

Exhibit No. 117

Issue: Cost of Service and Rate Design

Witness: H. Edwin Overcast

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Sponsoring Party: Empire District Electric

Case No. ER-2014-0351

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**Before the Public Service Commission  
Of the State of Missouri**

**Surrebuttal Testimony**

**of**

**H. Edwin Overcast**

**March 2015**

Empire Exhibit No. 117  
Date 4-14-15 Reporter KF  
File No. ER-2014-0351

**SURREBUTTAL TESTIMONY  
OF  
H. EDWIN OVERCAST  
ON BEHALF OF  
THE EMPIRE DISTRICT ELECTRIC COMPANY  
BEFORE THE  
MISSOURI PUBLIC SERVICE COMMISSION  
CASE NO. ER-2014-0351**

1 **INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME AND BUSINESS AFFILIATION.**

3 A. H. Edwin Overcast, Director, Enterprise Management Solutions, a Black & Veatch  
4 Company.

5 **Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY IN THIS CASE**  
6 **BEFORE THE MISSOURI PUBLIC SERVICE COMMISSION**  
7 **(“COMMISSION”)?**

8 A. Yes. I filed direct and rebuttal testimony in this case on behalf of The Empire District  
9 Electric Company (“Empire”).

10 **Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?**

11 A. My surrebuttal testimony responds to the rebuttal testimony filed by Commission Staff  
12 (“Staff”) witness Fortson, Staff witness Kliethermes, and Office of the Public Counsel  
13 (“OPC”) Witness Marke. I address issues related to cost of service and rate design, with  
14 emphasis on the rationale for increasing the customer charge.

15 **Q. IS THERE ANY VALID REASON BASED ON RATE DESIGN PRINCIPLES OR**  
16 **ECONOMIC THEORY NOT TO RAISE THE CUSTOMER CHARGE AS**  
17 **PROPOSED BY EMPIRE?**

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 A. No. The witnesses for Staff and OPC collectively seek to limit the increase to the  
2 customer charge or to have no increase at all. Their collective positions violate certain  
3 fundamental principles of both rate design and economic theory. The concerns they  
4 express about the Empire proposal are not well grounded in logic or in the proper role of  
5 regulation as it relates to approving just and reasonable rates that provide the utility an  
6 opportunity to earn its authorized return. Simply, the recommendations of the Staff and  
7 OPC continue to force high use residential customers to subsidize low use customers. In  
8 fact, the current rate design is so far from the cost to serve residential all electric  
9 customers that Staff's and OPC's proposed rates continue a pattern of undue  
10 discrimination within the residential class. I have explained in detail the basis for this  
11 discrimination in my rebuttal testimony. I have also noted that with the advent of the  
12 mixed monopoly and competition model where customers may substitute distributed  
13 generation technologies ("DG") for energy generated by Empire, subsidies result in  
14 adverse impacts on all customers. The reason is simple. Subsidies paid by segments of a  
15 rate class are not sustainable in the long-run, because competition will drive out any  
16 subsidies and shift those burdens to customers who cannot afford to invest in DG.

17 **Q. STAFF WITNESS FORTSON DOES NOT AGREE WITH YOU THAT 90.49%**  
18 **OF COST RECOVERY ON AN ENERGY BASIS IS SIGNIFICANT. PLEASE**  
19 **COMMENT ON THAT CONCLUSION.**

20 A. It is obvious that 90+% is a significant amount. The argument that because it is no  
21 different from other investor owned utilities in the state, makes this percentage somehow  
22 trivial, is not logical. The analysis provided by witness Fortson only shows that all of the  
23 utilities in Missouri are placed in the untenable long-run position of recovering far too

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 much of fixed costs in volumetric charges. This means that rates for regulated utilities in  
2 the state are highly inefficient. Missouri rates send the wrong price signals to residential  
3 and small non-demand metered commercial customers. This results in the resources of  
4 the state of Missouri being misallocated and without a good reason for doing so. The  
5 maximum value of the energy charge should be set at marginal cost. The Staff's  
6 proposed rate design increases the volumetric price to well over twice what a reasonable  
7 estimate of marginal cost would be, and efficiency is sacrificed with no more than an  
8 unsupported statement that the rates with higher customer charges are not just and  
9 reasonable. The evidence in this case shows just the opposite - that even under the  
10 Staff's cost of service study (a study which is fatally flawed from a cost causation  
11 perspective) - larger use customers are forced to pay costs for smaller customers within  
12 the residential class. Further, the burden of excess costs is borne disproportionately by all  
13 residential electric customers who are significantly less expensive to serve per unit of  
14 energy.

15 **Q. PLEASE COMMENT ON STAFF WITNESS FORTSON'S DISCUSSION OF**  
16 **BILL IMPACTS ON LOW USE CUSTOMERS.**

17 A. The discussion of low use customers is flawed. Witness Fortson uses as his first bill  
18 comparison, a customer who uses 100 kWh per month. It is unlikely that this is a normal  
19 low use customer at all. For example, the Energy Information Administration collects  
20 data in a Residential Energy Consumption Survey that provides data for the state of  
21 Missouri's 2.3 million residences. The latest data available is for 2009 and is  
22 representative of all of the households in the state. In that data, we find that 100% of  
23 households have at least one refrigerator. The smallest manual defrost refrigerator at 14

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 cubic feet uses about 100 kWhs per month. The typical refrigerator uses between 120  
2 and 160 kWh per month. The survey data also shows that 100% of Missouri households  
3 have at least one television. A television uses between 37 and 55 kWhs per month based  
4 on six hours of operation per day. This simply means that 100 kWhs is not representative  
5 of a normal low use customer. More importantly, the survey data indicates that all 2.3  
6 million households have some form of air-conditioning and that 91% of those households  
7 have central air-conditioning. An electric window unit would use over 300 kWhs per  
8 month in summer months and that assumes an efficient unit and an efficient thermal  
9 envelope. Over 65% of the Missouri residences have electric cooking also. Electric  
10 cooking for a family of three uses about 100 kWhs per month. Schedule HEO- SR-1  
11 provides a summary of the 2009 survey data for Missouri. When we add lighting and  
12 other motor loads such as fans in heating units, the energy used by charging devices and  
13 other small electric devices, it is unlikely that even 200 kWhs represents a typical low use  
14 residential customer. It is reasonable to conclude based on this data that a small  
15 residential customer would average about 400 kWh per month. The proposed increase at  
16 that level of use in witness Fortson's bill comparison is 13% or about \$0.25 per day. This  
17 can hardly be viewed as an unfair or unreasonable increase for low use customers who do  
18 not presently pay for the costs they cause.

19 **Q. WHAT IS YOUR CONCLUSION RELATED TO THE STAFF'S RATE DESIGN**  
20 **PROPOSAL?**

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 A. The Staff's rate design proposal is an unsustainable rate design in the face of the mixed  
2 monopoly and completion model as a result of DG advances in technology.<sup>1</sup> Staff makes  
3 no adjustment to the sales volumes that would be expected as the result of their rate  
4 design proposal. Staff's proposal does not provide a reasonable opportunity for Empire  
5 to earn its allowed return. Since the Staff's proposal also cannot pass the test that the  
6 proposed rates are not unduly discriminatory between customers in the residential class,  
7 the rates, as proposed, are not just and reasonable. Finally, the rates are not sustainable in  
8 the long-run and must be changed if customers are to pay for the services they use from  
9 the utility. The rates proposed by the Staff should not be adopted in this case. The only  
10 reasonable result would be to adopt Empire's proposed increase in the customer charge  
11 and to adjust the kWh charges to produce the required revenue requirement.

12 **Q. PLEASE DISCUSS STAFF WITNESS KLIETHERMES' VIEWS RELATIVE TO**  
13 **THE CUSTOMER CHARGE AND CONSERVATION.**

14 A. At page 1 of her rebuttal testimony, Staff witness Kliethermes states that "Staff  
15 recommends the Commission consider the off-setting policy objectives of encouraging  
16 and rewarding energy conservation and sending accurate price signals." It is difficult to  
17 understand why the Staff believes that there is an off-setting policy objective related to  
18 the proposed increase in the customer charge. Sending accurate price signals is  
19 fundamental to encouraging and rewarding energy conservation. As I discussed in my  
20 rebuttal testimony, the only conflict is if one assumes that the definition of conservation  
21 is an absolute reduction in use. There is no basis for the assumption that conservation is  
22 absolute reduction and, hence, no basis to argue that a conflict exists between efficient

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<sup>1</sup> It should also be noted that the Opinion No. SC93944 requiring solar rebates further improves the economics of DG. The impact will be felt in the Rate Effective Period and will obviously result in the inability of the Staff's rates to provide a reasonable opportunity for the utility to earn its allowed return.

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 rates and conservation. Further, the incentive to conserve is increased even under  
2 Empire's proposed rates. That is, the volumetric charge increases and promotes more  
3 uneconomic decisions relative to avoiding the higher volumetric rates. As I note above,  
4 this is not proper conservation, but merely avoiding the forced subsidy contained in the  
5 proposed rates for larger customers. Indeed, these are the very customers who have the  
6 most viable options for DG and also those who are typically the most efficient electric  
7 customers if they are not also low income customers.

8 **Q. PLEASE DISCUSS THE ARGUMENT RELATED TO "RATE SHOCK".**

9 A. At page 2 of her rebuttal testimony, Staff witness Kliethermes states that the advantage of  
10 the Staff's proposal is that it recognizes "the principles of rate shock and conservation  
11 policy guidance provided by the Commission." There is no rate shock rationale that  
12 supports not increasing the customer charge by only \$0.20 per day. More importantly,  
13 the principle of rate shock, as applied to utility rate making, is based on the total  
14 magnitude of bill increases when a major new plant addition produces overall increases  
15 in rates by several multiples of Empire's proposed residential rate increase (7.65%, with  
16 an overall increase of 5.45% in Company rates). These rate increases do not approach  
17 the level that is commonly considered as rate shock. Further, the solution for rate shock  
18 has typically been to phase-in the rate increase over several years. Indeed, Empire  
19 believes it is simply taking the first logical step to better and more efficient rates with the  
20 redesign of its residential rates. Adding 20 cents per day to the customer charge is not  
21 rate shock and does not come close to violating the principle of gradualism.

22 **Q. DOES STAFF WITNESS KLIETHERMES RELY ON A PRIOR COMMISSION**  
23 **DECISION TO SUPPORT THE STAFF'S PROPOSED CUSTOMER CHARGE?**

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 A. Yes. At page 3 of her rebuttal testimony, witness Kliethermes relies on a prior decision  
2 of the Commission where she states that “the Commission rejected a proposed increase to  
3 the residential customer charge, noting that increasing the customer charge would send  
4 exactly the wrong message to customers and would discourage efforts to conserve  
5 electricity.”

6 **Q. SHOULD THAT DECISION BE DETERMINATIVE FOR THE COMMISSION?**

7 A. No. The Commission’s decision in this case must reflect the situation with which the  
8 Commission is being presented. Here, the evidence will show that the Staff’s proposed  
9 rates are not just and reasonable and make the current residential undue discrimination  
10 worse. Under the principle of gradualism, the Company is proposing a modest step to  
11 address the issue of that occurs within the residential class. The process cannot be  
12 delayed, as the mixed monopoly and competition model is becoming an integral part of  
13 utility ratemaking. For example, the Rocky Mountain Institute has published a report  
14 titled “RATE DESIGN FOR THE DISTRIBUTION EDGE: ELECTRICITY PRICING  
15 FOR A DISTRIBUTED RESOURCE FUTURE”. That report, published in August of  
16 2014, recommends full unbundling for efficient integration of distributed resources that  
17 include not only DG but conservation and demand side management (“DSM”) as well.  
18 In the executive summary the report states “...bundled, volumetric block rates—provide  
19 little or no incentive for the deployment and operation of DERs at the times and places  
20 where they can create greatest overall benefit. The perpetuation of these pricing  
21 structures in the face of ongoing improvement in DER cost and performance and  
22 increased adoption of these technologies will result in *lost opportunities for cost*  
23 *reduction and inefficient utilization of assets on the part of both customers and utilities.”*



1 (Emphasis added). The concept of unbundled rates is described in detail on pages 27-28  
2 of my direct testimony and will not be repeated here. The emphasis required in this case  
3 should be on moving toward the goal of unbundling rates and eliminating the  
4 inefficiencies in current rates that the Staff proposed rate design will continue and make  
5 worse. The Commission has made a positive start in separating distribution demand  
6 charges for demand billed customers as a partial unbundling step. Increasing the  
7 residential and small commercial customer charges is another small step toward rates that  
8 will “avoid lost opportunities for cost reduction and inefficient utilization of assets.” The  
9 proposed Staff rate design cannot meet that goal and should be rejected.

10 **Q. DOES OPC WITNESS MARKE OPPOSE THE PROPOSED INCREASE IN THE**  
11 **CUSTOMER CHARGE?**

12 A. Yes.

13 **Q. HOW DOES OPC WITNESS MARKE DISCUSS HIS OPPOSITION TO THE**  
14 **PROPOSED CUSTOMER CHARGE INCREASE?**

15 A. OPC witness Marke sets up a strawman related to his view of the Empire rationale for  
16 supporting increased customer costs and then provides counter arguments to the  
17 strawman. Witness Marke’s strawman is not an accurate portrayal of the evidence filed  
18 in this case, nor does it capture the fundamental principles that underlie the proposed  
19 increase. In essence, he attempts to refute arguments that are not essential to the proposal  
20 to increase the customer charge.

21 **Q. PLEASE EXPLAIN THE STRAWMAN COMPONENTS AS DISCUSSED BY**  
22 **OPC WITNESS MARKE.**

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 A. The first component of his strawman is related to the issue of net metering. With respect  
2 to the net metering issue, witness Marke identified the issue by misquoting my testimony.  
3 He omitted a very significant word “not” in front of the word “avoided.” This is a key  
4 concept in the failure of net metering to address the issue of cost recovery. The most  
5 common form of DG for residential customers is solar PV rooftop generation. Once  
6 installed, these customers become partial requirements customers who require a different  
7 set of unbundled services as compared to other residential customers. These customers  
8 require the same and potentially more distribution services as full requirements  
9 customers, even though they use less energy produced by the utility. The fundamental  
10 point is that net metering permits the DG customer to avoid paying for the full cost  
11 imposed on the system for the services they use. In this regard, the proposed Empire rate  
12 is more favorable in terms of the credit for excess generation, but the proposed rate does  
13 not solve the problem of avoiding the payment for the distribution system for the self-  
14 generated kWhs consumed by the customer.

15 **Q. PLEASE DESCRIBE THE AVOIDED DISTRIBUTION PAYMENT PROBLEM.**

16 A. This concern reflects two different issues. First, there is the issue of Empire not having a  
17 reasonable opportunity to earn its allowed return. The second issue is the issue of cross  
18 subsidy that requires non-DG customers to subsidize DG customers. Customers without  
19 DG will certainly include low income customers whose rates will rise to cover the  
20 revenue shortfall attributable to the DG customer subsidy over time, unless there are  
21 some efforts to mitigate this risk in current rate design.

22 **Q. WHAT IS THE BASIS USED BY OPC WITNESS MARKE TO REJECT THIS**  
23 **CONCERN?**

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 A. OPC witness Marke states that net metering is not a valid concern. The only evidence  
2 provided to support this conclusion is the current number of net metered customers. The  
3 fundamental problem of this approach is the total reliance on the number of net metering  
4 customers to date. This evidence ignores a number of significant facts. First, even under  
5 Empire’s proposed rates, the volumetric charge increases and, if the OPC view is  
6 adopted, this increase will be even greater than proposed by Empire. Second, solar DG  
7 costs are declining, thus improving the economics of these installations. Third, Empire  
8 may be required to offer a standard rebate for solar installations in the future, which could  
9 further reduce the costs to the DG customers. There is no basis to dismiss the net  
10 metering issue.

11 **Q. PLEASE CONTINUE.**

12 A. The second element of OPC witness Marke’s strawman is the idea of appliance efficiency  
13 standards as a concern for reduced volumetric use per customer. Witness Marke rejects  
14 this argument by stating on page 6 of his rebuttal testimony that “energy efficiency  
15 efforts have been minimal in Empire’s service territory.” The purpose of appliance  
16 efficiency standards is to change the relative efficiency of new appliances that come into  
17 the market. To state that energy efficiency efforts have been minimal may be true, but it  
18 does not capture the essence of the impact these standards have on end use consumption.  
19 This is particularly true for Empire because of the electric heating, air conditioning, and  
20 water heating loads. Collectively, these are the three largest residential end use loads for  
21 Empire. The average life of these appliances is about ten years for a water heater with a  
22 tank, 8-15 years for air-conditioners, and 16 years for heat pumps. The average life  
23 reflects the frequency of appliance replacement. The higher efficiency standards for the

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 product's reduces use per customer at the difference between the older units with lower  
2 efficiencies when new and even lower efficiencies as the equipment ages and the current  
3 efficiency standards, even if there is no efficiency program in the region. The national  
4 forecast data included in witness Marke's rebuttal testimony as support for ignoring this  
5 issue has several drawbacks. First, the data assumes growth at the national level that  
6 differs from a single utility service area. Second, the data assumes changes in the  
7 saturation of these appliances over time. Since, as noted above, Missouri has a 100%  
8 saturation of air-conditioning (91% central units based on the 2009 data), there is no  
9 increase in use absent customer growth in the service area. The actual compound average  
10 customer growth rate for Empire over the last five years has been 0.13% and, thus, is not  
11 a source of either volume or revenue growth to offset the poor rate designs proposed by  
12 Staff and by OPC. The data also cannot take into account the thermal envelope building  
13 standards for each state. It is not uncommon for larger newer homes to use less energy  
14 than smaller older homes with equal occupancy and age distribution of residents. For all  
15 the discussion provided by witness Marke, there is no reason to believe that increasing  
16 energy charges will not have an impact on the overall adoption of more efficient  
17 appliances and will erode the ability of Empire to earn its allowed return with the OPC  
18 proposed rate design.

19 **Q. DOES OPC WITNESS MARKE ATTEMPT TO SHOW THAT THE PROPOSED**  
20 **RATE DESIGN WILL ACTUALLY INCREASE ELECTRIC CONSUMPTION?**

21 A. Yes. Witness Marke cites a study by Christensen Associates (an economic consulting  
22 firm) prepared for the Kansas Corporation Commission that found - according to witness  
23 Marke - at page 11 "increasing fixed charges can increase electricity use by 1.1 to 6.8%,

1 varying by utility and season.” In fact, that is not what the study showed. The study  
2 assumed that a revenue neutral rate change that recovered all fixed costs in a fixed  
3 customer charge and significantly reduced the volumetric charge for the amount of costs  
4 previously recovered in that kWh charge, would increase electricity use by between 1.1  
5 and 6.8%. As a result, this hyperbole does not apply to the Empire proposal in any sense.  
6 It is also worth noting that this study used a short-run price elasticity of 0.2 for residential  
7 electric service. For consistencies sake, using these numbers for the Empire case would  
8 reduce sales under the Empire residential rate design by over 1.1 million kWh. Under the  
9 OPC proposed rate design, the test year sales volume will be reduced by 2.4 million  
10 kWhs. I might further note that these numbers demonstrate that Empire has no  
11 reasonable opportunity to earn its allowed return, if one merely accepts the price  
12 elasticity values that OPC witness Marke found acceptable for evaluating the Empire rate  
13 design proposal. This suggests that the OPC should also support an elasticity adjustment  
14 for sales in the rate effective period of 0.14% reduction for residential service.

15 **Q. PLEASE CONTINUE WITH YOUR DISCUSSION OF OPC WITNESS MARKE’S**  
16 **THIRD STRAWMAN.**

17 A. The third strawman is that “an increase in fixed charges prevents cross-subsidization  
18 between customer classes and promotes efficient price signals.” This strawman is  
19 actually a misstatement of my argument that an increase in fixed charges in this case will  
20 begin to resolve the intra-class cross subsidy in residential rates and moves the rates  
21 toward more economically efficient rates. This argument is not based on Ramsey prices,  
22 as witness Marke asserts, because that has more to do with the allocation of costs than  
23 with rate design. The argument for a two part rate is based on work by Ronald Coase

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 who developed the concept of charging the excess revenue requirement above marginal  
2 cost in a customer charge component to attain an economically efficient rate. However,  
3 that is not the proposal in this case. The increase in the customer charge merely reduces  
4 slightly the subsidization present in existing rates. Yet, despite the increase in the  
5 customer charge, further increases in volumetric rates to customers already pay more for  
6 service than the cost they cause is made worse. The irony in witness Marke's comments  
7 is that he states that despite improving efficiency, the proposal "raises issues in terms of  
8 potential price discrimination and fairness." The statement is only true in the sense that  
9 Empire could not reduce the current level of discrimination without even larger changes  
10 to the rate than proposed. Further, the standard of fairness is almost universally measured  
11 by the fact that customers pay the costs they impose on the system. Low use residential  
12 customers on the Empire system pay far less than the costs they impose and large  
13 residential customers must make up that shortfall. I also find it interesting that witness  
14 Marke equates low use customers with low income. Even the data provided by witness  
15 Marke, based on California, does not support the conclusion that low income means low  
16 use. The graph at page 18 shows that more than half of low income customers are not low  
17 use. Further, this data is often misleading because of effects such as college students who  
18 live in apartments and would be considered low income, but may not pay their own utility  
19 bills from that income. There are also other significant errors in witness Marke's analysis  
20 of income and usage. Rather than deal with all of the errors in detail, I will list just a few  
21 that make this argument unsound. The analysis ignores the difference in urban and rural  
22 poverty on electric use. The analysis fails to reflect the impact of energy efficiency on  
23 use by low income customers. Even though they may have fewer appliances, the

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 appliances are typically older and less efficient. Similarly, the thermal envelope of low  
2 income dwellings is typically much less energy efficient. This is obviously a factor with  
3 which witness Marke would agree based on his support of the Low Income  
4 Weatherization Program. The analysis does not account for the effect of household size  
5 and age distribution of occupants that also impacts use. The bottom line is that detailed  
6 analysis of the relationship between income and usage typically finds weak or no  
7 correlation between income and usage. The important policy point in this discussion is  
8 that it makes no economic sense to send the wrong price signals to all customers to  
9 supposedly benefit a few customers. It is far more efficient to address the issues of low  
10 income customers directly through other possible options, such as low income rates for  
11 qualifying customers.

12 **Q. PLEASE COMMENT ON OPC WITNESS MARKE'S CONCLUSIONS.**

13 A. Witness Marke makes the following statement in his conclusion related to Empire's  
14 proposal:

15 Public Counsel believes that raising fixed charges would be a huge shift in energy  
16 policy for this Commission as it would effectively take away customers' ability to  
17 control their electricity bills and would cancel out any energy efficiency efforts to  
18 date. It would also impact low income, renters, and ratepayers on fixed incomes  
19 disproportionately raising issues of price discrimination and fairness.

20 These two sentences are not supported by the evidence in this case. The proposal to  
21 increase the customer charge does not depart from the Commission's policy of promoting  
22 conservation, but, instead, enhances the policy of promoting efficient demand response  
23 including lower long-run costs and more efficient investment in assets for the utility and

H. EDWIN OVERCAST  
SURREBUTTAL TESTIMONY

1 its customers. Customers still maintain control of their bills as the result of energy  
2 charges well above marginal cost. The conclusion that the increase in the customer  
3 charge would cancel out any energy efficiency efforts to date is based on incorrect  
4 analysis of an elasticity study and further relies on the concept that all of the energy  
5 efficiency responses to date are based on behavioral changes. In fact, most of the energy  
6 efficiency gains to date are based on capital investment in appliances, the thermal  
7 envelop, fuel switching, and other responses that will not go away with the customer  
8 charge increase. The advantages of setting the rates correctly and addressing low income  
9 issues directly far outweigh the loss in social welfare from continuation of economically  
10 inefficient rates. Finally, there is undue price discrimination or subsidization in the  
11 current rates. The discrimination is not based on income but, instead, is based on the  
12 departure of rates for all electric customers from the costs they cause. The OPC positions  
13 should be rejected, and Empire should begin the transition to fully unbundled rates to  
14 unlock the potential of distributed resources in the mixed monopoly and competitive  
15 market that electric utilities operate in today.

16 **Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?**

17 **A.** Yes, it does.



Midwest Region, Divisions, and States, 2009

**Table HC3.9 Appliances in Homes****Million Housing Units, Final**

Appliances	MO
<b>Total Homes.....</b>	<b>2.3</b>
<b>Cooking Appliances</b>	
<b>Stoves (Units With Both an Oven and a Cooktop)</b>	
Use a Stove.....	2.1
1.....	2.1
2 or More.....	0.0
Do Not Use a Stove.....	0.2
<b>Most-Used Stove Fuel</b>	
Electric.....	1.5
Natural Gas.....	0.4
Propane/LPG.....	0.1
Do Not Use a Stove.....	0.2
<b>Separate Cooktops</b>	
Use a Separate Cooktop.....	0.3
1.....	0.3
2 or More.....	Q
Do Not Use a Separate Cooktop.....	2.1
<b>Most-Used Separate Cooktop Fuel</b>	
Electric.....	0.2
Natural Gas.....	0.1
Propane/LPG.....	Q
Do Not Use a Separate Cooktop.....	2.1
<b>Separate Wall Ovens</b>	
Use a Separate Wall Oven.....	0.3
1.....	0.2
2 or More.....	0.1
Do Not Use a Separate Wall Oven.....	2.0
<b>Most-Used Separate Wall Oven Fuel</b>	
Electric.....	0.3
Natural Gas.....	0.0
Propane/LPG.....	Q
Do Not Use a Separate Wall Oven.....	2.0

**Built-in/Stove-top Grills**

Use a Built-in/Stove-top Grill.....	0.0
Do Not Use a Built-in/Stove-top Grill.....	2.3

**Built-in/Stove-top Grill Fuel**

Electric.....	Q
Natural Gas.....	Q
Propane/LPG.....	N
Do Not Use a Built-in/Stove-top Grill.....	2.3

**Frequency of Hot Meals Cooked**

3 or More Times A Day.....	0.2
2 Times A Day.....	0.5
Once a Day.....	0.8
A Few Times Each Week.....	0.6
About Once a Week.....	0.1
Less Than Once a Week.....	0.1
No Hot Meals Cooked.....	Q

**Most-Used Cooking Fuel**

Electric.....	1.7
Natural Gas.....	0.5
Propane/LPG.....	0.2
Some Other Fuel.....	N
Not Specified.....	Q
No Hot Meals Cooked.....	Q

**Oven Use (For Separate Wall Ovens or Ovens in Stoves)**

Use an Oven.....	2.3
Three or More Times a Day.....	0.1
Two Times a Day.....	0.2
Once a Day.....	0.5
A Few Times Each Week.....	0.9
Once a Week.....	0.3
Less than Once a Week.....	0.3
Do Not Use an Oven.....	0.1

**Microwave Oven**

Use a Microwave Oven.....	2.3
Do Not Use a Microwave Oven.....	0.1

**Microwave Oven Use**

**To Prepare Food**

For Most Meals and Snacks.....	0.5
For About Half of Meals and Snacks.....	0.7

For Very Few Meals and Snacks..... 0.8  
 Used Very Little..... 0.3

**To Defrost Food**

Yes..... 1.2  
 No..... 1.0

**Coffee Maker**

Yes..... 1.6  
 No..... 0.7

**Toaster Oven**

Yes..... 0.7  
 No..... 1.7

**Refrigerators**

Use a Refrigerator..... 2.3  
 1..... 1.7  
 2 or More..... 0.6  
 Do Not Use a Refrigerator..... N

**Most-Used Refrigerator**

**Type of Most-Used Refrigerator**

Single Door..... 0.1  
 2 Doors (Top Freezer)..... 1.2  
 2 Doors (Bottom Freezer)..... 0.1  
 2 Doors (Side-By-Side)..... 0.9  
 3 or More Doors..... Q  
 Half-Size/Other..... Q  
 Do Not Use a Refrigerator..... N

**Age of Most-Used Refrigerator**

Less than 2 Years..... 0.3  
 2 to 4 Years..... 0.5  
 5 to 9 Years..... 0.8  
 10 to 14 Years..... 0.4  
 15 to 19 Years..... 0.1  
 20 Years or More..... 0.1  
 Do Not Use a Refrigerator..... N

**Size of Most-Used Refrigerator**

Half-Size or Compact..... Q  
 Small (Less than 14 Cubic Feet)..... 0.1  
 Medium (15-18 Cubic Feet)..... 1.0  
 Large (19-22 Cubic Feet)..... 1.0  
 Very Large (More than 22 Cubic Feet)..... 0.2  
 Do Not Use a Refrigerator..... N

**Through-the-Door Ice  
and Water Service**

Yes.....	0.9
No.....	1.5
Do Not Use a Refrigerator.....	N

**Defrost Method**

Frost-Free.....	2.2
Manual.....	0.2
No Freezer Section.....	Q
Do Not Use a Refrigerator.....	N

**Energy Star (Most-Used)  
Refrigerator<sup>2</sup>**

Yes.....	0.8
No.....	0.6
Don't Know.....	0.2
Unit is More Than 9 Years Old.....	0.7
Do Not Use a Refrigerator.....	N

**Second Refrigerator**

Use a Second Refrigerator.....	0.6
Do Not Use a Second Refrigerator.....	1.7

**Type of Second Refrigerator**

Single Door.....	0.0
2 Doors (Top Freezer).....	0.3
2 Doors (Bottom Freezer).....	Q
2 Doors (Side-By-Side).....	0.1
3 or More Doors.....	N
Half-Size/Other.....	0.1
Do Not Use a Second Refrigerator.....	1.7

**Age of Second Refrigerator**

Less than 2 Years.....	0.0
2 to 4 Years.....	0.1
5 to 9 Years.....	0.2
10 to 14 Years.....	0.1
15 to 19 Years.....	0.1
20 Years or More.....	0.1
Do Not Use a Second Refrigerator.....	1.7

**Size of Second Refrigerator**

Half-Size or Compact.....	0.1
Small (Less than 14 Cubic Feet).....	0.1
Medium (15-18 Cubic Feet).....	0.3

Large (19-22 Cubic Feet).....	0.1
Very Large (More than 22 Cubic Feet).....	Q
Do Not Use a Second Refrigerator.....	1.7

**Number of Months**

**Turned On Each Year**

Less than 1 Month.....	Q
1 to 3 Months.....	Q
4 to 6 Months.....	Q
7 to 11 Months.....	Q
Turned On All Year.....	0.6
Do Not Use a Second Refrigerator.....	1.7

**Separate Freezers**

Use a Separate Freezer.....	1.0
1.....	1.0
2 or More.....	0.1
Do Not Use a Separate Freezer.....	1.3

**Type of Most-Used Freezer**

Upright.....	0.4
Chest.....	0.6
Do Not Use a Separate Freezer.....	1.3

**Age of Most-Used Freezer**

Less than 2 Years.....	0.0
2 to 4 Years.....	0.1
5 to 9 Years.....	0.3
10 to 14 Years.....	0.2
15 to 19 Years.....	0.1
20 Years or More.....	0.2
Do Not Use a Separate Freezer.....	1.3

**Size of Most-Used Freezer**

Small (Less than 14 Cubic Feet).....	0.3
Medium (15-18 Cubic Feet).....	0.5
Large (19-22 Cubic Feet).....	0.3
Very Large (More than 22 Cubic Feet).....	Q
Do Not Use a Separate Freezer.....	1.3

**Most-Used Freezer Defrost Method**

Frost-Free.....	0.5
Manual.....	0.6
Do Not Use a Separate Freezer.....	1.3

**Dishwasher Use**

Use a Dishwasher.....	1.6
-----------------------	-----

At Least Once Each Day.....	0.3
4 to 6 Times a Week.....	0.3
2 to 3 Times a Week.....	0.6
Once Each Week.....	0.2
Less than Once Each Week.....	0.2
Do Not Use a Dishwasher.....	0.8

**Age of Dishwasher**

Less than 2 Years.....	0.2
2 to 4 Years.....	0.4
5 to 9 Years.....	0.5
10 to 14 Years.....	0.2
15 to 19 Years.....	0.1
20 Years or More.....	0.1
Do Not Use a Dishwasher.....	0.8

**Energy Star Dishwasher<sup>2</sup>**

Yes.....	0.6
No.....	0.4
Don't Know.....	0.2
Unit is More Than 9 Years Old.....	0.4
Do Not Use a Dishwasher.....	0.8

**Clothes Washers and Dryers**

**Clothes Washer**

Use a Clothes Washer At Home.....	2.1
Top Loading.....	1.9
Front Loading.....	0.3
Do Not Use a Clothes Washer At Home.....	0.2

**Age of Clothes Washer**

Less than 2 Years.....	0.3
2 to 4 Years.....	0.4
5 to 9 Years.....	0.7
10 to 14 Years.....	0.4
15 to 19 Years.....	0.1
20 Years or More.....	0.1
Do Not Use a Clothes Washer At Home.....	0.2

**Clothes Washer Use**

Use a Clothes Washer.....	2.1
1 Load or Less Each Week.....	0.1
2 to 4 Loads Each Week.....	0.9
5 to 9 Loads Each Week.....	0.8
10 to 15 Loads Each Week.....	0.2
More than 15 Loads Each Week.....	0.1

Do Not Use a Clothes Washer At Home..... 0.2

**Usual Water Temperature Setting**

**Wash Cycle**

Hot..... 0.1  
 Warm..... 1.0  
 Cold..... 1.0  
 Do Not Use a Clothes Washer At Home..... 0.2

**Rinse Cycle**

Hot..... Q  
 Warm..... 0.3  
 Cold..... 1.8  
 Do Not Use a Clothes Washer At Home..... 0.2

**Energy Star Clothes Washer<sup>2</sup>**

Yes..... 0.7  
 No..... 0.6  
 Don't Know..... 0.2  
 Unit is More Than 9 Years Old..... 0.7  
 Do Not Use a Clothes Washer At Home..... 0.2

**Clothes Dryer**

Use a Clothes Dryer At Home..... 2.1  
 Electric..... 1.9  
 Natural Gas..... 0.2  
 Propane/LPG..... Q  
 Do Not Use a Clothes Dryer At Home..... 0.2

**Age of Clothes Dryer**

Less than 2 Years..... 0.3  
 2 to 4 Years..... 0.4  
 5 to 9 Years..... 0.7  
 10 to 14 Years..... 0.4  
 15 to 19 Years..... 0.1  
 20 Years or More..... 0.1  
 Do Not Use a Clothes Dryer At Home..... 0.2

**Clothes Dryer Use**

Used Every Time Clothes are Washed..... 1.7  
 Used For Some, But Not All Loads..... 0.3  
 Used Infrequently..... Q  
 Do Not Use a Clothes Dryer At Home..... 0.2

**Rechargeable Portable  
 Tools and Appliances<sup>3</sup>**

**Number of Rechargeable Portable**

**Tools and Appliances**

0.....	0.8
1 to 3.....	1.0
4 to 8.....	0.3
More than 8.....	0.1

**Portable Tools and Appliances**

**Charging Pattern**

Always Plugged In.....	0.1
Only Recharged When Needed.....	1.1
Both Ways Are Used.....	0.2
No Rechargeable Portable Tools and Appliances.....	0.8

**Chargers Always Plugged Into Wall<sup>4</sup>**

Yes.....	0.4
No.....	1.0
Some, But Not All.....	0.2
No Rechargeable Portable Tools and Appliances.....	0.8

**Other Appliances**

Auto Block/Engine/Battery Heater.....	N
Filter Systems in Swimming Pools.....	0.1
Well Water Pumps.....	Q

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<sup>1</sup>Total U.S. includes all primary occupied housing units in the 50 States and the District of Columbia. Vacant housing units, seasonal units, second homes, military housing, and group quarters are excluded.

<sup>2</sup>Energy Star is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy in which household products that meet strict energy efficiency guidelines earn the Energy Star.

<sup>3</sup>Rechargeable Portable Tools and Appliances include handheld vacuum cleaners, flashlights, power drills, and similar equipment.

<sup>4</sup>Yes includes chargers for tools and appliances that are always plugged in.

Q = Data withheld either because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 10 households were sampled.

N = No cases in reporting sample.

Notes: • Because of rounding, data may not sum to totals. • See Glossary for definition of terms used in these tables.

Source: U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the 2009 Residential Energy Consumption Survey.

**Table HC4.9 Televisions in Homes**

**Million Housing Units, Final**

Televisions	MO
<b>Total Homes</b> .....	2.3
<b>Televisions</b>	
<b>Number of Televisions</b>	
0.....	Q
1.....	0.5
2.....	0.8
3.....	0.6
4.....	0.3
5 or More.....	0.2
<b>Most-Used Television</b>	
<b>Display Size</b>	
Less than 21 Inches.....	0.2
21 to 36 Inches.....	1.2
37 Inches or More.....	0.9
No Televisions.....	Q
<b>Display Type</b>	
Standard Tube.....	1.1
LCD.....	0.9
Plasma.....	0.2
Projection.....	0.1
LED.....	0.0
No Televisions.....	Q
<b>Hours Used Per Weekday</b>	
Less than 1 Hour.....	0.1
1 to 3 Hours.....	0.5
3 to 6 Hours.....	0.9
6 to 10 Hours.....	0.5
More than 10 Hours.....	0.4
No Televisions.....	Q
<b>Hours Used Per Weekend Day</b>	
Less than 1 Hour.....	0.1
1 to 3 Hours.....	0.3
3 to 6 Hours.....	0.8
6 to 10 Hours.....	0.5

More than 10 Hours.....	0.6
No Televisions.....	Q

**Peripherals Connected**

**(more than one may apply)**

Combo DVR/Cable Box.....	0.3
Combo DVR/Satellite Box.....	0.4
Separate DVR.....	0.2
Separate Cable Box.....	0.6
Separate Satellite Box.....	0.4
Digital Converter Box.....	0.4
Video Game Console.....	0.7
Combo VCR/DVD Player.....	0.6
Separate VCR.....	0.4
Separate DVD Player.....	1.2
Home Theater System.....	0.5
Other Set-Top Box.....	0.1
No Televisions.....	Q

**Second Most-Used Television**

**Display Size**

Less than 21 Inches.....	0.7
21 to 36 Inches.....	0.9
37 Inches or More.....	0.2
Less than 2 Televisions.....	0.5

**Display Type**

Standard Tube.....	1.1
LCD.....	0.6
Plasma.....	0.1
Projection.....	0.1
LED.....	Q
Less than 2 Televisions.....	0.5

**Hours Used Per Weekday**

Less than 1 Hour.....	0.6
1 to 3 Hours.....	0.6
3 to 6 Hours.....	0.4
6 to 10 Hours.....	0.1
More than 10 Hours.....	0.1
Less than 2 Televisions.....	0.5

**Hours Used Per Weekend Day**

Less than 1 Hour.....	0.6
1 to 3 Hours.....	0.6
3 to 6 Hours.....	0.4

6 to 10 Hours.....	0.2
More than 10 Hours.....	0.1
Less than 2 Televisions.....	0.5

**Peripherals Connected**

(more than one may apply)

Combo DVR/Cable Box.....	0.1
Combo DVR/Satellite Box.....	0.1
Separate DVR.....	0.1
Separate Cable Box.....	0.6
Separate Satellite Box.....	0.4
Digital Converter Box.....	0.2
Video Game Console.....	0.3
Combo VCR/DVD Player.....	0.3
Separate VCR.....	0.3
Separate DVD Player.....	0.6
Home Theater System.....	0.1
Other Set-Top Box.....	Q
Less than 2 Televisions.....	0.5

**Third Most-Used Television**

**Display Size**

Less than 21 Inches.....	0.5
21 to 36 Inches.....	0.5
37 Inches or More.....	0.1
Less than 3 Televisions.....	1.2

**Display Type**

Standard Tube.....	0.8
LCD.....	0.3
Plasma.....	0.0
Projection.....	Q
LED.....	Q
Less than 3 Televisions.....	1.2

**Hours Used Per Weekday**

Less than 1 Hour.....	0.6
1 to 3 Hours.....	0.3
3 to 6 Hours.....	0.1
6 to 10 Hours.....	Q
More than 10 Hours.....	Q
Less than 3 Televisions.....	1.2

**Hours Used Per Weekend Day**

Less than 1 Hour.....	0.6
1 to 3 Hours.....	0.3

3 to 6 Hours.....	0.1
6 to 10 Hours.....	0.1
More than 10 Hours.....	Q
Less than 3 Televisions.....	1.2

**Peripherals Connected**

**(more than one may apply)**

Combo DVR/Cable Box.....	0.1
Combo DVR/Satellite Box.....	0.1
Separate DVR.....	0.0
Separate Cable Box.....	0.3
Separate Satellite Box.....	0.2
Digital Converter Box.....	0.1
Video Game Console.....	0.1
Combo VCR/DVD Player.....	0.1
Separate VCR.....	0.1
Separate DVD Player.....	0.3
Home Theater System.....	0.0
Other Set-Top Box.....	Q
Less than 3 Televisions.....	1.2

<sup>1</sup>Total U.S. includes all primary occupied housing units in the 50 States and the District of Columbia. Vacant housing units, seasonal units, second homes, military housing, and group quarters are excluded.

Q = Data withheld either because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 10 households were sampled.

N = No cases in reporting sample.

Notes: • Because of rounding, data may not sum to totals. • See Glossary for definition of terms used in these tables.

Source: U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the 2009 Residential Energy Consumption Survey.

Midwest Region, Divisions, and States, 2009

**Table HC7.9 Air Conditioning in Homes**

**Million Housing Units, Final**

Air Conditioning	MO
<b>Total Homes</b> .....	2.3
<b>Air Conditioning Equipment</b>	
Use Air Conditioning Equipment.....	2.3
Have Air Conditioning Equipment But Do Not Use It.....	0.0
Do Not Have Air Conditioning Equipment.....	Q
<b>Type of Air Conditioning Equipment</b>	
<b>Used (more than one may apply)</b>	
Use Central Air Conditioning Equipment.....	2.1
Without a Heat Pump.....	1.9
With a Heat Pump.....	0.1
Use Window/Wall Air Conditioning Units.....	0.3
With 1 Unit.....	0.2
With 2 Units.....	0.1
With 3 or More Units.....	Q
Have But Do Not Use Central Air Conditioning Equipment.....	Q
Have But Do Not Use Window/Wall Air Conditioning Units.....	Q
Do Not Have Air Conditioning Equipment.....	Q
<b>Central Air Conditioning</b>	
<b>Housing Units Served by Central Air Conditioning Equipment<sup>2</sup></b>	
One Housing Unit.....	2.0
Two or More Housing Units.....	Q
Do Not Have or Use Central Air Conditioning Equipment.....	0.3
<b>Usage of Central Air Conditioning</b>	
All Summer.....	1.2
Quite a Bit.....	0.4
Only A Few Times When Needed.....	0.4
Do Not Have or Use Central Air Conditioning Equipment.....	0.3
<b>Age of Central Air Conditioning</b>	

**Equipment**

Less Than 2 Years.....	0.1
2 to 4 Years.....	0.3
5 to 9 Years.....	0.6
10 to 14 Years.....	0.5
15 to 19 Years.....	0.2
20 Years or More.....	0.3
Do Not Have or Use Central Air Conditioning Equipment.....	0.3

**Routine Service or Maintenance**

**Performed on Central Air**

**Conditioning Equipment<sup>3</sup>**

Yes.....	0.8
No.....	1.3
Do Not Have or Use Central Air Conditioning Equipment.....	0.3

**Thermostats**

**Have Thermostat for Central Air**

**Conditioning Equipment**

Yes.....	2.0
No.....	Q
Do Not Have or Use Central Air Conditioning Equipment.....	0.3

**Have Programmable Thermostat**

**for Central Air Conditioning**

**Equipment**

Yes.....	0.9
No.....	1.1
No Thermostat or Do Not Have or Use Central Air Conditioning Equipment.....	0.3

**Use of Programmable Thermostat**

**Adjusts Temperature During Day**

**When No One is Home**

Yes.....	0.5
No.....	0.4

**Adjusts Temperature During**

**Sleeping Hours**

Yes.....	0.5
No.....	0.4

**No Programmable Thermostat or**

**Do Not Have or Use Central**

Air Conditioning Equipment.....	1.4
---------------------------------	-----

**Summer Indoor Temperatures**

**Daytime Temperature When**

**Someone is Home**

69 Degrees or Less.....	0.2
70 Degrees.....	0.3
71 to 73 Degrees.....	0.4
74 to 76 Degrees.....	0.4
77 to 79 Degrees.....	0.3
80 or More Degrees.....	0.0
Do Not Have or Regularly Use Central Air Conditioning Equipment.....	0.7

**Daytime Temperature When**

**No One is Home**

69 Degrees or Less.....	0.1
70 Degrees.....	0.2
71 to 73 Degrees.....	0.3
74 to 76 Degrees.....	0.5
77 to 79 Degrees.....	0.3
80 or More Degrees.....	0.2
Do Not Have or Regularly Use Central Air Conditioning Equipment.....	0.7

**Temperature at Night**

69 Degrees or Less.....	0.2
70 Degrees.....	0.3
71 to 73 Degrees.....	0.4
74 to 76 Degrees.....	0.4
77 to 79 Degrees.....	0.2
80 or More Degrees.....	0.1
Do Not Have or Regularly Use Central Air Conditioning Equipment.....	0.7

**Window/Wall Air Conditioning**

**Usage of Most-Used Window/Wall Unit**

All Summer.....	0.1
Quite a Bit.....	0.1
Only A Few Times When Needed.....	0.1
Do Not Have or Use Window/Wall Unit.....	2.1

**Age of Most-Used Window/Wall Unit**

Less Than 2 Years.....	Q
2 to 4 Years.....	0.1
5 to 9 Years.....	Q



10 to 14 Years.....	Q
15 to 19 Years.....	Q
20 Years or More.....	Q
Do Not Have or Use Window/Wall Unit.....	2.1

**Energy Star Most-Used**

**Window/Wall Unit<sup>4</sup>**

Yes.....	0.1
No.....	0.1
Don't Know.....	Q
Unit More than 9 Years Old.....	0.1
Do Not Have or Use Window/Wall Unit.....	2.1

**Dehumidifier Use During 2009**

Use a Dehumidifier.....	0.4
1 to 3 Months.....	0.2
4 to 6 Months.....	0.1
7 to 9 Months.....	0.0
10 to 11 Months.....	Q
Turned on All Year.....	0.1
Do Not Use a Dehumidifier.....	2.0

**Use an Evaporative or Swamp Cooler**

**(Asked Only in Arid Areas)<sup>5</sup>**

Yes.....	N
No.....	N
Not Asked.....	2.3

**Number of Ceiling Fans Used**

0.....	0.4
1.....	0.5
2.....	0.4
3.....	0.4
4 or More.....	0.7

**Frequency of Most-Used**

**Ceiling Fan Use**

All Summer.....	0.7
Quite a Bit.....	0.5
Only A Few Times When Needed.....	0.6
Do Not Have or Use Ceiling Fans.....	0.5

---

<sup>1</sup>Total U.S. includes all primary occupied housing units in the 50 States and the District of Columbia. Vacant housing units, seasonal units, second homes, military housing, and group quarters are excluded.

<sup>2</sup>Use of central air conditioning equipment for another housing unit also includes the use of the central air conditioning equipment for a business or farm building as well as another housing unit.

<sup>3</sup>Only includes routine service or maintenance performed in the last year.

<sup>4</sup>Energy Star is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy in which household products that meet strict energy efficiency guidelines earn the Energy Star. The Energy Star questions were only asked of appliances purchased within the past nine years. Older appliances probably do not meet the current Energy Star criteria, and the respondent may not have purchased or remember purchasing the appliance.

<sup>5</sup>Only housing units in Alabama, Arkansas, Arizona, California, Colorado, Georgia, Louisiana, Montana, New Mexico, Nevada, Oklahoma, Oregon, South Carolina, Texas, Utah, and Washington were asked about evaporative coolers.

Q = Data withheld either because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 10 households were sampled.

N = No cases in reporting sample.

Notes: • Because of rounding, data may not sum to totals. • See Glossary for definition of terms used in these tables.

Source: U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the 2009 Residential Energy Consumption Survey.

Midwest Region, Divisions, and States, 2009

**Table HC8.9 Water Heating in Homes**

**Million Housing Units, Final**

Water Heating	MO
<b>Total Homes</b> .....	2.3
<b>Number of Storage Tank Water Heaters</b>	
0.....	Q
1.....	2.2
2 or More.....	0.1
<b>Number of Tankless Water Heaters<sup>2</sup></b>	
0.....	2.3
1.....	0.0
2 or More.....	N
<b>Main Water Heater</b>	
<b>Main Water Heater Type</b>	
Storage Tank.....	2.3
Tankless.....	Q
Do Not Use Hot Water.....	Q
<b>Housing Units Served by Main Water Heater<sup>3</sup></b>	
One Housing Unit.....	2.3
Two or More Housing Units.....	0.0
Do Not Use Hot Water.....	Q
<b>Fuel Used by Main Water Heater</b>	
Natural Gas.....	1.1
For One Housing Unit.....	1.1
For Two or More Housing Units.....	Q
Electricity.....	1.0
For One Housing Unit.....	1.0
For Two or More Housing Units.....	Q
Propane/LPG.....	0.2
Fuel Oil.....	N
Other.....	Q
Do Not Use Hot Water.....	Q
<b>Size of Main Water Heater</b>	
<b>Used by One Housing Unit</b>	
Small (30 Gallons or Less).....	0.4

Medium (31 to 49 Gallons).....	1.4
Large (50 Gallons or More).....	0.5

**Used by Two or More Housing Units**

Small (30 Gallons or Less).....	Q
Medium (31 to 49 Gallons).....	Q
Large (50 Gallons or More).....	Q
Tankless Water Heater.....	Q
Do Not Use Hot Water.....	Q

**Age of Main Water Heater**

Less Than 2 Years.....	0.2
2 to 4 Years.....	0.4
5 to 9 Years.....	0.7
10 to 14 Years.....	0.5
15 to 19 Years.....	0.2
20 Years or More.....	0.3
Do Not Use Hot Water.....	Q

**Main Water Heater Insulated With**

**Water Heater Blanket**

Yes.....	0.2
No.....	2.1
Tankless Water Heater.....	Q
Do Not Use Hot Water.....	Q

**Secondary Water Heater**

**Secondary Water Heater Type**

Storage Tank.....	0.1
Tankless.....	Q
Only One Water Heater or	
Do Not Use Hot Water.....	2.2

**Fuel Used by Secondary Water Heater**

Natural Gas.....	0.1
Electricity.....	0.0
Propane/LPG.....	Q
Fuel Oil.....	N
Other.....	N
Only One Water Heater or	
Do Not Use Hot Water.....	2.2

**Size of Secondary Water Heater**

Small (30 Gallons or Less).....	Q
Medium (31 to 49 Gallons).....	0.0
Large (50 Gallons or More).....	Q
Tankless Secondary Water Heater.....	Q

Only One Water Heater or  
Do Not Use Hot Water..... 2.2

**Age of Secondary Water Heater**

Less Than 2 Years..... Q  
 2 to 4 Years..... Q  
 5 to 9 Years..... 0.0  
 10 to 14 Years..... Q  
 15 to 19 Years..... Q  
 20 Years or More..... Q  
 Only One Water Heater or  
 Do Not Use Hot Water..... 2.2

**Hot Tub or Spa and Fuel**

Yes..... 0.1  
     Electricity..... 0.1  
     Natural Gas..... Q  
     Other..... Q  
 No..... 2.2

**Heated Swimming Pool and Fuel**

Yes..... Q  
     Natural Gas..... Q  
     Electricity..... Q  
     Propane/LPG..... N  
     Other..... Q  
 Pool Not Heated..... 0.1  
 No Swimming Pool..... 1.7  
 Not Asked (Apartments and Mobile Homes)..... 0.5

**Heated Aquarium (20 gallons or larger)**

Yes..... 0.1  
 No..... 2.3

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<sup>1</sup>Total U.S. includes all primary occupied housing units in the 50 States and the District of Columbia. Vacant housing units, seasonal units, second homes, military housing, and group quarters are excluded.

<sup>2</sup>Tankless water heaters, also known as instantaneous or on-demand water heaters, are water heaters that do not contain a storage tank. The water is only heated as it passes through the heat exchanger.

<sup>3</sup>Use of a water heater for another housing unit also includes the use of the water heater for a business or farm building as well as another housing unit.

Q = Data withheld either because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 10 households were sampled.

N = No cases in reporting sample.

Notes: • Because of rounding, data may not sum to totals. • See Glossary for definition of terms used in these tables.

Source: U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics, Forms EIA-457 A and C of the 2009 Residential Energy Consumption Survey.

**AFFIDAVIT OF H. EDWIN OVERCAST**

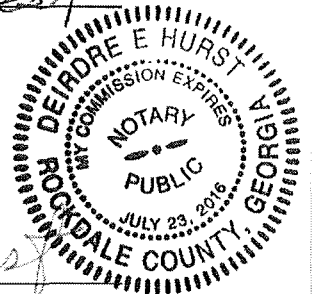
STATE OF GEORGIA )  
  ) ss  
COUNTY OF HENRY )

On the 19<sup>th</sup> day of March, 2015, before me appeared H. Edwin Overcast, to me personally known, who, being by me first duly sworn, states that he is Director of Management Consulting of Black & Veatch and acknowledged that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

H. Edwin Overcast  
H. Edwin Overcast

Subscribed and sworn to before me this 19<sup>th</sup> day of March, 2015

Deirdre E. Hurst  
Notary Public



My commission expires: 7.23.2016