology applications in the energy sector. Developed and launched new and integrated program activities relating to hydrogen energy technologies, combined heat and power, distributed energy resources, renewable energy, energy efficiency, green buildings, and regional clean energy development. Active participant in policy development and regulatory implementation in Texas, the Southwest, and national venues. Frequently engaged with policy, regulatory, and market leaders in the region and internationally. Additional activities:

- President, Texas Renewable Energy Industries Association. As elected president of the statewide business association, leader and manager of successful efforts to secure and implement significant expansion of the state's renewable portfolio standard as well as other policy, regulatory, and market development activities.
- Director, Southwest Biofuels Initiative. Established the Initiative acts as an umbrella structure for a number of biofuels related projects, including emissions evaluation for a stationary biodiesel pilot project, feedstock development, and others.
- Member, Committee to Study the Environmental Impacts of Windpower, National Academies of Science National Research Council. The Committee was chartered by Congress and the Council on Environmental Quality to assess the impacts of wind power on the environment.
- Advisory Board Member, Environmental & Energy Law & Policy Journal, University of Houston Law Center.

CARGILL DOW LLC (NOW NATUREWORKS, LLC)

Sustainability Alliances Leader: April 2002—December 2003. Founded in 1997, NatureWorks, LLC is based in Minnetonka, Minnesota. Integrated sustainability principles into all aspects of a ground-breaking biobased polymer manufacturing venture. Responsible for maintaining, enhancing and building relationships with stakeholders in the worldwide sustainability community, as well as managing corporate and external sustainability initiatives. NatureWorks is the first company to offer its customers a family of polymers (polylactide – "PLA") derived entirely from annually renewable resources with the cost and performance necessary to compete with packaging materials and traditional fibers; now marketed under the brand name "Ingeo."

- Successfully completed Minnesota Management Institute at University of Minnesota Carlson School of Management, an alternative to an executive MBA program that surveyed fundamentals and new developments in finance, accounting, operations management, strategic planning, and human resource management.

ROCKY MOUNTAIN INSTITUTE

Managing Director/Principal: October 1999–April 2002. In two years, co-led the team and grew annual revenues from approximately $300,000 to more than $2 million in annual grant and consulting income. Co-authored "Small Is Profitable," a comprehensive analysis of the benefits of distributed energy resources. Worked to increase market opportunities for clean and distributed

energy resources through consulting, research, and publication activities. Provided consulting and advisory services to help business and government clients achieve sustainability through application and incorporation of Natural Capitalism principles. Frequent appearance in media at international, national, regional and local levels.

- President of the Board, Texas Ratepayers Organization to Save Energy. Texas R.O.S.E. is a non-profit organization advocating low-income consumer issues and energy efficiency programs.
- Co-Founder and Chair of the Advisory Board, Renewable Energy Policy Project-Center for Renewable Energy and Sustainable Technology. REPP-CREST was a national non-profit research and internet services organization.

CH2M HILL

Vice President, Energy, Environment and Systems Group: July 1998–August 1999. Responsible for providing consulting services to a wide range of energy-related businesses and organizations, and for creating new business opportunities in the energy industry for an established engineering and consulting firm. Completed comprehensive electric utility restructuring studies for the states of Colorado and Alaska.

PLANERGY

Vice President, New Energy Markets: January 1998–July 1998. Responsible for developing and managing new business opportunities for the energy services market. Provided consulting and advisory services to utility and energy service companies.

ENVIRONMENTAL DEFENSE FUND

Energy Program Manager: March 1996–January 1998. Managed renewable energy, energy efficiency, and electric utility restructuring programs for a not-for-profit environmental group with a staff of 160 and over 300,000 members. Led regulatory intervention activities in Texas and California. In Texas, played a key role in crafting Deliberative Polling processes. Initiated and managed nationwide collaborative activities aimed at increasing use of renewable energy and energy efficiency technologies in the electric utility industry, including the Green-e Certification Program, Power Scorecard, and others. Participated in national environmental and energy advocacy networks, including the Energy Advocates Network, the National Wind Coordinating Committee, the NCSL Advisory Committee on Energy, and the PV-COMPACT Coordinating Council. Frequently appeared before the Texas Legislature, Austin City Council, and regulatory commissions on electric restructuring issues.

UNITED STATES DEPARTMENT OF ENERGY

Deputy Assistant Secretary, Utility Technologies: January 1995–March 1996. Manager of the Department's programs in renewable energy technologies and systems, electric energy systems, energy efficiency, and integrated resource planning. Supervised technology research, development and deployment activities in photovoltaics, wind energy, geothermal energy, solar thermal energy, biomass energy, high-temperature superconductivity, transmission and distribution, hydrogen, and electric and magnetic fields. Developed, coordinated, and advised on legislation, policy, and renewable energy technology development within the Department, among other agencies, and with Congress. Managed, coordinated, and developed international agreements for cooperative activities in renewable energy and utility sector policy, regulation, and market development between the Department and counterpart foreign national entities. Established and enhanced partnerships with stakeholder groups, including technology firms, electric utility companies, state and local governments, and associations. Supervised development

and deployment support activities at national laboratories. Developed, advocated and managed a Congressional budget appropriation of approximately $300 million.

STATE OF TEXAS

Commissioner, Public Utility Commission of Texas. May 1992–December 1994. Appointed by Governor Ann W. Richards. Regulated electric and telephone utilities in Texas. Laid the groundwork for legislative and regulatory adoption of integrated resource planning, electric utility restructuring, and significantly increased use of renewable energy and energy efficiency resources. Co-chair and organizer of the Texas Sustainable Energy Development Council. Vice-Chair of the National Association of Regulatory Utility Commissioners (NARUC) Committee on Energy Conservation. Member and co-creator of the Photovoltaic Collaborative Market Project to Accelerate Commercial Technology (PV-COMPACT). Member, Southern States Energy Board Integrated Resource Planning Task Force. Member of the University of Houston Environmental Institute Board of Advisors.

LAW TEACHING

Professor for a Designated Service: Pace University Law School, 2014-present. Non-tenured member of faculty. Courses taught: Energy Law. Supervise a student clinical effort that engages in a wide range of advocacy, analysis, and research activities in support of the mission of the Pace Energy and Climate Center.

Associate Professor of Law: University of Houston Law Center, 1990–1992. Full time, tenure track member of faculty. Courses taught: Criminal Law, Environmental Law, Criminal Procedure, Environmental Crimes Seminar, Wildlife Protection Law. Provided *pro bono* legal services in administrative proceedings and filings at the Texas Public Utility Commission.

Assistant Professor: United States Military Academy, West Point, New York, 1988–1990. Member of the faculty in the Department of Law. Honorably discharged in August 1990, as Major in the Regular Army. Courses taught: Constitutional Law, Military Law, and Environmental Law Seminar. Greatly expanded the environmental law curriculum and laid foundation for the concentration program in law. While carrying a full time teaching load, earned a Master of Laws degree in Environmental Law. Established a program for subsequent environmental law professors to obtain an LL.M. prior to joining the faculty.

LITIGATION

Trial Defense Attorney and Prosecutor, U.S. Army Judge Advocate General's Corps, Fort Polk, Louisiana, January 1985–July 1987. Assigned to Trial Defense Service and Office of the Staff Judge Advocate. Prosecuted and defended more than 150 felony-level courts-martial. As prosecutor, served as legal officer for two brigade-sized units (approximately 5,000 soldiers), advising commanders on appropriate judicial, non-judicial, separation, and other actions. Pioneered use of some forms of psychiatric and scientific testimony in administrative and judicial proceedings.

NON-LEGAL MILITARY SERVICE

Armored Cavalry Officer, 2d Squadron 9th Armored Cavalry, Fort Stewart, Georgia, May 1978–August 1981. Served as Logistics Staff Officer (S-4). Managed budget, supplies, fuel, ammunition, and other support for an Armored Cavalry Squadron. Served as Support Platoon Leader for the Squadron (logistical support), and as line Platoon Leader in an Armored Cavalry Troop. Graduate of Airborne and Ranger Schools. Special training in Air Mobilization Planning and Nuclear, Biological and Chemical Warfare.

Formal Education

LL.M., Environmental Law, Pace University School of Law, 1990: Curriculum designed to provide breadth and depth in study of theoretical and practical aspects of environmental law. Courses included: International and Comparative Environmental Law, Conservation Law, Land Use Law, Seminar in Electric Utility Regulation, Scientific and Technical Issues Affecting Environmental Law, Environmental Regulation of Real Estate, Hazardous Wastes Law. Individual research with Hudson Riverkeeper Fund, Garrison, New York.

LL.M., Military Law, U.S. Army Judge Advocate General's School, 1988: Curriculum designed to prepare Judge Advocates for senior level staff service. Courses included: Administrative Law, Defensive Federal Litigation, Government Information Practices, Advanced Federal Litigation, Federal Tort Claims Act Seminar, Legal Writing and Communications, Comparative International Law.

J.D. with Honors, University of Texas School of Law, 1984: Attended law school under the U.S. Army Funded Legal Education Program, a fully funded scholarship awarded to 25 or fewer officers each year. Served as Editor-in-Chief (1983–84); Articles Editor (1982–83); Member (1982) of the Review of Litigation. Moot Court, Mock Trial, Board of Advocates. Summer internship at Staff Judge Advocate's offices. Prosecuted first cases prior to entering law school.

B.B.A., Business Management, Texas A&M University, 1977: ROTC Scholarship (3–yr). Member: Corps of Cadets, Parson's Mounted Cavalry, Wings & Sabers Scholarship Society, Rudder's Rangers, Town Hall Society, Freshman Honor Society, Alpha Phi Omega service fraternity.

Selected Publications

"Achieving very high PV penetration – The need for an effective electricity remuneration framework and a central role for grid operators," Richard Perez (corresponding author), Energy Policy, Vol. 96, pp. 27-35 (2016).

"The Net Metering Riddle," Electricity Policy.com, April 2016.

"The Clean Power Plan," Power Engineering Magazine (invited editorial), Vol. 119, Issue 12 (Dec. 2, 2015)

"The 'Sharing Utility:' Enabling & Rewarding Utility Performance, Service & Value in a Distributed Energy Age," co-author, 51st State Initiative, Solar Electric Power Association (Feb. 27, 2015)

"Rethinking the Grid: Encouraging Distributed Generation," Building Energy Magazine, Vol. 33, No. 1 Northeast Sustainable Energy Association (Spring 2015)

"The Value of Solar Tariff: Net Metering 2.0," The ICER Chronicle, Ed. 1, p. 46 [International Confederation of Energy Regulators] (December 2013)

"A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation," co-author, Interstate Renewable Energy Council (October 2013)

"The 'Value of Solar' Rate: Designing an Improved Residential Solar Tariff," Solar Industry, Vol. 6, No. 1 (Feb. 2013)

"A Review of Barriers to Biofuels Market Development in the United States," 2 Environmental & Energy Law & Policy Journal 179 (2008)

"A Strategy for Developing Stationary Biodiesel Generation," Cumberland Law Review, Vol. 36, p.461 (2006)

"Evaluating Fuel Cell Performance through Industry Collaboration," co-author, Fuel Cell Magazine (2005)

"Applications of Life Cycle Assessment to NatureWorks™ Polylactide (PLA) Production," co-author, Polymer Degradation and Stability 80, 403-19 (2003)

"An Energy Resource Investment Strategy for the City of San Francisco: Scenario Analysis of Alternative Electric Resource Options," contributing author, Prepared for the San Francisco Public Utilities Commission, Rocky Mountain Institute (2002)

"Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size," co-author, Rocky Mountain Institute (2002)

"Socio-Economic and Legal Issues Related to an Evaluation of the Regulatory Structure of the Retail Electric Industry in the State of Colorado," with Thomas E. Feiler, Colorado Public Utilities Commission and Colorado Electricity Advisory Panel (April 1, 1999)

"Study of Electric Utility Restructuring in Alaska," with Thomas E. Feiler, Legislative Joint Committee on electric Restructuring and the Alaska Public Utilities Commission (April 1, 1999)

"New Markets and New Opportunities: Competition in the Electric Industry Opens the Way for Renewables and Empowers Customers," EEBA Excellence (Journal of the Energy Efficient Building Association) (Summer 1998)

"Building a Better Future: Why Public Support for Renewable Energy Makes Sense," Spectrum: The Journal of State Government (Spring 1998)

"The Green-e Program: An Opportunity for Customers," with Ryan Wiser and Jan Hamrin, Electricity Journal, Vol. 11, No. 1 (January/February 1998)

"Being Virtual: Beyond Restructuring and How We Get There," Proceedings of the First Symposium on the Virtual Utility, Klewer Press (1997)

"Information Technology," Public Utilities Fortnightly (March 15, 1996)

"Better Decisions with Better Information: The Promise of GIS," with James P. Spiers, Public Utilities Fortnightly (November 1, 1993)

"The Regulatory Environment for Utility Energy Efficiency Programs," Proceedings of the Meeting on the Efficient Use of Electric Energy, Inter-American Development Bank (May 1993)

"An Alternative Framework for Low-Income Electric Ratepayer Services," with Danielle Jaussaud and Stephen Benenson, Proceedings of the Fourth National Conference on Integrated Resource Planning, National Association of Regulatory Utility Commissioners (September 1992)

"What Comes Out Must Go In: The Federal Non-Regulation of Cooling Water Intakes Under Section 316 of the Clean Water Act," Harvard Environmental Law Review, Vol. 16, p. 429 (1992)

"Least Cost Electricity for Texas," State Bar of Texas Environmental Law Journal, Vol. 22, p. 93 (1992)

"Environmental Costs of Electricity," Pace University School of Law, Contributor–Impingement and Entrainment Impacts, Oceana Publications, Inc. (1990)

Table of Testimony Submitted by Karl R. Rábago, on behalf of Pace Energy and Climate Center, and through Rábago Energy LLC

(as of 10 March 2017)

Date	Proceeding	Case/Docket #	On Behalf Of:
Dec. 21, 2012	VA Electric & Power Special Solar Power Tariff	Virginia SCC Case # PUE-2012-00064	Southern Environmental Law Center
May 10, 2013	Georgia Power Company 2013 IRP	Georgia PSC Docket # 36498	Georgia Solar Energy Industries Association
Jun. 23, 1203	Louisiana Public Service Commission Re-examination of Net Metering Rules	Louisiana PSC Docket # R-31417	Gulf States Solar Energy Industries Association
Aug. 29, 2013	DTE (Detroit Edison) 2013 Renewable Energy Plan Review (Michigan)	Michigan PUC Case # U-17302	Environmental Law and Policy Center
Sep. 5, 2013	CE (Consumers Energy) 2013 Renewable Energy Plan Review (Michigan)	Michigan PUC Case # U-17301	Environmental Law and Policy Center
Sep. 27, 2013	North Carolina Utilities Commission 2012 Avoided Cost Case	North Carolina Utilities Commission Docket # E-100, Sub. 136	North Carolina Sustainable Energy Association
Oct. 18, 2013	Georgia Power Company 2013 Rate Case	Georgia PSC Docket # 36989	Georgia Solar Energy Industries Association
Nov. 4, 2013	PEPCO Rate Case (District of Columbia)	District of Columbia PSC Formal Case # 1103	Grid 2.0 Working Group & Sierra Club of Washington, D.C.
Apr. 24, 2014	Dominion Virginia Electric Power 2013 IRP	Virginia SCC Case # PUE-2013-00088	Environmental Respondents
May 7, 2014	Arizona Corporation Commission Investigation on the Value and Cost of Distributed Generation	Arizona Corporation Commission Docket # E-00000J-14-0023	Rábago Energy LLC (invited presentation and workshop participation)
Jul. 10, 2014	North Carolina Utilities Commission 2014 Avoided Cost Case	North Carolina Utilities Commission Docket # E-100, Sub. 140	Southern Alliance for Clean Energy
Jul. 23, 2014	Florida Energy Efficiency and Conservation Act, Goal Setting – FPL, Duke, TECO, Gulf	Florida PSC Docket # 130199-EI, 130200-EI, 130201-EI, 130202-EI	Southern Alliance for Clean Energy
Sep. 19, 2014	Ameren Missouri's Application for Authorization to Suspend Payment of Solar Rebates	Missouri PSC File No. ET-2014-0350, Tariff # YE-2014-0494	Missouri Solar Energy Industries Association
Aug. 6, 2014	Appalachian Power Company 2014 Biennial Rate Review	Virginia SCC Case # PUE-2014-00026	Southern Environmental Law Center (Environmental Respondents)

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(as of 10 March 2017)

Aug. 13, 2014	Wisconsin Public Service Corp. 2014 Rate Application	Wisconsin PSC Docket # 6690-UR-123	RENEW Wisconsin and Environmental Law & Policy Center
Aug. 28, 2014	WE Energies 2014 Rate Application	Wisconsin PSC Docket # 05-UR-107	RENEW Wisconsin and Environmental Law & Policy Center
Sep. 18, 2014	Madison Gas & Electric Company 2014 Rate Application	Wisconsin PSC Docket # 3720-UR-120	RENEW Wisconsin and Environmental Law & Policy Center
Sep. 29, 2014	SOLAR, LLC v. Missouri Public Service Commission	Missouri District Court Case # 14AC-CC00316	SOLAR, LLC
Jan. 28, 2016 (date of CPUC order)	Order Instituting Rulemaking to Develop a Successor to Existing Net Energy Metering Tariffs, etc.	California PUC Rulemaking 14-07-002	The Utility Reform Network (TURN)
Mar. 20, 2015	Orange and Rockland Utilities 2015 Rate Application	New York PSC Case # 14-E-0493	Pace Energy and Climate Center
May 22, 2015	DTE Electric Company Rate Application	Michigan PSC Case # U-17767	Michigan Environmental Council, NRDC, Sierra Club, and ELPC
Jul. 20, 2015	Hawaiian Electric Company and NextEra Application for Change of Control	Hawai'i PUC Docket # 2015-0022	Hawai'i Department of Business, Economic Development, and Tourism
Sep. 2, 2015	Wisc. PSCo Rate Application	Wisconsin PSC Case # 6690-UR-124	ELPC
Sep. 15, 2015	Dominion Virginia Electric Power 2015 IRP	VA SCC Case # PUE-2015-00035	Environmental Respondents
Sep. 16, 2015	NYSEG & RGE Rate Cases	New York PSC Cases 15-E-0283, -0285	Pace Energy and Climate Center
Oct. 14, 2015	Florida Power & Light Application for CCPN for Lake Okeechobee Plant	Florida PSC Case 150196-EI	Environmental Confederation of Southwest Florida
Oct. 27, 2015	Appalachian Power Company 2015 IRP	VA SCC Case # PUE-2015-00036	Environmental Respondents
Nov. 23, 2015	Narragansett Electric Power/National Grid Rate Design Application	Rhode Island PUC Docket No. 4568	Wind Energy Development, LLC
Dec. 8, 2015	State of West Virginia, et al., v. U.S. EPA, et al.	U.S. Court of Appeals for the District of Columbia Circuit Case No. 15-1363 and Consolidated Cases	Declaration in Support of Environmental and Public Health Intervenors in Support of Movant Respondent-Intervenors' Responses in Opposition to Motions for Stay

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(as of 10 March 2017)

Dec. 28, 2015	Ohio Power/AEP Affiliate PPA Application	PUC of Ohio Case No. 14-1693-EL-RDR	Environmental Law and Policy Center
Jan. 19, 2016	Ohio Edison Company, Cleveland Electric Illuminating Company, and Toledo Edison Company Application for Electric Security Plan (FirstEnergy Affiliate PPA)	PUC of Ohio Case No. 14-1297-EL-SSO	Environmental Law and Policy Center
Jan. 22, 2016	Northern Indiana Public Service Company (NIPSCO) Rate Case	Indiana Utility Regulatory Commission Cause No. 44688	Citizens Action Coalition and Environmental Law and Policy Center
Mar. 18, 2016	Northern Indiana Public Service Company (NIPSCO) Rate Case – Settlement Testimony	Indiana Utility Regulatory Commission Cause No. 44688	Joint Intervenors – Citizens Action Coalition and Environmental Law and Policy Center
Mar. 18, 2016	Comments on Pilot Rate Proposals by MidAmerican and Alliant	Iowa Utility Board NOI-2014-0001	Environmental Law and Policy Center
May 27, 2016	Consolidated Edison of New York Rate Case	New York PSC Case No. 16-E-0060	Pace Energy and Climate Center
June 21, 2016	Federal Trade Commission: Workshop on Competition and Consumer Protection Issues in Solar Energy	Invited workshop presentation	Pace Energy and Climate Center
Aug. 17, 2016	Dominion Virginia Electric Power 2016 IRP	VA SCC Case # PUE-2016-00049	Environmental Respondents
Sep. 13, 2016	Appalachian Power Company 2016 IRP	VA SCC Case # PUE-2016-00050	Environmental Respondents
Oct. 27, 2016	Consumers Energy PURPA Compliance Filing	Michigan PSC Case No. U-18090	Environmental Law & Policy Center, "Joint Intervenors"
Oct. 28, 2016	Delmarva, PEPCO (PHI) Utility Transformation Filing – Review of Filing & Utilities of the Future Whitepaper	Maryland PSC Case PC 44	Public Interest Advocates
Dec. 1, 2016	DTE Electric Company PURPA Compliance Filing	Michigan PSC Case No. U-18091	Environmental Law & Policy Center, "Joint Intervenors"
Dec. 16, 2016	Rebuttal of Unitil Testimony in Net Energy Metering Docket	New Hampshire Docket No. DE 16-576	New Hampshire Sustainable Energy Association ("NHSEA")
Jan. 13, 2017	Gulf Power Company Rate Case	Florida Docket No. 160186-EI	Earthjustice, Southern Alliance for Clean Energy, League of Women Voters-Florida

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(as of 10 March 2017)

Jan. 13, 2017	Alpena Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18089	Environmental Law & Policy Center, "Joint Intervenors"
Jan. 13, 2017	Indiana Michigan Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18092	Environmental Law & Policy Center, "Joint Intervenors"
Jan. 13, 2017	Northern States Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18093	Environmental Law & Policy Center, "Joint Intervenors"
Jan. 13, 2017	Upper Peninsula Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18094	Environmental Law & Policy Center, "Joint Intervenors"
Mar. 10, 2017	Eversource Energy Grid Modernization Plan	Massachusetts DPU Case No. 15-122/15-123	Cape Light Compact
Apr. 27, 2017	Eversource Rate Case & Grid Modernization Investments	Massachusetts DPU Case No. 17-05	Cape Light Compact

"Principles of Public Utility Rates"

THREE-PART ANALYSIS OF THE COSTS OF AN ELECTRIC UTILITY BUSINESS

In order to simplify the exposition of a typical fully apportioned cost analysis, let us assume the application of the analysis to an electric utility company supplying a single city with power generated by its own steam-generation plant. Let us also assume the existence of only one class or type of service, all of which is supplied at the same voltage, phase, etc. to residential, commercial, and industrial customers. This latter assumption will permit us to center attention on the most controversial aspect of modern public utility cost analysis—the distinction among costs that are functions of outputs of the same service measured along different dimensions.

Since the company under review is supplying what we are here regarding as only one kind of service, we might suppose that the problem of total cost apportionment would be very simple; indeed, that it would be limited to a finding of the total annual operating and capital costs of the business, followed by a calculation of this total in terms of annual cost per kilowatt-hour of consumption. In fact, however, the problem is not so simple. For a statement of costs per kilowatt-hour would ignore the fact that many of these costs are not a function of kilowatt-hour output (or consumption) of energy. A recognition of multiple cost functions is therefore required.

The simplest division, and the one most frequently used (with subdivisions) in gas and electric rate cases, is a threefold division of the total operating and capital costs into "customer costs," "energy" or "volumetric costs," and "demand" or "capacity" costs.[7] If this threefold division of costs were to have its counterpart in the

[7] Other cost breakdowns, such as those allowing for the power factor, for voltage differences, for distances between points of generation and points of consumption, and for the customer-density factor, have been used to a limited extent. Compare Vickrey's selection of six parameters in order to approximate the response of the operating costs of the New York City Rapid Transit System to various changes in service and traffic: Train miles; car miles; maximum number of cars in service; number of passengers carried; number of passengers carried during the peak hour; and the layout of the system, consisting of the number of route miles, number of stations, etc. William S. Vickrey, *The Revision of the Rapid Transit Fare Structure of the City of New York*. Technical Monograph No. Three, Finance Project, Mayor's Committee on Management Survey of the City of New York, Feb., 1952, p. 8.

actual rates of charge for service, as it actually does have in some rates, there would result a three-part rate for any one class of service. For example, the monthly bill of a residential consumer might be the sum of a $1 customer charge, a $5 charge for 250 kilowatt-hours of energy at 2¢ per kilowatt-hour, and a $2 charge for a maximum demand of 2 kilowatts during the month at the rate of $1 per kilowatt—a total bill of $8 for that month. But our present interest lies in the measurement of costs of service, and only indirectly in rates that may or may not be designed to cover these costs. Let us therefore consider each of the three types of cost in turn, recognizing that this simplified classification is used only for illustrative purposes; costs actually vary in much more complex ways.

1. THE CUSTOMER COSTS

These are those operating and capital costs found to vary with number of customers regardless, or almost regardless, of power consumption. Included as a minimum are the costs of metering and billing along with whatever other expenses the company must incur in taking on another consumer. These minimum costs may come to $1 per month, more or less, for residential and small commercial customers, although they are substantially higher for large industrial users, who require more costly connections and metering devices. While costs on this order are sometimes separately charged for in residential and commercial rates, in the form of a mere "service charge," they are more frequently wholly or partly covered by a minimum charge which entitles the consumer to a very small amount of gas or electricity with no further payment.

But the really controversial aspect of customer-cost imputation arises because of the cost analyst's frequent practice of including, not just those costs that can be definitely earmarked as incurred for the benefit of specific customers but also a substantial fraction of the annual maintenance and capital costs of the secondary (low-voltage) distribution system—a fraction equal to the estimated annual costs of a hypothetical system of minimum capacity. This minimum capacity is sometimes determined by the smallest sizes of conductors deemed adequate to maintain voltage and to keep from falling of their own weight. In any case, the annual costs of this phantom, minimum-sized distribution system are treated as

customer costs and are deducted from the annual costs of the existing system, only the balance being included among those demand-related costs to be mentioned in the following section. Their inclusion among the customer costs is defended on the ground that, since they vary directly with the area of the distribution system (or else with the lengths of the distribution lines, depending on the type of distribution system), they therefore vary indirectly with the number of customers.

What this last-named cost imputation overlooks, of course, is the very weak correlation between the area (or the mileage) of a distribution system and the number of customers served by this system. For it makes no allowance for the density factor (customers per linear mile or per square mile). Indeed, if the company's entire service area stays fixed, an increase in number of customers does not necessarily betoken any increase whatever in the costs of a minimum-sized distribution system.

While, for the reason just suggested, the inclusion of the costs of a minimum-sized distribution system among the customer-related costs seems to me clearly indefensible,[8] its exclusion from the demand-related costs stands on much firmer ground. For this exclusion makes more plausible the assumption that the *remaining* cost of the secondary distribution system is a cost which varies continuously (and, perhaps, even more or less directly) with the maximum demand imposed on this system as measured by peak load.

But if the hypothetical cost of a minimum-sized distribution system is properly excluded from the demand-related costs for the reason just given, while it is also denied a place among the customer costs for the reason stated previously, to which cost function does it then belong? The only defensible answer, in my opinion, is that it belongs to none of them. Instead, it should be recognized as a strictly unallocable portion of total costs. And this is the disposition that it would probably receive in an estimate of long-run marginal costs. But the fully-distributed cost analyst dare not avail

[8] This is in accord with the views of Hubert F. Havlik: *Service Charges in Gas and Electric Rates* (New York, 1938), Chap. 8 and Appendix A. Allocation, in whole or in part, would be at least theoretically possible if a customer-density parameter were added to the three traditional cost components. See G. P. Watkins, *Electrical Rates* (New York, 1921), p. 212. But if this factor were embodied, not only in cost analysis but in the resulting rate differentials, rates would not be uniform throughout a given community and hence would violate a generally accepted tradition.

himself of this solution, since he is the prisoner of his own assumption that "the sum of the parts equals the whole." He is therefore under impelling pressure to "fudge" his cost apportionments by using the category of customer costs as a dumping ground for costs that he cannot plausibly impute to any of his other cost categories.

2. THE ENERGY COSTS

The energy-cost component of this threefold division of total annual costs is supposed to consist of those costs which would vary with changes in consumption of energy, measured in kilowatt-hours, even if the number of customers should remain constant and even if there were no change in maximum load upon the system or subsystem as measured by kilowatts or kilovolt amperes.[9] The most obvious costs of this character are fuel costs, although a small portion even of these costs may be regarded as demand-related on the ground that some fuel is required in order to maintain a "spinning reserve." But other operating costs may also be deemed to vary with output of energy and hence with consumption of energy, including whatever depreciation of the equipment may be regarded as a function of use rather than of obsolescence and aging.

Reduced to costs per kilowatt-hour, the imputed energy costs may be only a fraction of total average costs. It is this relative smallness which is often held to justify a company in conceding very low rates for off-peak or interruptible services, on the ground that these services impose upon the company little or no additional capacity costs.

The treatment of energy costs as a separate cost function is subject to one serious deficiency: namely, in its assumption that the

[9] Estimates of the ratio of energy-related costs to total costs of electric supply (including capital costs) have ranged from ⅓ down to only ¼. Referring to British conditions, Bolton writes: "More accurate costing has shown that, on the average, only one-quarter of the total costs of electricity supply are represented by coal or items proportional to energy, whilst three-quarters are represented by fixed costs or items proportional to power, etc." D. J. Bolton, *Costs and Tariffs in Electricity Supply* (London, 1951), p. 59. But he notes two practical reasons, among others, why this situation does not justify a corresponding dominance of demand charges rather than energy charges in electric rate structures: (a) that the effective power demand imposed upon the system by any given individual is very difficult to determine, and (b) that a pure demand-charge rate would probably lead to a more serious waste of energy than a pure energy rate would lead to a waste of power capacity. The latter reason invokes a "value-of-service" or "demand-elasticity" principle of rate making rather than a cost principle.

Results Summary of 2014-2017 Fixed Charge Increase Proposals

State	Utility	Holding Company	Electric/ Natural Gas	Monthly Fixed Residential Charges			Percent Change		Notes	Decision Date
				Existing	Proposed	Approved	Existing to Proposed	Existing to Approved		
Electric										
AR	Entergy Arkansas	Entergy Corporation	Electric	$6.95	$9.00	$8.43	29%	21%		2/2016
AZ	Arizona Public Service		Electric	$8.66	$24.00	$15.00	177%	73%	Settlement pending. Fixed charges	
AZ	UniSource Energy Services	Fortis	Electric	$10.00	$20.00	$15.00	100%	50%	Also rejected mandatory demand	8/2016
CA	Liberty Utilities	Algonquin Power and	Electric	$7.10	$7.67	$6.56	8%	-8%	Settlement; decreased fixed charge	12/2016
CA	Pacific Gas & Electric Company	PG&E Corp	Electric	$0.00	$10.00	$0.00	0%	0%	$10 minimum bill adopted instead	7/2015
CA	San Diego Gas & Electric	Sempra Energy	Electric	$0.00	$10.00	$0.00	0%	0%	$10 minimum bill adopted instead	7/2015
CA	Southern California Edison	Edison International	Electric	$0.95	$10.00	$0.95	953%	0%	$10 minimum bill adopted instead	7/2015
CO	Public Service Company of Colorado	Xcel Energy	Electric	$7.71	$5.78	$5.39	-25%	-30%	Settlement; decreased fixed charge,	11/2016
CO	Black Hills Energy	Black Hills Corporation	Electric	$16.50	$18.62	$16.50	13%	0%		11/2016
CT	United Illuminating Company	Avangrid	Electric	$17.25	$17.25	$9.67	0%	-44%	Decreased fixed charge; first	12/2016
CT	Connecticut Light & Power	Eversource Energy	Electric	$16.00	$25.50	$19.25	59%	20%		12/2014
CT	Statewide	N/A	Electric	Legislature acted to essentially overturn commission's approval of CL&P's 12/2014					Legislation	7/2015
FL	Gulf Power		Electric	$18.86	$48.06	$18.86	155%	0%	Settlement pending	
FL	Florida Light and Power	NextEra Energy	Electric	$7.87	$10.00	$7.87	27%	0%	Settlement	12/2016
ID	Avista Utilities	Avista Utilities	Electric	$5.25	$6.25	$5.75	19%	10%	Settlement	12/2016
ID	Avista Utilities	Avista Utilities	Electric	$5.25	$8.50	$5.25	62%	0%	Settlement; decoupling pilot	12/2015
IN	Indianapolis Power & Light	AES	Electric	$11.00	$17.00	$17.00	55%	55%		3/2016
IN	Northern Indiana Public Service	NiSource Inc.	Electric	$11.00	$20.00	$14.00	82%	27%	Settlement	7/2016
IN	Statewide	N/A	Electric	Proposed legislation to increase fixed charges was withdrawn by the House					Legislation	2/2015
KS	Empire District Electric	Empire District Electric	Electric	$14.00	$19.60	$14.00	40%	0%	10/6/16 Settlement pending approval	1/2017
KS	KCP&L	Great Plains Energy	Electric	$10.71	$19.00	$14.00	77%	31%	Settlement	9/2015
KS	Westar	Westar	Electric	$12.00	$27.00	$14.50	125%	21%	Settlement	9/2015
KY	Kentucky Utilities Company	PPL Corp	Electric	$10.75	$18.00	$10.75	67%	0%	Settlement	6/2015
KY	Louisville Gas-Electric	PPL Corp	Electric	$10.75	$18.00	$10.75	67%	0%	Settlement	6/2015
KY	Kentucky Power	AEP	Electric	$8.00	$16.00	$11.00	100%	38%		6/2015
MA	Massachusetts Electric Co	National Grid	Electric	$4.00	$20.00	$5.50	400%	38%	Tiered fixed charge (increases to $6-	9/2016
MD	Delmarva Power & Light	Exelon	Electric	$7.94	$12.00	$9.43	51%	19%	Proposed order (final order expected	
MD	PEPCO	Exelon	Electric	$7.39	$12.00	$7.60	62%	3%		11/2016
MD	Baltimore Gas +Electric	Exelon	Electric	$7.50	$10.50	$7.50	40%	0%	Settlement	12/2014
MD	Baltimore Gas +Electric	Exelon	Electric	$7.50	$12.00	$7.90	60%	5%	Noted gradualism	6/2016
ME	Emera Maine	Emera	Electric	$5.82	$6.31	$6.75	8%	16%	(mimimum distribution service charge)	12/2016
ME	Central Maine Power Company	Iberdrola	Electric	$5.71	$20.00	$10.00	250%	75%	Decoupling implemented as well	8/2014
MI	Upper Peninsula Power Company	WEC Energy Group	Electric	$12.00	$15.00	$15.00	25%	25%		9/2016
MI	Consumers Energy	CMS Energy Corporation	Electric	$7.00	$7.50	$7.00	7%	0%		11/2015
MI	DTE Electric Company	DTE Energy	Electric	$6.00	$9.00	$7.50	50%	25%		1/2017
MI	DTE Electric Company	DTE Energy	Electric	$6.00	$10.00	$6.00	67%	0%		12/2015
MI	Indiana Michigan Power	AEP	Electric	$7.25	$9.10	$7.25	26%	0%	Settlement	8/2015
MI	Xcel Energy	Xcel Energy	Electric	$8.65	$8.75	$8.75	1%	1%		4/2015
MI	Wisconsin Public Service	WEC Energy Group	Electric	$9.00	$12.00	$12.00	33%	33%	Settlement	4/2015
MN	Xcel Energy	Xcel Energy	Electric	$8.00	$9.25	$8.00	16%	0%	Denied in favor of decoupling	5/2015
MO	Kansas City Power & Light - Greater	Great Plains Energy	Electric	$9.54	$14.50	$10.43	52%	9%	Settlement; existing fixed charge was	9/2016
MO	Empire District Electric	Empire District Electric	Electric	$12.52	$14.47	$13.00	16%	4%	Settlement	8/2016
MO	Ameren	Ameren	Electric	$8.00	$8.77	$8.00	10%	0%	Emphasized customer control	4/2015
MO	KCP&L	Great Plains Energy	Electric	$9.00	$25.00	$11.88	178%	32%		9/2015
MO	Empire District Electric	Empire District Electric	Electric	$12.52	$18.75	$12.52	50%	0%	Settlement	6/2015

Results Summary of 2014-2017 Fixed Charge Increase Proposals

State	Utility	Holding Company	Electric/ Natural Gas	Monthly Fixed Residential Charges			Percent Change		Notes	Decision Date
				Existing	Proposed	Approved	Existing to Proposed	Existing to Approved		
Electric										
MT	Montana-Dakota Utilities	MDU Resources Group	Electric	$5.40	$7.50	$5.40	39%	0%	Settlement	3/2016
NC	Dominion North Carolina Power	Dominion Resources	Electric	$10.96	$13.48	$10.96	23%	0%	Settlement	12/2016
ND	Montana-Dakota Utilities	MDU Resources Group	Electric	$10.65	$19.77	$14.00	86%	31%	Settlement pending	
NJ	Jersey Central Power and Light	FirstEnergy	Electric	$1.92	$2.99	$2.98	56%	55%		12/2017
NJ	Atlantic City Electric Company	Exelon	Electric	$4.00	$6.00	$4.44	50%	11%	Settlement	8/2016
NM	Southwestern Public Service Company	Xcel Energy	Electric	$7.90	$9.95	$8.50	26%	8%	Settlement	8/2016
NM	Public Service Co. of New Mexico	PNM Resources Inc	Electric	$5.00	$13.00	$7.00	160%	40%		9/2016
NM	El Paso Electric	El Paso Electric	Electric	$7.00	$10.00	$7.00	43%	0%	Rejected recommended decision, citing low income and average use customers & conservation	6/2016
NV	Sierra Pacific Power Company	Nevada Energy/Berkshire Hathaway	Electric	$15.25	$20.75	$15.25	36%	0%	Settlement	12/2016
NV	Nevada Power	Nevada Energy/Berkshire Hathaway	Electric	$10.00	$15.25	$12.75	53%	28%		10/2014
NY	Central Hudson Gas & Electric	Fortis	Electric	$24.00	$30.00	$24.00	25%	0%		6/2015
NY	Consolidated Edison	Consolidated Edison	Electric	$15.76	$18.00	$15.76	14%	0%	Settlement	6/2015
NY	New York State Electric and Gas	Iberdrola	Electric	$15.11	$18.89	$15.11	25%	0%	Settlement	6/2016
NY	Rochester Gas & Electric	Iberdrola	Electric	$21.38	$26.73	$21.38	25%	0%	Settlement	6/2016
NY	Orange & Rockland	Consolidated Edison	Electric	$20.00	$25.00	$20.00	25%	0%	Settlement	10/2015
OK	Oklahoma Gas & Electric	OG&E Energy	Electric	$13.00	$26.54	$13.00	104%	0%	Settlement pending	
OK	Public Service Co. of Oklahoma	AEP	Electric	$16.16	$20.00	$20.00	24%	24%		4/2015
OR	Portland General Electric	Portland General Electric	Electric	$10.00	$11.00	$10.50	10%	5%	Settlement	11/2015
PA	Pennsylvania Power	FirstEnergy	Electric	$10.85	$13.41	$11.00	24%	1%	Settlement	1/2017
PA	West Penn Power	FirstEnergy	Electric	$5.81	$13.98	$7.44	141%	28%	Settlement	1/2017
PA	Metropolitan Edison	FirstEnergy	Electric	$10.25	$17.42	$11.25	70%	10%	Settlement	1/2017
PA	Pennsylvania Electric	FirstEnergy	Electric	$9.99	$17.10	$11.25	71%	13%	Settlement	1/2017
PA	Pennsylvania Power	FirstEnergy	Electric	$8.89	$12.71	$10.85	43%	22%	Settlement	4/2015
PA	West Penn Power	FirstEnergy	Electric	$5.00	$7.35	$5.81	47%	16%	Settlement	4/2015
PA	Metropolitan Edison	FirstEnergy	Electric	$8.11	$13.29	$10.25	64%	26%	Settlement	4/2015
PA	Pennsylvania Electric	FirstEnergy	Electric	$7.98	$11.92	$9.99	49%	25%	Settlement	4/2015
PA	PECO	Exelon	Electric	$7.09	$12.00	$8.45	69%	19%	Settlement; decoupling collaborative discussions	12/2015
PA	PPL	PPL Corp	Electric	$14.09	$20.00	$14.09	42%	0%	Settlement; decoupling collaborative discussions	11/2015
SC	Duke Energy Progress	Duke Energy	Electric	$6.50	$9.25	$9.06	42%	39%	Settlement; and no further fixed charge changes in 2018	12/2016
SD	NorthWestern Energy	Northwestern Company	Electric	$5.00	$9.00	$6.00	80%	20%	Settlement	11/2015
SD	MidAmerican	Berkshire Hathaway Energy	Electric	$7.00	$8.50	$8.00	21%	14%		7/2015
TN	Kingsport Power Company	AEP	Electric	$7.30	$11.00	$12.63	51%	73%	Settlement	10/2016
TN	Entergy Arkansas	Entergy Corporation	Electric	$6.96	$8.40	$8.40	21%	21%		7/2016
TX	El Paso Electric	El Paso Electric	Electric	$5.00	$10.00	$6.90	100%	38%	Settlement	8/2016
TX	Southwestern Public Service Company	Xcel Energy	Electric	$9.50	$10.50	$10.00	11%	5%	Settlement	1/2017
TX	Southwestern Public Service Company	Xcel Energy	Electric	$7.50	$9.50	$9.50	27%	27%		12/2015
UT	Rocky Mountain Power	PacifiCorp/Berkshire Hathaway Energy	Electric	$5.00	$8.00	$6.00	60%	20%	Settlement	8/2014
VA	Appalachian Power Co	AEP	Electric	$8.35	$16.00	$8.35	92%	0%		11/2014

Results Summary of 2014-2017 Fixed Charge Increase Proposals

State	Utility	Holding Company	Electric/ Natural Gas	Monthly Fixed Residential Charges			Percent Change		Notes	Decision Date
				Existing	Proposed	Approved	Existing to Proposed	Existing to Approved		
Electric										
WA	Avista Utilities	Avista	Electric	$8.50	$9.50	$8.50	12%	0%		12/2016
WA	Avista Utilities	Avista	Electric	$8.50	$14.00	$8.50	65%	0%	Settlement	1/2016
WA	PacifiCorp	PacifiCorp/Berkshire Hathaway Energy	Electric	$7.75	$14.00	$7.75	81%	0%	Stated preference for decoupling	3/2015
WV	Appalachian Power/Wheeling Power	AEP	Electric	$5.00	$10.00	$8.00	100%	60%		5/2015
WI	Wisonsin Power and Light	Alliant Energy	Electric	$7.67	$18.00	$15.00	135%	96%		11/2016
WI	Madison Gas and Electric	MGE Energy	Electric	$10.29	$68.00	$19.00	113%	87%		12/2014
WI	Xcel Energy	Xcel Energy	Electric	$8.00	$18.00	$14.00	113%	87%		12/2015
WI	We Energies	WEC Energy Group	Electric	$9.13	$16.00	$16.00	75%	75%		11/2014
WI	Wisconsin Public Service	WEC Energy Group	Electric	$10.40	$25.00	$19.00	140%	83%		11/2014
WI	Wisconsin Public Service	WEC Energy Group	Electric	$19.00	$25.00	$21.00	140%	83%	PSC to undertake study on customer impacts of fixed charge	11/2015

OHIO POWER COMPANY'S RESPONSE TO
THE ENVIRONMENTAL LAW AND POLICY CENTER'S
DISCOVERY REQUEST
PUCO CASE. NO. 16-1852-EL-SSO et al.
FIRST SET

REQUEST FOR PRODUCTION OF DOCUMENTS

ELPC-RPD-1-005 Please provide all analyses, evaluations, reports, or studies that the Company conducted to evaluate any rate design with a lower fixed customer charge than that proposed by the Company.

RESPONSE

The Company objects to the form of the question as this request is vague, overbroad and/or unduly burdensome. Without waiving the foregoing objection(s) or any general objection the Company may have, the Company states as follows. The Company did not perform nor contemplate that type of design.

Prepared by: David R. Gill
Counsel

OHIO POWER COMPANY'S RESPONSE TO
THE ENVIRONMENTAL LAW AND POLICY CENTER'S
DISCOVERY REQUEST
PUCO CASE. NO. 16-1852-EL-SSO et al.
FIRST SET

INTERROGATORY

ELPC-INT-1-006 Refer to Company witness Moore's testimony at page 13, lines 5-6. Please explain how the Company will "move customers towards the full customer charge" of $27.24 "in a gradual fashion."

RESPONSE

The Company's proposal in this case is to increase the customer charge and reduce the energy charge in two increments and not to increase the customer charge to the full $27.24 with no energy charge. The two incremental changes were prosed to represent gradually implementing the change.

Prepared by: Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE
TO NATURAL RESOURCES DEFENSE COUNCIL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO
FIRST SET

REQUEST FOR PRODUCTION OF DOCUMENTS

NRDC-RPD-1-031 Please provide a breakdown of the bill changes in Exhibit DRG-7, between the effects of rate redesign and the effects of other adjustments and riders.

RESPONSE

The Company has not performed the requested analysis.

Prepared by: David R. Gill

**OHIO POWER COMPANY'S RESPONSE TO
THE ENVIRONMENTAL LAW AND POLICY CENTER'S
DISCOVERY REQUEST
PUCO CASE. NO. 16-1852-EL-SSO et al.
FIRST SET**

REQUEST FOR PRODUCTION OF DOCUMENTS

ELPC-RPD-1-010 Please provide all data, evaluations, analyses, reports, or studies since 2010 relating to income levels of AEP Ohio residential customers.

RESPONSE

The Company objects to the form of the question as this request is vague, overbroad and/or unduly burdensome. The Company also objects to a request to identify all supporting analyses, to the extent such analyses are not documented and cannot be discovered through an interrogatory or request for production. The Company objects to this request seeking a narrative answer that includes an array of details or outlines of evidence, which can be more efficiently answered through production of documents or taking of depositions. Without waiving the foregoing objection(s) or any general objection the Company may have, the Company states as follows. The Company has not performed a separate or distinct scientific study that supports the proposition being discussed. But the Company maintains that its position is just and reasonable and is adequately supported and explained in testimony.

Prepared by: Andrea E. Moore
Counsel

Ohio Power - Columbus Southern Power Rate Zone

2015 Average Monthly Usage

kWh/Mo.	*Frequency*	% of Customers	Cumulative %
0	1778	0.36%	0.36%
100	10803	2.21%	2.58%
200	17560	3.60%	6.18%
300	32462	6.65%	12.83%
400	43438	8.90%	21.74%
500	40797	8.36%	30.10%
600	39794	8.16%	38.26%
700	40865	8.38%	46.64%
800	40031	8.21%	54.84%
900	35994	7.38%	62.22%
1000	31108	6.38%	68.60%
1100	25838	5.30%	73.90%
1200	21430	4.39%	78.29%
1300	17454	3.58%	81.87%
1400	14390	2.95%	84.82%
1500	12051	2.47%	87.29%
1600	10186	2.09%	89.38%
1700	8426	1.73%	91.10%
1800	7185	1.47%	92.58%
1900	6014	1.23%	93.81%
2000	5004	1.03%	94.84%
2100	4222	0.87%	95.70%
2200	3508	0.72%	96.42%
2300	2807	0.58%	97.00%
2400	2384	0.49%	97.48%
2500	1944	0.40%	97.88%
2600	1610	0.33%	98.21%
2700	1325	0.27%	98.48%
2800	1082	0.22%	98.71%
2900	907	0.19%	98.89%
3000	794	0.16%	99.05%
> 3000	4611	0.95%	100.00%
	487,802	100.00%	

Notes: Numbers shown represent number of standard tariff residential customers (Frequency) by average monthly usage (kWh/Mo) calculated by summing monthly usage and dividing by 12.
The first group is zero average usage. The second one (labeled 100) is average usage > 0 and ≤ 100.
For this analysis, storage water heating and time-of-use residential customers were excluded.
In addition, only customers with a full 12 months of usage were included.

Ohio Power - Ohio Power Rate Zone

2015 Average Monthly Usage

kWh/Mo.	*Frequency*	% of Customers	Cumulative %
0	1628	0.39%	0.39%
100	9310	2.21%	2.60%
200	8550	2.03%	4.63%
300	15315	3.64%	8.26%
400	23986	5.69%	13.95%
500	29746	7.06%	21.01%
600	32850	7.80%	28.81%
700	34633	8.22%	37.03%
800	34277	8.14%	45.17%
900	31816	7.55%	52.72%
1000	28925	6.87%	59.58%
1100	25420	6.03%	65.62%
1200	22023	5.23%	70.84%
1300	19053	4.52%	75.37%
1400	16168	3.84%	79.20%
1500	13865	3.29%	82.49%
1600	11860	2.81%	85.31%
1700	10088	2.39%	87.70%
1800	8622	2.05%	89.75%
1900	7251	1.72%	91.47%
2000	6073	1.44%	92.91%
2100	5114	1.21%	94.13%
2200	4201	1.00%	95.12%
2300	3476	0.83%	95.95%
2400	2886	0.68%	96.63%
2500	2354	0.56%	97.19%
2600	1955	0.46%	97.66%
2700	1704	0.40%	98.06%
2800	1340	0.32%	98.38%
2900	1074	0.25%	98.63%
3000	838	0.20%	98.83%
> 3000	4918	1.17%	100.00%
	421319	100.00%	

Notes: Numbers shown represent number of standard tariff residential customers (Frequency) by average monthly usage (kWh/Mo) calculated by summing monthly usage and dividing by 12. The first group is zero average usage. The second one (labeled 100) is average usage > 0 and ≤ 100. For this analysis, storage water heating and time-of-use residential customers were excluded. In addition, only customers with a full 12 months of usage were included.

OHIO POWER COMPANY'S RESPONSE
TO NATURAL RESOURCES DEFENSE COUNCIL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO
FIRST SET

REQUEST FOR PRODUCTION OF DOCUMENTS

NRDC-RPD-1-027 Please provide any studies or documents available to the Company that estimate the extent to which a decrease in energy charges will increase energy usage by customers.

RESPONSE

The Company has not performed the requested analysis.

Prepared by: Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE
TO NATURAL RESOURCES DEFENSE COUNCIL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO
FIRST SET

REQUEST FOR PRODUCTION OF DOCUMENTS

NRDC-RPD-1-028 Please provide any data on the bill frequency distribution of the Company's low-income residential customers, other than those on the Percentage of Income Payment Plan.

RESPONSE

The Company has not performed the requested analysis.

Prepared by: Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE
TO NATURAL RESOURCES DEFENSE COUNCIL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO
FIRST SET

INTERROGATORY

NRDC-INT-1-013 Please explain whether the higher proposed customer charge ($18.40 by January 1, 2018, as described on pages 12 to 13 of Witness Moore's Direct Testimony) may encourage some customers who are eligible for the Percentage of Income Payment Plan and have consumption below the average residential usage to file for the Percentage of Income Payment Plan. If not, please explain why.

RESPONSE

As a premise for the question, the Company cannot verify that there are any PIPP eligible customers that are not already participating in the program. Further, the Company has not performed any studies that would indicate whether or not the higher proposed customer charge would encourage customers that are already eligible to participate in the PIPP plan (but chose not to participate to date) would begin participating if their usage was below the average usage.

Prepared by: Selwyn J. Dias
Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE TO
THE ENVIRONMENTAL LAW AND POLICY CENTER'S
DISCOVERY REQUEST
PUCO CASE. NO. 16-1852-EL-SSO et al.
FIRST SET

INTERROGATORY

ELPC-INT-1-008 Please identify:
(a) the number and percentage of Percentage of Income Payment Plan ("PIPP") customers served by AEP Ohio in each year from 2011 through 2016;
(b) a bill frequency analysis for PIPP customers served by AEP Ohio in each year from 2011 through 2016;
(c) average and median monthly kilowatt hour usage data for PIPP customers served by AEP Ohio in each year from 2011 through 2016;
(d) average and median monthly kilowatt hour usage data for non-PIPP customers served by AEP Ohio in each year from 2011 through 2016;
(e) the number and percentage of AEP Ohio residential customers with average monthly kilowatt hour usage of less than 1030 kilowatt hours in each year from 2011 through 2016.

RESPONSE

a. See ELPC INT 1-008 Attachment 1.

b. The Company does not have the data as requested.

c. See ELPC INT 1-008 Attachment 1 for the average monthly kilowatt hour usage data. The Company does not have the median kilowatt hour data as requested.

d. The Company does not have the data as requested. See ELPC INT 1-008 Attachment 2 for the billed kWh for the months requested for total residential. The number of customers is included in ELPC INT 1-008 Attachment 1.

e. The Company has not performed that calculation

Prepared by: Andrea E. Moore

**OHIO POWER COMPANY'S RESPONSE TO
THE ENVIRONMENTAL LAW AND POLICY CENTER'S
DISCOVERY REQUEST
PUCO CASE. NO. 16-1852-EL-SSO et al.
FIRST SET**

INTERROGATORY

ELPC-INT-1-009 For 2011-2016, please provide monthly and annual customer counts for: (a) residential customers with average monthly usage of 0-300 kWh/month; 301-400 kWh/month; 401-500 kWh/month; 501-600 kwh/month; 601-700 kwh/month; 701-800 kwh/month; 801-900 kwh/month; 901-1000 kwh/month; 1001-1100 kwh/month; 1101-1200 kwh/month; 1201-1300 kwh/month; 1301-1400 kwh/month; 1401-1500 kWh/month; 1501-2000 kWh/month; 2001-2500 kWh/month; 2501-3000 kWh/month; and 3000 kWh/month and above;
(b) PIPP customers with average monthly usage of 0-300 kWh/month; 301-400 kWh/month; 401-500 kWh/month; 501-600 kwh/month; 601-700 kwh/month; 701-800 kwh/month; 801-900 kwh/month; 901-1000 kwh/month; 1001-1100 kwh/month; 1101-1200 kwh/month; 1201-1300 kwh/month; 1301-1400 kwh/month; 1401-1500 kWh/month; 1501-2000 kWh/month; 2001-2500 kWh/month; 2501-3000 kWh/month; and 3000 kWh/month and above.

RESPONSE

The Company has not performed that calculation.

Prepared by: Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE
TO NATURAL RESOURCES DEFENSE COUNCIL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO
FIRST SET

INTERROGATORY

NRDC-INT-1-014 On page 14, lines 10-11, of her Direct Testimony, Witness Moore states, "with the proposed increase in the customer charge more accurately reflecting the cost causation from customers' use of the distribution system." Please explain how the proposed increase more accurately reflects the cost causation from the customers' use of the distribution system. Specifically, please list the components of the distribution system for which the Company believes that cost causation is more accurately reflected by including the cost in a customer charge, rather than in an energy charge.

RESPONSE

The cost of providing distribution service do not vary with volumetric usage. Generally, the distribution system costs are affected by either peak demand imposed on the distribution facilities or by the number of customers served. If these costs are primarily recovered through an energy charge, the customer is sent a price signal that by lowering their usage they are lowering the cost imposed on the system even though they have not necessarily lowered the costs imposed on the system.

Prepared by: Selwyn J. Dias
Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE TO
THE OFFICE OF THE OHIO CONSUMERS' COUNSEL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO et al.
SECOND SET

INTERROGATORY

OCC-INT-2-276 From the testimony of Andrea E. Moore Page 13, lines 7 – 11:
"Distribution costs are incurred by sizing the distribution system to meet customer(s) peak kW demand usage. These costs vary by peak demand requirement, not by kWh usage or by simply connecting a customer to the system. These costs would be ideally collected through a demand charge, but this cannot be done for all customers due to the current limitations of the Company's metering infrastructure."
a. Does "limitations of the Company's metering infrastructure" refer to the lack of demand meters for residential customers?
b. If demand costs are neither kWh or customer-connection driven, why is it more appropriate to put them in the customer charge rather that a kWh charge?

RESPONSE

a. Yes

b. The cost of providing service does not vary with volumetric usage. Generally, the distribution system costs are affected by either peak demand imposed on the distribution facilities or by the number of customers. If these costs are primarily recovery through an energy charge, the customer is sent a price signal that by lowering their usage they are lowering the cost imposed on the system even through they have not necessarily lowered the costs imposed on the system.

Prepared by: Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE TO
THE PUBLIC UTILITIES COMMISSION'S
DISCOVERY REQUEST
PUCO CASE 16-1852-EL-SSO et al.
FIRST SET

INTERROGATORY

OCC-INT-1-046 Referring to the Moore Testimony at 12:18- 14:2, identify why the Company proposes to increase the residential customer charge if, given the offset of the PTBAR, the rate design is revenue neutral.

RESPONSE

The revenue neutral rate design proposed assures that all customers pay a fair share of the system. The amount collected for base rates by the Company will be the same, the way the dollars get collected will differ. This rate design more closely aligns with the full-based customer charge the Company calculated in Case No. 11-351-EL-AIR.

Prepared by: Andrea E. Moore

OHIO POWER COMPANY'S RESPONSE
TO NATURAL RESOURCES DEFENSE COUNCIL'S
DISCOVERY REQUEST
PUCO CASE NO. 16-1852-EL-SSO
FIRST SET

INTERROGATORY

NRDC-INT-1-012 Please describe whether the Company expects or understands that a decrease in energy charges would increase energy usage by customers, and the basis for that expectation or understanding.

RESPONSE

The Company objects to the form of the question and further objects because this request seeking the Company's expectations is vague, overbroad and requests information that is not presently known with certainty. The Company further objects because it is unable to fully answer the hypothetical question posed in the absence of all of the pertinent assumptions and fact/circumstances that apply to the hypothetical scenario. Without waiving the foregoing objection(s) or any general objection the Company may have, the Company states as follows. There are a number of variables that can affect a customer's energy usage. One example could be a customer's intentional goal of reducing energy usage to reduce greenhouse gas emissions. If that is the motive, there may not be an increase in energy usage based on price signals. Further, a large portion of the bill total for a typical residential customer using 1,000 kWh per month varies with usage. Please see NRDC-INT-1-012 Attachment 1 for a quantification, using rates current as of 3-10-17, of the portion of the total bill that varies with usage. Please note that the "Proposed" bill total reflects the increase of the customer charge to $18.40, the corresponding decrease to the base distribution energy charge, and no other changes. Pricing the distribution portion more in line with the cost of the system will maintain the opportunity for plenty of savings for lowering energy usage.

Prepared by: Andrea E. Moore
David R. Gill
Counsel

Ohio Power Company
Columbus Southern Power Rate Zone
Residential Secondary Bundled Service
Breakdown of Charges Based on Entered Information

Billing Parameters

Metered kWh Usage: 1,000 kWh

Bill Calculation			Rates					**Billing**			
			Generation	Transmission	Distribution	Total		**Generation**	**Transmission**	**Distribution**	**Total**
Customer Charge					$ 8.40	$ 8.40				$ 8.40	$ 8.40
Energy Charge	1,000 kWh	x			$ 0.0182747	$ 0.0182747	/kWh			$ 18.27	$ 18.27
Base Charges										**$ 26.67**	**$ 26.67**
Riders											
Universal Service Fund (first 833,000 kWh)	1,000 kWh	x			$ 0.0001430	$ 0.0001430	/kWh			$ 0.14	$ 0.14
Universal Service Fund (in excess of 833,000 kWh)	0 kWh	x			$ 0.0001430	$ 0.0001430	/kWh			$ -	$ -
kWh Tax (first 2000 kWh)	1,000 kWh	x			$ 0.00465	$ 0.00465	/kWh			$ 4.65	$ 4.65
kWh Tax (next 13,000 kWh)	0 kWh	x			$ 0.00419	$ 0.00419	/kWh			$ -	$ -
kWh Tax (in excess of 15,000 kWh)	0 kWh	x			$ 0.00363	$ 0.00363	/kWh			$ -	$ -
Residential Distribution Credit Rider	**$26.67** Base (Dist)	x			-3.5807%	-3.5807%				$ (0.95)	$ (0.95)
Pilot Throughput Balancing Adjustment Rider	1,000 kWh	x			$ 0.0016693	$ 0.0016693	/kWh			$ 1.67	$ 1.67
Deferred Asset Phase-In Rider	**$26.67** Base (Dist)	x			7.7300%	7.7300%				$ 2.06	$ 2.06
Generation Energy Rider	1,000 kWh	x	$ 0.0466600			$ 0.0466600	/kWh	$ 46.66			$ 46.66
Generation Capacity Rider	1,000 kWh	x	$ 0.0102700			$ 0.0102700	/kWh	$ 10.27			$ 10.27
Auction Cost Reconciliation Rider	1,000 kWh	x	$ (0.0010714)			$ (0.0010714)	/kWh	$ (1.07)			$ (1.07)
Power Purchase Agreement Rider	1,000 kWh	x				$ 0.0016624	/kWh				$ 1.66
Basic Transmission Cost Rider	1,000 kWh	x		$ 0.0142293		$ 0.0142293	/kWh		$ 14.23		$ 14.23
Energy Efficiency and Peak Demand Reduction Cost Recovery	1,000 kWh	x			$ 0.0031170	$ 0.0031170	/kWh			$ 3.12	$ 3.12
Economic Development Cost Recovery	**$26.67** Base (Dist)	x			1.05864%	1.05864%				$ 0.28	$ 0.28
Enhanced Service Reliability	**$26.67** Base (Dist)	x			7.34119%	7.34119%				$ 1.96	$ 1.96
gridSMART Phase 1 Rider	Month				$ 1.01	$ 1.01				$ 1.01	$ 1.01
Retail Stability Rider	1,000 kWh	x				$ 0.0015421	/kWh				$ 1.54
Distribution Investment Rider	**$26.67** Base (Dist)	x			28.98750%	28.98750%				$ 7.73	$ 7.73
Alternative Energy Rider	1,000 kWh	x	$ 0.0010060			$ 0.0010060	/kWh	$ 1.01			$ 1.01
Riders Total								**$ 56.87**	**$ 14.23**	**$ 21.67**	**$ 95.97**
Base + Rider Total								**$ 56.87**	**$ 14.23**	**$ 48.34**	**$ 122.64**

	Current	Proposed
Total per-kWh charges	$ 109.74	$ 96.02
Total bill	$ 122.64	$ 122.94

Ohio Power Company
Ohio Power Rate Zone
Residential Secondary Bundled Service
Breakdown of Charges Based on Entered Information

Billing Parameters

Metered kWh Usage: 1,000 kWh

Bill Calculation			Rates					Billing			
			Generation	Transmission	Distribution	Total		**Generation**	**Transmission**	**Distribution**	**Total**
Customer Charge					$ 8.40	$ 8.40				$ 8.40	$ 8.40
Energy Charge	1,000 kWh	x			$ 0.0182747	$ 0.0182747	/kWh			$ 18.27	$ 18.27
Base Charges										**$ 26.67**	**$ 26.67**
Riders											
Universal Service Fund (first 833,000 kWh)	1,000 kWh	x			$ 0.0010772	$ 0.0010772	/kWh			$ 1.08	$ 1.08
Universal Service Fund (in excess of 833,000 kWh)	0 kWh	x			$ 0.0001681	$ 0.0001681	/kWh			$ -	$ -
kWh Tax (first 2000 kWh)	1,000 kWh	x			$ 0.00465	$ 0.00465	/kWh			$ 4.65	$ 4.65
kWh Tax (next 13,000 kWh)	0 kWh	x			$ 0.00419	$ 0.00419	/kWh			$ -	$ -
kWh Tax (in excess of 15,000 kWh)	0 kWh	x			$ 0.00363	$ 0.00363	/kWh			$ -	$ -
Residential Distribution Credit Rider	**$26.67** Base (Dist)	x			-3.5807%	-3.5807%				$ (0.95)	$ (0.95)
Pilot Throughput Balancing Adjustment Rider	1,000 kWh	x			$ 0.0016641	$ 0.0016641	/kWh			$ 1.66	$ 1.66
Deferred Asset Phase-In Rider	**$26.67** Base (Dist)	x			7.7300%	7.7300%				$ 2.06	$ 2.06
Generation Energy Rider	1,000 kWh	x	$ 0.0466600			$ 0.0466600	/kWh	$ 46.66			$ 46.66
Generation Capacity Rider	1,000 kWh	x	$ 0.0102700			$ 0.0102700	/kWh	$ 10.27			$ 10.27
Auction Cost Reconciliation Rider	1,000 kWh	x	$ (0.0010714)			$ (0.0010714)	/kWh	$ (1.07)			$ (1.07)
Power Purchase Agreement Rider	1,000 kWh	x				$ 0.0016624	/kWh				$ 1.66
Basic Transmission Cost Rider	1,000 kWh	x		$ 0.0142293		$ 0.0142293	/kWh		$ 14.23		$ 14.23
Energy Efficiency and Peak Demand Reduction Cost Recovery	1,000 kWh	x			$ 0.0031170	$ 0.0031170	/kWh			$ 3.12	$ 3.12
Economic Development Cost Recovery	**$26.67** Base (Dist)	x			1.05864%	1.05864%				$ 0.28	$ 0.28
Enhanced Service Reliability	**$26.67** Base (Dist)	x			7.34119%	7.34119%				$ 1.96	$ 1.96
gridSMART Phase 1 Rider	Month				$ 1.01	$ 1.01				$ 1.01	$ 1.01
Retail Stability Rider	1,000 kWh	x				$ 0.0015421	/kWh				$ 1.54
Distribution Investment Rider	**$26.67** Base (Dist)	x			28.98750%	28.98750%				$ 7.73	$ 7.73
Alternative Energy Rider	1,000 kWh	x	$ 0.0010060			$ 0.0010060	/kWh	$ 1.01			$ 1.01
Phase-In Recovery Rider	1,000 kWh	x				$ 0.0055510	/kWh				$ 5.55
Riders Total								**$ 56.87**	**$ 14.23**	**$ 22.60**	**$ 102.45**
Base + Rider Total								**$ 56.87**	**$ 14.23**	**$ 49.27**	**$ 129.12**

	Current	Proposed
Total variable charges	$ 116.22	$ 102.50
Total bill	$ 129.12	$ 129.42

Ohio Power Company

Year	Peak	Month	Day	Hour
2008	5458	6	9	12
2009	4901	1	20	10
2010	5235	7	23	14
2011	5544	7	22	13
2012	9670	6	29	14
2013	9385	7	17	16
2014	8256	9	5	18
2015	8423	7	29	16
2016	8616	8	11	14

Columbus Southern Power

Year	Peak	Month	Day	Hour
2008	4406	6	9	16
2009	4209	6	25	16
2010	4289	7	23	16
2011	4669	7	21	16

**OHIO POWER COMPANY'S RESPONSE TO
THE ENVIRONMENTAL LAW AND POLICY CENTER'S
DISCOVERY REQUEST
PUCO CASE. NO. 16-1852-EL-SSO et al.
FIRST SET**

INTERROGATORY

ELPC-INT-1-014 Please describe what process, if any, the Company uses to determine whether distributed energy resources such as demand response, energy efficiency, distributed generation, or energy storage may be utilized to defer or avoid distribution investment costs.

RESPONSE

The Company agreed to study avoided distribution and transmission costs in its EE/PDR stipulation but the process has yet to be determined

Prepared by: Andrea E. Moore

Summary: Testimony and Exhibits of Karl R. Rabago electronically filed by Madeline Fleisher on behalf of Environmental Law and Policy Center