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Witness: Avi Allison
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Sponsoring Party: Sierra Club
Date Testimony Prepared: Dec. 18, 2019

BEFORE THE PUBLIC SERVICE COMMISSION OF THE STATE OF MISSOURI

FILE NO. ER-2019-0335

RATE DESIGN

DIRECT TESTIMONY

OF

AVI ALLISON

ON BELHAF OF SIERRA CLUB

December 18, 2019

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application Union Electric Company d/b/a Ameren Missouri's Tariffs to Decrease Its Revenues for Electric Service.	)))))	File No. ER-2019-0335

AFFIDAVIT

STATE OF Washington)
) ss.
COUNTY OF King)

Avi Allison, first being sworn on his oath, states:

1. My name is Avi Allison, and I am a Senior Associate with Synapse Energy Economics, Incorporated (Synapse). My business address is 485 Massachusetts Avenue, Suite 2, Cambridge, Massachusetts 02139.
2. Attached hereto and made part hereof for all purposes is my Rate Design Direct Testimony on behalf of Sierra Club, including exhibits, all of which have been prepared by me in written form for introduction into evidence in the above-referenced docket.
3. I hereby swear and affirm that, to the best of my knowledge and belief, the facts stated in the direct testimony are true. In addition, my judgment is based upon my professional experience, and the opinions and conclusions stated in the Rate Design Direct Testimony are true, valid, and accurate.

Avi Allison aka Abraham Allison

SUBSCRIBED TO AND SWORN TO before me this 18th day of December, 2019, by Avi Allison.

Notary Public

My commission expires: 11/09/2022

VLADISLAV VAKHER
Notary Public
State of Washington
Commission # 203560
My Comm. Expires Nov 9, 2022

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AA-D-36. Ameren Responses to Data Requests.

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AA-D-38. Bonbright, James. *Principles of Public Utility Rates*, Columbia University Press (1961).

AA-D-39. Ryan Hledik, Ahmad Faruqui, and Cody Warner. *The National Landscape of Residential TOU Rates: A Preliminary Summary* (Nov. 2017).

AA-D-40. Jennifer Potter, Stephen George, and Lupe Jimenez. *SmartPricing Options Final Evaluation*, Prepared for the U.S. Department of Energy (SMUD, Sept. 5, 2014).

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1. INTRODUCTION AND PURPOSE OF TESTIMONY

Q Please state your name and occupation.

A My name is Avi Allison and I am a Senior Associate with Synapse Energy Economics, Incorporated.

Q Are you the same Avi Allison who filed direct testimony regarding revenue requirement issues in this proceeding?

A Yes.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of Sierra Club.

Q What is the purpose of this testimony?

A The purpose of this testimony is to evaluate the residential rate design proposals advanced by Union Electric Company d/b/a Ameren Missouri (Ameren or the Company) in this proceeding. Specifically, I assess Ameren's proposals to (1) increase the residential customer charge from $9 to $11 per month, (2) implement two new opt-in residential time-of-use (TOU) rates, and (3) implement a three-part residential pilot rate that would include a non-coincident peak (NCP) demand charge.

Q Please identify the documents upon which you base the opinions presented in your testimony.

A My findings rely primarily upon the testimony, exhibits, and discovery responses of Ameren witnesses. I also rely to a limited extent on external documents, such as the foundational ratemaking publications of James Bonbright.

2. FINDINGS AND RECOMMENDATIONS

Q Please summarize your findings.

A My primary findings include the following:

1. **Ameren's proposed residential customer charge increase is not cost-based.** Limiting the costs recovered through the customer charge to only those costs that the Commission has previously identified as truly customer-related yields a cost-based customer charge of $7.90 per month.

2. **Ameren's proposed residential customer charge increase would have undesirable policy effects.** The proposed increase would weaken incentives for energy efficiency, reduce customers' control over their bills, and disproportionately harm low-income customers.

3. **Ameren's TOU proposals are generally sound but contain elements that could unnecessarily discourage customer adoption.** These concerning elements include a very high summer peak rate for the Company's proposed Smart Savers Rate and an initial requirement that Ameren's proposed EV Savers Rate be applied to a customer's whole-home load rather than just electric vehicle (EV) charging load.

4. **Ameren's proposal to implement a residential NCP demand charge as part of a three-part pilot rate is not cost-based.** Such a charge is inconsistent with cost causation and would provide perverse incentives regarding when to use electricity. Superior alternatives, including TOU rates and critical peak pricing (CPP), are available for recovering distribution system costs.

Q Do you have any recommendations to offer the Commission?

A Yes. Based on my findings, I offer the following recommendations:

1. The Commission should reject the proposed increase in the residential customer charge and require that Ameren implement a residential customer charge of $7.90 per month.

2. The Commission should require that Ameren reduce the peak summer rate associated with its Smart Savers Rate. My recommended mechanisms to help achieve this result include extending the summer peak period to include the hour from 2 p.m. to 3 p.m. and implementing CPP.

3. The Commission should require Ameren to promptly develop an option for EV owners to use currently available sub-metering technologies, such as those in use in California and Minnesota, to apply Ameren's proposed EV Savers Rate exclusively to their EV charging.

4. The Commission should require that Ameren develop and apply tools and personalized tips to improve residential customers' understanding of their rate options. In addition, the Company should take further education and outreach steps as needed to maximize enrollment in TOU rates.

5. The Commission should reject Ameren's proposed residential three-part rate, as it is not cost-based. If the Commission decides to allow Ameren to implement a pilot three-part rate, I recommend that the Commission require Ameren to (1) apply any demand charge to a narrower set of hours that is more consistent with Ameren's peak hours and (2) collect and make available detailed information regarding the effectiveness of the pilot rate.

3. RESIDENTIAL CUSTOMER CHARGE PROPOSAL

Q Please summarize this section.

A In this section I evaluate Ameren's proposal to increase its residential customer charge from $9 to $11 per month. I show that Ameren's proposal is not cost-based, but instead uses the

customer charge to recover distribution system costs that are not directly related to the number of customers that Ameren serves. I discuss how this Commission and others throughout the country have rejected the methodology upon which Ameren bases its proposed customer charge increase. I show that a customer charge grounded in costs that are truly customer-driven would be approximately $7.90 per month. I then identify the ways in which Ameren's proposed customer charge increase would be incompatible with Missouri policy objectives. I conclude that the Commission should reject Ameren's proposal to increase its residential customer charge and should instead decrease the residential customer charge to $7.90 per month.

i. Ameren's proposed residential customer charge increase is not cost-based.

Q Please summarize Ameren's proposed change to its residential customer charge.

A The Company proposes to increase the residential customer charge from $9 to $11 per month for all residential rates (an increase of 22 percent), while decreasing the volumetric energy charges faced by residential customers. The Company's proposal is summarized in Table 1 below.

Table 1. Ameren proposed changes to residential basic rate

	Current	Proposed	Change
Customer Charge	$9.00	$11.00	22%
Summer: Energy	$0.1258	$0.1151	-9%
Winter: Energy (First 750 kW)	$0.0876	$0.0800	-9%
Winter: Energy (Above 750 kW)	$0.0600	$0.0551	-8%

Source: Ameren Residential Service Rate, MO PSC Schedule No. 6, 3rd Revised, Sheet No. 54 and Direct Testimony of Michael W. Harding, Schedule MWH-D1, p. 2.

Q Why is Ameren proposing these changes to residential rates?

A The Company explains that it is requesting an increase in the residential customer charge in order to "move the required rates within the Residential class marginally toward cost of

service," since, according to the Company, the current customer charge is below the fully allocated value indicated by its cost of service study.[1] The Company claims that raising the customer charge will make it more cost-reflective, increasing both equity and overall system efficiency.[2]

Q What guidance has the Commission provided regarding the costs that belong in a customer charge?

A In its Report and Order in Ameren's 2014 rate case, the Commission stated that customer-related costs that belong in a customer charge "include meter reading, billing, postage, customer account service, and a portion of the costs associated with required investment in a meter, the service line drop, and other billing costs."[3]

Q What types of costs is the Company proposing to recover through the customer charge?

A The Company is proposing to recover the following costs through the customer charge: "monthly meter reading, billing, postage, customer accounting and customer service expenses, investments in meters and service lines, as well as a portion of line transformers, and other distribution system facilities."[4] Ameren's proposed inclusion of a portion of line transformers and "other distribution system facilities" in the customer charge is based on the Company's use of the Minimum Distribution System (MDS) approach. This approach classifies certain secondary distribution system costs as customer-related and is primarily

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[1] Direct Testimony of Michael W. Harding on Behalf of Ameren at 10.

[2] Direct Testimony of Steven M. Wills on Behalf of Ameren at 22-23.

[3] Missouri Public Service Commission. Case No. ER-2014-0258, *Report and Order* at 76 (April 29, 2015).

[4] Direct Testimony of Thomas Hickman on Behalf of Ameren at 9.

responsible for the Company's finding that residential customer-related costs amount to $24.85 per month.[5]

Q Is the Company's customer charge proposal and methodology consistent with Commission guidance?

A No. Secondary distribution system costs are notably absent from the list of costs that the Commission stated are customer-related.

Q Has the Commission rejected a similar proposal in the past?

A Yes. In its 2014 rate case Report and Order, the Commission rejected Ameren's proposed residential customer charge increase, which was based on a cost of service study that the Company claimed supported a customer charge greater than $20. Instead, the Commission required Ameren to maintain an $8 per month residential customer charge.[6]

Q What is an MDS study?

A An MDS study is an approach to determining the portion of secondary distribution system costs that should be classified as customer-driven, rather than demand-driven, for the purpose of cost allocation. The "minimum" distribution system is a hypothetical one composed of the smallest system components currently installed by the utility. The idea is that such a system would represent the smallest one that could possibly be built; the costs associated with a "minimum" system are deemed necessary to make service available and are classified as customer-related, while the balance of distribution system costs are allocated based on demand.

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[5] Direct Testimony of Steven M. Wills at 27.

[6] *Id.* 76-77.

Q Do you have concerns with the MDS methodology?

A Yes. In addition to being inconsistent with past Commission guidance, I have general concerns with the reasonableness of the MDS methodology for rate design purposes.

Q What are your general concerns with the reasonableness of the MDS methodology?

A The MDS approach classifies portions of secondary distribution system costs as customer-related, when in fact such costs have no direct relationship to the number of residential customers on the system. Specifically, Ameren's MDS classifies components of the Company's poles, conductors, conduit, and line transformers as customer-related. But the costs associated with these secondary distribution system elements are driven by two factors: customer demand and the geographic dispersion of the grid. Such costs are unlikely to have any direct relationship with the marginal costs of a customer joining or leaving the grid, especially in areas that are already served by the utility. In other words, these MDS costs are clearly not customer-related in any straightforward way.

Q The Company notes that the MDS methodology is described in the National Association of Regulatory Utility Commissioners (NARUC) Electric Cost Allocation Manual. Does this mean that this is a sound methodology for rate design purposes?

A Not necessarily. While the MDS methodology is described in the 1992 NARUC manual, the manual notes that classification of distribution system costs as customer-related is "controversial," that it can produce statistically unreliable results, and that the results can be influenced by multiple factors.[7] Further, the manual states that even "minimum size

[7] Ex. AA-D-29, NARUC. *Electric Utility Cost Allocation Manual* at 95-96 (1992).

distribution equipment has a certain load-carrying capability, which can be viewed as a demand-related cost."[8]

An updated report published by NARUC in 2000 expounds on the shaky assumptions underpinning the MDS approach as follows:

> In the case of the minimum-size and zero-intercept methods, the threshold assumption is that there is some portion of the system whose costs are unrelated to demand (or to energy for that matter). From one perspective, this notion has a certain intuitive appeal – these are the lowest costs that must be incurred before any or some minimal amount of power can be delivered – but from another viewpoint it seems absurd, since in the absence of any demand no such system would be built at all.[9]

In addition, it is worth noting that even if one were to accept the MDS method as a flawed but acceptable approach for allocation of embedded costs across different classes, that does not justify its use for rate design purposes, where marginal costs are much more important than embedded costs.

Q What method do you recommend instead of the MDS method for the purposes of estimating a cost-based residential customer charge?

A I recommend the Basic Customer Method. This method is intuitive, since it includes only costs that vary directly based on the number of customers on the system. Specifically, the Basic Customer Method classifies as customer-related only costs associated with meters,

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[8] *Id.* at 95.

[9] Ex. AA-D-30, Weston, Frederick. *Charging for Distribution Utility Services: Issues in Rate Design* at 30 (Dec. 2000).

service drops, meter reading, customer service, and billing. This is analogous to the approach the Commission endorsed in the 2014 Ameren rate case.

Q Can you provide any examples where other state commissions have adopted the Basic Customer Method for rate design?

A Yes. I provide two examples below:

1) In a 2015 rate case, the Washington Utilities and Transportation Commission rejected proposals to increase the customer charge, stating:

> The Commission is not prepared to move away from the long-accepted principle that basic charges should reflect only "direct customer costs" such as meter reading and billing. Including distribution costs in the basic charge and increasing it 81 percent, as the Company proposes in this case, does not promote, and may be antithetical to, the realization of conservation goals.[10]

2) The Texas Public Utilities Commission has stated that "the customer charge shall be comprised of costs that vary by customer such as metering, billing and customer service."[11]

In some states, the Basic Customer Method has been mandated by legislation. For example, in 2015, the Connecticut legislature passed a law limiting costs recovered through residential

[10] Ex. AA-D-31, Washington Utilities and Transportation Commission. Docket UE-140762. *Final Order Rejecting Tariff Sheets, Resolving Contested Issues, Authorizing And Requiring Compliance Filings* at 91(Mar. 2015).

[11] Ex. AA-D-32, Public Utilities Commission Texas. Docket No. 22344. *Interim Order Establishing Generic Customer Classification and Rate Design, Generic Issues Associated with Applications for Approval of Unbundled Cost of Service Rate Pursuant to PURA § 39.201 and Public Utility Commission Substantive Rule § 25.344* at 6 (Nov. 2000).

customer charges to "the fixed costs and operation and maintenance expenses directly related to metering, billing, service connections and the provision of customer service."[12]

Q Do any sections of Ameren's testimony reflect the principles of the Basic Customer Method rather than the MDS method upon which the Company's customer charge proposal relies?

A Yes. Ameren witness Ahmad Faruqui refers to the work of James Bonbright in stating that a fixed customer charge should "recover the full costs of billing, metering, and customer service."[13] MDS costs are not among these costs.

Q What would Ameren's residential customer charge be under the Basic Customer Method?

A I calculate that Ameren's residential customer charge would be $7.90 under the Basic Customer Method. I arrived at this estimate by modifying the Company's cost of service study[14] to exclude all MDS components from the customer charge. I note that this $7.90 value is very similar to the $8 customer charge that the Company presented as covering the "basic costs of metering and billing customers (e.g., monthly meter reading, billing, postage, customer accounting and customer service expenses, investment in meters and service lines)" in its previous rate case.[15] The calculated $7.90 value is $1.10 less than the Company's

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[12] Ex. AA-D-33, CGS § 16-243bb, June Sp. Sess. P.A. 15-5, S. 105.

[13] Direct Testimony of Ahmad Faruqui on Behalf of Ameren at 7.

[14] Ameren Workpaper "Ameren-UE_DIR_001_Hickman-Att-MO ECCOS_2018 Final," tab "Unbundled."

[15] Ex. AA-D-34, Direct Testimony of William R. Davis on Behalf of Ameren, Missouri Public Service Commission File No. ER-2016-0179 at 20 (July 2016).

current customer charge. Critically, this result suggests that Ameren's current residential customer charge is over-collecting, rather than under-collecting, customer-related costs.

ii. Ameren's proposed residential customer charge increase would have undesirable policy consequences.

Q Do you have additional concerns regarding the consistency of Ameren's proposed customer charge increase with Missouri energy policy and prior Commission guidance?

A Yes. I am concerned that the proposed customer charge increase would have consequences that are at odds with Missouri's energy policy goals. Specifically, the proposed customer charge increase would be detrimental to energy efficiency efforts and would reduce customers' control over their energy bills.

Q What impact would the Company's rate design proposal have on customer incentives to use electricity more efficiently?

A A higher customer charge reduces customers' incentive to use electricity more efficiently. Holding all else equal, a customer charge increase is necessarily linked to a decrease in the energy charge under a two-part rate. And since only the energy charge can be avoided through greater energy efficiency, increasing the customer charge makes customer efforts to reduce their electricity bills through energy efficiency investments less effective. As a consequence, higher customer charges are likely to discourage customers from implementing energy efficiency measures. The end result is greater future energy consumption.

Q Have you estimated the effect of Ameren's proposed customer charge increase on residential electricity consumption?

A Yes. I estimate that Ameren's $11 customer charge proposal would result in a 0.6 percent increase in residential electricity consumption relative to a cost-based $7.90 customer charge. To put this in context, Ameren's 2019-2024 energy efficiency plan calls for annual average

energy savings of about 1.1 percent of sales.[16] Thus, the proposed customer charge would likely offset about half a year of savings achieved through the Company's residential energy efficiency programs.

Q How did you arrive at these estimated energy consumption impacts?

A The change in electricity consumption that results when a customer charge increase drives energy rates downward is mediated by the price elasticity of demand. There are a wide variety of estimates in the literature regarding the price elasticity of demand of residential electricity assumption. For the purposes of my analysis, I used Ameren's 2017 Integrated Resource Plan (IRP) assumption of -0.19.[17] I multiplied this value by the percentage difference between Ameren's calculated energy rates under an $11 customer charge and a $7.90 customer charge.[18] This calculation resulted in my estimated residential consumption impact of 0.6 percent.

Q Will increasing the residential customer charge impact the efficacy of the Company's energy efficiency programs?

A Yes. Increasing the customer charge and reducing the energy charge works at cross-purposes to the Company's energy efficiency programs. As the Company reports in its 2019-2024

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[16] Ameren *2019-24 MEEIA Energy Efficiency Plan* at 7. Available at http://www.missouribusinessalert.com/wp-content/uploads/2018/06/Ameren-efficiency-plan-2.pdf.

[17] Ex. AA-D-35, Ameren 2017 IRP, Chapter 3, p. 16. This indicates that a 1 percent decrease in energy prices will result in a 0.19 percent increase in residential electricity consumption.

[18] Ameren Workpaper "Ameren-UE_DIR_001_Harding-Att-Jan 2018 to Dec 2018 warehouse bill units Dec 2019 growth delete premeeia formulas jul1.xlsx," tab "Res Rates." Compare calculated energy rates in Column H resulting when customer charge in Cell H8 is set to $11 to energy rates resulting when customer charge is set to $7.90.

energy efficiency plan, it intends to ramp up both spending and energy savings over this forthcoming period relative to recent years.[19] Increasing the customer charge and reducing the energy charge reduces the cost-effectiveness of energy efficiency investments–an effect that the Company has acknowledged. For example, the Company's past analysis of its 2016 proposal to increase the total fixed charges faced by residential customers concluded that increasing fixed charges would hamper efficiency efforts by lengthening the payback period on customer investments.[20] Longer payback periods reduce the economic attractiveness of efficiency investments, lowering adoption rates. As a result, the Company may have to further increase its spending on efficiency programs to achieve the same energy savings, ultimately leading to higher program costs borne by customers.

Q Has the state of Missouri adopted policies that prioritize energy efficiency?

A Yes. Executive Order 14-06, issued by Governor Jay Nixon in 2014 to commission a comprehensive state energy plan, identified the "efficient use of energy in all sectors of the economy" as a priority.[21] Missouri's Energy Efficiency Investment Act identifies efficient provision of energy as a cardinal goal for utility resource planning.[22]

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[19] Ameren *2019-24 MEEIA Energy Efficiency Plan*. Available at http://www.missouribusinessalert.com/wp-content/uploads/2018/06/Ameren-efficiency-plan-2.pdf.

[20] Attachment "Sierra_2-SC_0002_20-Att-SC 0002.20 Attach FirstYrSavingsUpdates_2016-06-15.xlsx" to Ameren Response to Data Request No. SC 2.20(b) (*see* Ex. AA-D-36).

[21] Ex. AA-D-37, Governor Jeremiah (Jay) Nixon, Executive Order 14-06 (June 18, 2014).

[22] Missouri Energy Efficiency Investment Act. (§393.1075, RSMo.)

Q Has the Commission previously recognized the detrimental impacts of higher customer charges on energy efficiency efforts?

A Yes, the Commission has long recognized the negative effects of increasing customer charges on energy efficiency programs. In 2012, the Commission rejected a proposed increase in the customer charge for residential and small general service classes, writing:

> Shifting customer costs from variable volumetric rates, which a customer can reduce through energy efficiency efforts, to fixed customer charges, that cannot be reduced through energy efficiency efforts, will tend to reduce a customer's incentive to save electricity. Admittedly, the effect on payback periods associated with energy efficiency efforts would be small, but increasing customer charges at this time would send exactly [the] wrong message to customers that both the company and the Commission are encouraging to increase efforts to conserve electricity.[23]

Q How would an increased customer charge impact residential customers' ability to control their electricity bills?

A Increasing Ameren's residential customer charge would unambiguously decrease customers' ability to control their bills. The only way for a customer to avoid the customer charge is by disconnecting from the electric grid entirely. Since access to the electric grid is a core component of modern life, a customer charge is effectively unavoidable. In contrast, an energy charge can be avoided through energy conservation and energy efficiency efforts. Shifting cost recovery from the energy charge to the customer charge, as Ameren proposes to do, thus increases the unavoidable component of customers' bills while decreasing the

[23] Missouri Public Service Commission. Case No. ER-2012-0166, *Report and Order* at 110-11. (Dec. 12, 2012).

avoidable component. The end result is a decrease in customers' ability to manage their electricity bills.

Q Has the Commission previously commented on the importance of residential customers' control over their energy bills?

A Yes. In its Report and Order in Ameren's 2014 rate case, the Commission clearly noted its preference for maintaining customer control, stating:

> The Commission must also consider the public policy implications of changing the existing customer charges. There are strong public policy considerations in favor of not increasing the customer charges…Residential customers should have as much control over the amount of their bills as possible so that they can reduce their monthly expenses by using less power, either for economic reasons or because of a general desire to conserve energy. Leaving the monthly charge where it is gives the customer more control.[24]

iii. Ameren's proposed residential customer charge increase would disproportionately burden low-income customers.

Q Do you have other concerns with the Company's proposed residential customer charge increase?

A Yes, I am concerned that the proposed customer charge increase would disproportionately burden low-income customers.

[24] Missouri Public Service Commission. Case No. ER-2014-0258, *Report and Order* at 76 (April 29, 2015).

Q Why would the Company's proposal disproportionately impact low-income customers?

A The lower a customer's monthly electricity consumption, the greater the percentage by which the monthly bill will rise under the proposed customer charge increase. Research indicates that low-income customers tend to use less electricity on average. This means that higher customer charges will raise electricity bills the most for those who can least afford such increases.

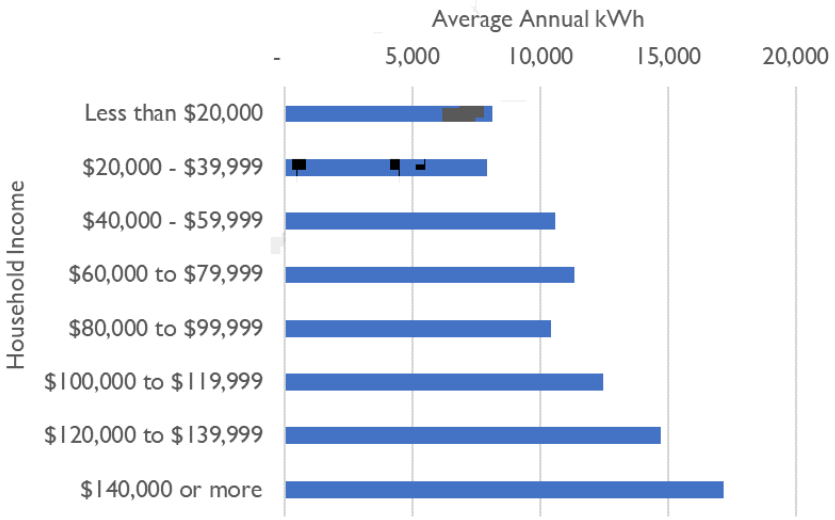
Q Why do you assert that low-income customers tend to use less electricity than other residential customers?

A While the Company has not provided data on electricity consumption patterns for its low-income customers,[25] publicly available data from the U.S. Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) is illustrative. The data for Census Division 4, which includes Missouri, indicates that electricity use and income are highly correlated. This is shown in Figure 1.[26] Because electricity usage tends to rise with income, low-income customers will generally be worse off than the average customer under the Company's proposal.

[25] Ameren Response to Data Request No. SC 2.47 (*see* Ex. AA-D-36).

[26] U.S. Energy Information Administration. *Residential Energy Consumption Survey*. Available at https://www.eia.gov/consumption/residential/.

Figure 1. Average annual household electricity consumption by household income



Source: U.S. Energy Information Administration. 2015 Residential Energy Consumption Survey.

iv. Recommendations regarding the residential customer charge

Q What are your overall recommendations regarding Ameren's proposal to increase its residential customer charge?

A I recommend that the Commission reject Ameren's proposal to increase its residential customer charge and instead require Ameren to decrease that charge to $7.90 per month.

4. RESIDENTIAL TOU RATE PROPOSALS

Q Please summarize this section.

A In this section I review Ameren's two new residential TOU rate proposals. I provide general support for Ameren's proposed use of TOU rates. However, I also raise concerns regarding elements of those TOU proposals that may limit customer adoption. To address those concerns, I recommend that Ameren (1) reduce the summer energy rate associated with the proposed Smart Savers Rate, (2) extend the summer peak period of the Smart Savers Rate by

one hour, and (3) promptly develop an option for EV owners to use existing sub-metering technology to apply Ameren's proposed EV Savers Rate exclusively to their EV charging. I further recommend that Ameren implement a robust customer outreach and education program to accompany its TOU rate offerings.

i. <u>Ameren's focus on developing TOU rates is appropriate.</u>

Q Please summarize Ameren's residential TOU rate proposals.

A The Company has proposed two new residential TOU rates—the EV Savers rate and the Smart Savers rate. While both rates are new, the Smart Savers rate is related to an existing TOU pilot rate that the Company has proposed to phase out.[27] The EV Savers rate, targeted at customers who will charge EVs at home, is without any precedent for the Company. Both rates apply to the customer's total household load. While the EV Savers rate is open to customers with Automated Meter Reading (AMR) or Advanced Metering Infrastructure (AMI), the Smart Savers rate is only available to those with AMI.

Q What characteristics do the proposed TOU rates have in common?

A Both rates divide the year into identical summer and non-summer periods, designate the same nighttime hours as off peak, and feature nearly identical off-peak energy charges.

Q How do the two TOU rate proposals differ?

A The rates differ in their scheduling of peak and other rate periods. They also differ in both their absolute energy charges and the differentials between their respective peak and off-peak charges. The EV Savers rate designates the period from 6 a.m. to 10 p.m. on all days as on

[27] Direct Testimony of Steve M. Wills at 56.

peak and all remaining hours as off peak.[28] The Smart Savers rate has seasonal periods, with the on-peak window set between 3 p.m. and 7 p.m. in the summer and covering the periods from 6 a.m. to 8 a.m. and from 6 p.m. to 8 p.m. during non-summer months. Off-peak hours are those between 10 p.m. and 6 a.m. All other hours are subject to a third, intermediate rate.[29]

The ratio between peak and off-peak rates in the EV Savers rate is comparatively moderate. The summer peak rate is about 2.5 times greater than the summer off-peak rate, while the non-summer peak rate is about 1.6 times greater than the non-summer off-peak rate.[30] In contrast, the Smart Savers summer peak rate is nearly 6 times greater than the corresponding off-peak rate. In non-summer months, the peak Smart Savers rate is about 3.4 times greater than the off-peak rate.[31]

Q How did the Company determine the on-peak hours for its proposed TOU rates?

A The Company used different methodologies to designate rate periods in each TOU rate. For the Smart Savers rate, the Company analyzed system load data to identify the hours in each season when system peaks are most likely to occur.[32] Specifically, the Company selected the 10 summer days and 10 winter days with the highest load, calculated composite days based

[28] *Id.* at 43.
[29] *Id.* at 55.
[30] *Id.* at 43.
[31] *Id.* at 55.
[32] *Id.* at 54.

on the average of each of these 10 days' loads, and then identified periods of greatest demand during both the composite summer and composite winter days.[33]

For the EV Savers rate, it appears that the Company simply adopted the same off-peak period as appears in the Smart Savers rate and then designated the balance of hours as on-peak.[34]

Q How did the Company determine rates for each TOU period?

A For both TOU proposals, the Company set the rates to be revenue neutral for a typical residential customer who does not modify their consumption behavior in response to the rate, based upon a sample of 800 residential customers.[35]

Q Do you support the Company's TOU rates?

A I commend the Company for proposing two new TOU rates. Well-designed and well-implemented TOU rates promise to provide better information and bill control to customers, align customer incentives with overall system efficiency, and help to reduce total system costs. TOU rates can also help to advance other policy goals, including promotion of EV adoption and other beneficial electrification. There is abundant evidence of the efficacy of TOU rates from other states, such as California.

Q How well do the Company's proposed TOU rates conform to rate design principles?

A In general, I find that these rates are fairly consistent with core rate design principles, such as those outlined by James Bonbright.[36] The Company's proposed TOU rates appear to be

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[33] Attachment "Sierra_2-SC_0002_27-Att-MPSC 0002.27 Attach Load analysis for TOU.xlsx" to Ameren Response to Data Request No. SC 2.27. (*see* Ex. AA-D-36)

[34] Ameren Response to Data Request No. SC 2.21 (*see* Ex. AA-D-36).

[35] Direct Testimony of Steven M. Wills at 50.

broadly cost-reflective, simple, and easy to understand. However, I have some concerns regarding the principle of acceptability, as I describe below. Customer acceptability is critical, as these rates are intended to be opt-in rates. To achieve the energy policy goals of encouraging customers to use the grid more efficiently and encouraging beneficial electrification, the rates must be appealing enough to attract subscribers. Otherwise the rates will not achieve their intended purposes.

ii. Ameren's proposed Smart Savers rate includes an unnecessarily high summer peak rate and a poorly supported summer peak window.

Q What are your concerns regarding the proposed Smart Savers rate?

A I am concerned that the high summer peak rate associated with Ameren's proposed Smart Savers rate may disincentivize customers from enrolling in the rate. In addition, I am concerned that the Company's proposed summer peak window misses one of the afternoon hours in which Ameren's system experiences some of its highest loads. I believe that these issues may be resolved jointly, as I describe further below.

Q Please describe your concerns with the proposed Smart Savers summer peak rate in greater detail.

A The Smart Savers rate features a very high differential between the peak and off-peak energy rates during the summer season. The proposed summer peak energy charge is about 32 cents per kilowatt-hour (kWh), while the proposed summer off-peak charge is about 5 cents per kWh, for a ratio of about 6:1. I am concerned that such a large differential in rates, driven by

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[36] Ex. AA-D-38, Bonbright, James. *Principles of Public Utility Rates*, Columbia University Press at 291(1961).

an on-peak price that is nearly three times the current residential basic rate, will discourage customers from signing up due to the fear of high bills if they cannot shift load away from on-peak hours. This adverse potential is recognized by Company witness Steven Wills, who indicates in testimony that "there is no question that it sounds intimidating and potentially costly when a customer hears that peak usage could be priced at over 30 cents/kWh when the default rate they otherwise pay is only around 12 cents."[37]

Q Has the Company tested a rate with a similar price differential previously?

A Yes. The Company's TOU pilot rate also featured a substantial peak to off-peak rate differential. That rate suffered from very low customer enrollment.[38] While the Company suggests that this concern will be mitigated by the large potential for savings for customers who shift their load to the less expensive off-peak periods, I am not convinced that this opportunity will outweigh the fear of the high peak rate. I also do not find completely convincing the Company's suggestion that customer access to detailed consumption data through AMI will necessarily allay customers' fears of punitively high bills from the Smart Savers rate. There are many types of residential customer electricity usage that are difficult to shift temporally, and other types of load-shifting that will take time and money to implement.

Q What are typical price ratios for TOU rates in other jurisdictions?

A According to research conducted by Ameren witness Ahmad Faruqui and his Brattle Group colleagues, the median price ratio is 2.7:1 for both two- and three-period TOU rates, with

[37] Direct Testimony of Steven M. Wills at 57.

[38] *Id.*

approximately 90 percent of TOU rates having a peak to off-peak price ratio of less than 6:1.[39]

Q Is a peak to off-peak price ratio of 6:1 required to achieve substantial peak demand reductions?

A No. Mr. Faruqui's research indicates that substantial peak demand reductions are achievable with much lower ratios. For example, Mr. Faruqui estimates that a peak to off-peak price ratio of 4:1 will result in peak demand reductions of greater than 10 percent, even in the absence of enabling technology to respond to TOU rates.[40] Mr. Faruqui's testimony further indicates that there are declining returns to higher peak to off-peak price ratios.[41] That is, increasing a peak to off-peak price ratio from 5:1 to 6:1 has a much smaller impact on peak demand than increasing a peak to off-peak price ratio from 2:1 to 3:1.

Q How do you recommend that the Company modify its Smart Savers rate?

A I recommend that the Company reduce the summer peak rate such that the peak rate is less than 30 cents per kWh and is no greater than 4 times the off-peak rate.

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[39] Ex. AA-D-39, Ryan Hledik, Ahmad Faruqui, and Cody Warner. *The National Landscape of Residential TOU Rates: A Preliminary Summary* (Nov. 2017), http://files.brattle.com/files/12658_the_national_landscape_of_residential_tou_rates_a_preliminary_summary.pdf.

[40] Direct Testimony of Ahmad Faruqui at 12.

[41] *Id.*

Q Do you have particular suggestions for how the Company might arrive at a lower summer peak rate while still providing a strong price signal for residential customers to reduce their electricity usage during peak hours?

A Yes, I have two suggested options, which could be implemented separately or in combination. First, Ameren could and should extend the summer peak period to encompass additional hours. Second, Ameren could implement CPP as part of its Smart Savers rate option. I discuss the rationale for each of these approaches further below. I note that neither option is necessary for Ameren to reduce the summer peak rate associated with its proposed Smart Savers rate. But because both of these options will also improve the load-shifting effectiveness of the Smart Savers rate, I recommend their adoption.

Q How would expanding the summer peak period result in a lower peak rate?

A Expanding the summer peak period would increase the number of hours across which peak-related costs could be recovered. Spreading those peak-related costs across a higher number of hours would in turn facilitate a lower peak rate.

Q Does Ameren's load data support increasing the number of hours to which the Smart Savers rate summer peak period applies?

A Yes. My review of Ameren's system load data indicates that the Company's proposed summer peak period does not cover the full range of hours in which its load tends to be highest. I find that the Company's Smart Savers rate would be more cost-reflective if its summer peak period lasted from 2 p.m.to 7 p.m. rather than 3 p.m. to 7 p.m.

Q How did you reach this conclusion?

A The analysis that the Company conducted to inform its summer peak periods focused on the 10 highest-load days of 2018.[42] That analysis shows that the average load between 2 p.m. and 3 p.m. during the top 10 summer days was in fact *greater* than the average load between 6 p.m. and 7 p.m. This suggests that it is more beneficial for customers to shift load out of the hour from 2 p.m. to 3 p.m. than it is for them to avoid usage during the hour from 6 p.m. to 7 p.m. Including the hour from 2 p.m. to 3 p.m. would therefore both improve efficiency and provide increased flexibility to support a reduction in the summer peak rate.

I also verified this conclusion with my own analysis, using Ameren's load data from 2018 to assess when the Company's system load tends to be highest.[43] Figure 2 presents a heat map identifying Ameren's average system load during each combination of month and hour of the day in 2018. It is clear from this figure that summer hours from 2 p.m. to 3 p.m. are among the highest-load hours of the year. In fact, Figure 2 shows that in each of the summer months of 2018, average loads during the hour from 2 p.m. to 3 p.m. were higher than average loads during the hour from 6 p.m. to 7 p.m.

[42] Attachment "Sierra_2-SC_0002_27-Att-MPSC 0002.27 Attach Load analysis for TOU.xlsx" to Ameren Response to Data Request No. SC 2.27. (*see* Ex. AA-D-36)

[43] Attachment "Sierra_2-SC_0002_44-Att-SC 0002.44 Attach AMMO_SYSTEM_LOAD.xlsx" to Ameren Response to Data Request No. SC 2.44. (*see* Ex. AA-D-36)

Figure 2. Ameren average system load by hour and month, 2018 (MW)

Hour	1	2	3	4	5	6	7	8	9	10	11	12
1	4,572	4,010	3,551	3,294	3,472	4,105	4,216	4,026	3,654	3,217	3,787	3,925
2	4,530	3,963	3,503	3,233	3,276	3,866	3,965	3,805	3,468	3,118	3,733	3,864
3	4,522	3,962	3,500	3,226	3,145	3,696	3,792	3,658	3,344	3,072	3,725	3,847
4	4,555	3,988	3,527	3,249	3,084	3,602	3,683	3,567	3,276	3,064	3,755	3,870
5	4,656	4,099	3,631	3,346	3,100	3,591	3,673	3,578	3,295	3,139	3,863	3,972
6	4,876	4,334	3,853	3,567	3,229	3,673	3,754	3,706	3,423	3,332	4,086	4,181
7	5,170	4,642	4,167	3,854	3,435	3,847	3,890	3,897	3,650	3,641	4,356	4,447
8	5,294	4,752	4,284	3,971	3,688	4,159	4,195	4,101	3,794	3,793	4,461	4,575
9	5,255	4,737	4,266	3,977	3,937	4,491	4,557	4,377	4,013	3,861	4,455	4,583
10	5,177	4,684	4,232	3,952	4,187	4,826	4,927	4,686	4,264	3,920	4,417	4,534
11	5,070	4,619	4,183	3,904	4,430	5,158	5,282	5,017	4,529	3,981	4,353	4,456
12	4,958	4,532	4,116	3,835	4,623	5,450	5,573	5,300	4,766	4,024	4,277	4,360
13	4,847	4,445	4,046	3,786	4,799	5,692	5,807	5,546	4,975	4,055	4,209	4,262
14	4,757	4,373	3,981	3,739	4,959	5,914	5,997	5,761	5,156	4,078	4,164	4,192
15	4,684	4,305	3,911	3,694	5,080	6,069	6,125	5,886	5,270	4,073	4,122	4,153
16	4,686	4,287	3,863	3,665	5,169	6,186	6,209	5,981	5,352	4,070	4,131	4,174
17	4,823	4,358	3,873	3,676	5,225	6,242	6,254	6,028	5,406	4,077	4,264	4,360
18	5,125	4,541	3,933	3,708	5,216	6,173	6,193	5,973	5,348	4,070	4,481	4,603
19	5,195	4,686	4,040	3,736	5,091	5,965	6,019	5,791	5,168	4,111	4,505	4,616
20	5,165	4,658	4,144	3,825	4,891	5,703	5,757	5,556	5,041	4,103	4,461	4,584
21	5,103	4,595	4,135	3,910	4,782	5,477	5,519	5,412	4,862	3,989	4,393	4,535
22	4,965	4,459	4,019	3,791	4,551	5,249	5,281	5,123	4,570	3,811	4,258	4,408
23	4,756	4,257	3,826	3,582	4,173	4,859	4,890	4,727	4,219	3,580	4,067	4,224
24	4,593	4,084	3,655	3,389	3,796	4,462	4,494	4,349	3,884	3,361	3,901	4,045

Source: Attachment to Ameren Responses to Data Request N0. SC 2.44 (see Ex. AA-D-36).

Q Do you have any other observations regarding the data presented in Figure 2?

A Yes. Figure 2 shows that load patterns in the months of May and (to a lesser degree) October are much more similar to the load shapes of summer months than winter months. In both May and October, the highest-load hours tend to occur in the afternoon and early evening, and load tends to be lower in the morning hours. It is therefore likely inappropriate that the Company's proposed Smart Savers rate would apply the "non-summer" peak periods of 6 a.m. to 8 a.m. and 6 p.m. to 8 p.m. to these months rather than the summer peak period of 2 p.m. to 7 p.m.

Q Why do you recommend that the Company introduce a CPP rate?

A CPP rates assess an extremely high price during only a small number of event hours per year. Customers are typically notified the day before an event. For example, a utility might call five CPP events during the year, each of which lasts for between two and four hours. During the events, electricity might be priced at $1.50 per kWh. CPP can easily be layered on top of a standard TOU rate, though additional consumer education efforts are essential for a rate that includes CPP.

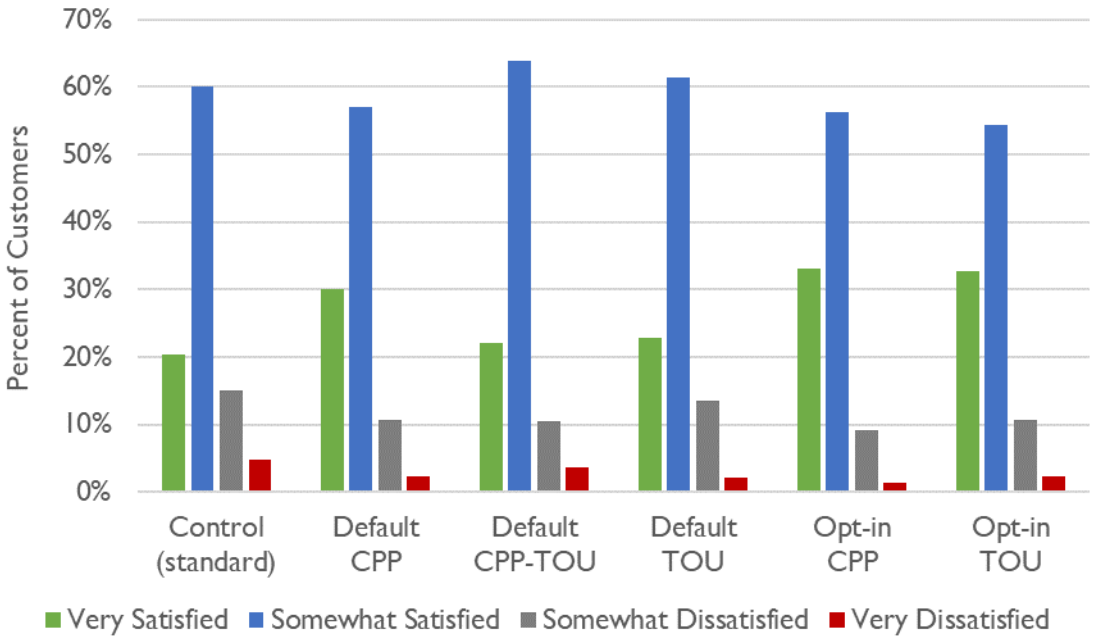
CPP can be used to concentrate recovery of peak-related costs on a small number of hours during which the system is actually at or near its peak. This reduces the magnitude of the peak-related costs that are left to be recovered through an on-peak TOU rate. By imposing substantial, temporary rate increases during a few system peaks, the Company could achieve an efficient behavioral response that would ultimately reduce overall system costs, while simultaneously allowing it to reduce the summer on-peak price to a more moderate level, which would likely enhance adoption of the rate.

Q Are CPP rates likely to be accepted by customers?

A Yes. CPP has been widely tested and found to be both highly effective and popular with customers. For example, in Sacramento Municipal Utility District's (SMUD) SmartPricing Options pilot, customer satisfaction with the CPP rate options was virtually identical to satisfaction with TOU rates (see Figure 3).[44]

[44] Ex. AA-D-40, Jennifer Potter, Stephen George, and Lupe Jimenez. *SmartPricing Options Final Evaluation*, Prepared for the U.S. Department of Energy (SMUD, Sept. 5, 2014), 123, https://www.smartgrid.gov/files/SMUD-CBS_Final_Evaluation_Submitted_DOE_9_9_2014.pdf. I note that in SMUD's pilot, the TOU

Figure 3. Customer acceptance of alternative rates under SMUD SmartPricing program



Source: Developed using data presented in Potter, Jennifer, Stephen George, and Lupe Jimenez, "SmartPricing Options Final Evaluation," p. 123.

iii. Ameren's proposal to only offer its EV Savers Rate as a whole-home rate could unnecessarily stifle rate adoption.

Q Do you generally support EV TOU charging rates?

A Yes. EV charging load can substantially increase residential electricity usage. If charging generally occurs during periods when the grid is not stressed, EVs can increase total electricity sales with minimal additional costs to the system. This can result in more efficient use of existing system infrastructure and put downward pressure on rates for all customers,

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rate had a peak to off-peak price ratio of approximately 3 to 1, while the CPP rate was approximately 9 times higher than the off-peak rate.

including both EV owners and non-EV owners. Well-designed TOU rates can help to achieve these benefits by aligning customer price signals with system conditions, thereby helping to reduce total system costs.

In addition, TOU rates can provide fuel cost savings to EV customers who charge off peak, thereby increasing the adoption of EVs. According to a survey of nearly 20,000 EV drivers, fuel cost savings relative to gasoline are the single biggest motivator of EV purchase decisions.[45]

Q What are your concerns with the EV Savers rate?

A I am concerned that customers on the EV Savers rate would have no choice but to apply the rate to their whole house load, rather than just the load associated with charging an EV. This could hinder adoption of the rate by customers who own EVs.

Q Why would it be preferable if customers could elect to enroll only their EV load in the EV Savers rate?

A EV load is generally easier to shift than other types of household load. When EVs draw electricity from the grid, that electricity is not immediately used to propel the vehicle. Instead, the electricity is stored in the vehicle's battery for later use. Most people do not care much about precisely when their EV gets charged, as long as the battery works when it is needed. This is very different from most major residential electricity uses (such as air conditioning) and opens up the possibility of encouraging efficient charging without inconveniencing consumers. However, customers may be reluctant to enroll in a whole-home rate if they do not expect to be able to easily shift the remainder of their household load.

[45] California Clean Vehicle Rebate Project, EV Consumer Survey Dashboard. Available at https://cleanvehiclerebate.org/eng/survey-dashboard/ev (last visited December 16, 2019).

Thus, a whole-home requirement for a TOU rate may dissuade customers who own an EV, or who are considering purchasing an EV, from enrolling in the rate.

Customer reluctance to enroll in the EV Savers rate as a whole-home TOU rate would undermine a principal aim of the rate—to appeal to EV owners.[46] If the whole-home metering requirement dissuades EV customers from enrolling in the EV Savers rate, those customers will remain on the standard residential rate, which fails to incentivize charging during off-peak periods. This will result in higher costs imposed on the grid by EV charging, rather than the more efficient use of existing grid assets that off-peak EV charging promises.

Q Does the Company intend to offer a sub-metering option for the EV Savers rate?

A While the Company has expressed its "hope" that it will be able to permit customers to use sub-metering to apply a TOU rate to just EV load, it has no specific timeline for implementing sub-metering capability and reports that it is not aware of any market-ready approaches.[47]

Q Are you aware of other jurisdictions that have successfully implemented sub-metering approaches to EV rates?

A Yes. Utilities in Minnesota and California have already implemented sub-metering options for their customers. In Minnesota, Xcel Energy has successfully implemented a pilot program that used networked EV supply equipment capable of providing billing-quality data of on-

[46] Direct Testimony of Steven M. Wills at 43.

[47] Ameren Response to Data Request No. SC 2.25 (*see* Ex. AA-D-36).

and off-peak charging.[48] Based on positive pilot results indicating that participants were benefitting from cost savings, were charging during off-peak hours, and were satisfied with their experience, Xcel decided to transition its sub-metering program from a pilot to a permanent offering.[49] California initiated its first pilot programs to evaluate sub-metering approaches in 2014.[50] Based off lessons learned during those pilots, San Diego Gas & Electric (SDG&E) plans to employ sub-meters at scale through its residential charging program.[51] This indicates that, contrary to Ameren's statements, the necessary technology for sub-metering is available today. I therefore recommend that the Company promptly investigate and develop a sub-metering option for its EV Savers customers.

Q Do you have any other recommendations regarding the implementation of Ameren's proposed TOU rates?

A Yes. To achieve the benefits promised by time-varying rates, customer enrollment levels must be maximized. Simply designing a rate well is not sufficient to ensure its success. Due to customer inertia, low levels of customer enrollment are common when customers are required to actively opt in to a rate. Therefore, Ameren should implement a robust customer outreach and education program to accompany its TOU rate offerings. Education and outreach are critical to ensuring widespread adoption of opt-in TOU rates. I note that the Company's pilot TOU rate may have suffered from limited adoption due to inadequate

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[48] Ex. AA-D-41, Minnesota Public Utilities Commission. Docket No. E002/M-15-111 and E002/M-17-817. *Compliance Filing: Residential Electric Vehicle Charging Tariff* at 10-24 (May 31, 2019).

[49] *Id.* at 24.

[50] Ex. AA-D-42, Jonathan Cook, Candice Churchwell, Alana Lemarchand, and Michael Sullivan. *California Statewide PEV Submetering Pilot –Phase 1 Report*, Nexant (April 1, 2016).

[51] Ex. AA-D-43, California Public Utilities Commission, *Decision on the Transportation Electrification Standard Review Projects*, Decision 18-05-040 at 14 (May 31, 2018).

customer outreach and education. The Commission should ensure that Ameren follows through on its expressed plans to develop and apply tools and personalized tips to help customers improve understanding of their circumstances and options.[52] In addition, I recommend that the Company take further education and outreach steps as needed, which I discuss in more detail below.

Q Is there any evidence that education and outreach increases customer adoption of TOU rates?

Yes. A recent report by the Smart Electric Power Alliance (SEPA) found that "Utilities that have a marketing budget for these rates see a 3x increase in enrollment. Further, those using more than three marketing channels have a 1.4x increase in customer enrollment."[53] The SEPA report also notes that lack of enrollment in an available rate was largely attributable to survey respondents' lack of awareness of the rate and the related potential for savings.[54]

Q What types of customer outreach and education activities do you recommend?

A There are many low-cost means of increasing customer awareness and adoption of TOU rates, such as through posting rate information clearly on the Company's website and through bill stuffers. Other options include:

- Providing auto dealership education, since auto sales representatives often have little to no understanding of the rates available to EV drivers, or the potential savings these could provide to customers. In California, a collaboration of organizations developed and

[52] Direct Testimony of Steven M. Wills at 58.

[53] Ex. AA-D-44, Smart Electric Power Alliance. *Residential Electric Vehicle Rates That Work: Attributes That Increase Enrollment*, (Nov. 2019) at 5.

[54] *Id.* at 6.

conducts a dealership training curriculum, and a $250 dealership incentive is provided for each EV purchase in which the customer also signs up for an EV rate.[55]

- Direct outreach to EV customers. To identify customers, utilities may be able to work with state agencies to access Department of Motor Vehicle registration records and directly contact EV drivers. Some utilities also offer gift cards or other rewards to customers. Establishing these points of contact can be an important first step to educating and enrolling customers in an EV rate.

- Price guarantees could be offered for the first six months or year after a customer signs up for a new rate. These guarantees ensure that the customer will not pay more on the TOU rate than they would on a standard rate, thereby reducing the customer's risk of signing up for a rate structure that is new to them.

iv. Recommendations regarding TOU rate proposals

Q Please summarize your recommendations regarding the Company's TOU rate proposals.

A I recommend that the Commission:

1. Require that Ameren reduce summer peak rate associated with its Smart Savers Rate. My recommended mechanisms to help achieve this result include extending the summer peak period to include the hour from 2 p.m. to 3 p.m. and implementing CPP.

[55] The monetary incentive was recently approved for SDG&E. *See* Ex. AA-D-45, California Public Utilities Commission. Decision on the Transportation Electrification Priority Review Projects. Decision 18-01-024 at 39 (Jan. 11, 2018).

2. Require Ameren to promptly develop an option for EV owners to use currently available sub-metering technologies, such as those in use in California and Minnesota, to apply Ameren's proposed EV Savers Rate exclusively to their EV charging.

3. Require that Ameren develop and apply tools and personalized tips to help customers improve their understanding of rate options,[56] and that the Company take further education and outreach steps as needed to maximize enrollment in TOU rates.

5. RESIDENTIAL THREE-PART PILOT RATE PROPOSAL

Q Please summarize this section.

A In this section I evaluate Ameren's proposal to implement a three-part residential pilot rate that includes a demand charge. I show that Ameren's proposed residential demand charge is effectively an NCP demand charge, is not cost-based, and could have effects contrary to its intended purpose. I then explain why alternative residential rate designs are generally preferable to residential demand charges. I conclude that Ameren's proposed three-part residential pilot rate should be rejected. However, should the Commission decide to allow Ameren to implement a pilot three-part rate, I recommend that the Commission require Ameren to (1) apply the demand charge to a narrower set of hours that is more consistent with Ameren's peak hours and (2) collect and make available detailed information regarding the effectiveness of the pilot rate.

[56] Direct Testimony of Steven M. Wills at 58.

i. Ameren's proposed pilot residential demand charge is not cost-based.

Q Please summarize Ameren's proposed residential three-part pilot rate.

A Ameren is proposing to implement a three-part residential pilot rate that consists of a customer charge, a TOU energy charge, and a demand charge.

Q How does Ameren define its proposed demand charge?

A The proposed demand charge would apply to a customer's maximum one-hour demand that occurs during any day of the relevant billing period between the hours of 6 a.m. and 10 p.m.[57] Ameren is proposing to set the residential demand charge at $6.86 per kilowatt (kW) during the summer months of June through September and $2.93 per kW during the remaining months of the year.[58]

Although the Company's proposed residential demand charge is not an NCP demand charge in a strict sense, in covering two thirds of all hours the proposed demand charge is effectively an NCP demand charge. In fact, Ameren's testimony explicitly describes the Company's proposed demand charge as an NCP demand charge.[59]

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[57] Direct Testimony of Steven M. Wills at 61.

[58] *Id.*

[59] Direct Testimony of Ahmad Faruqui at 16.

Q What is Ameren's justification for implementing its proposed three-part rate?

A Ameren argues that three-part rates such as the one proposed in this case provide "the best pure reflection of cost to customers."[60] Ameren thus presents its proposed three-part rate as "a highly equitable rate with economically efficient price signals."[61]

Q Do you agree with Ameren that its proposed three-part rate provides a "pure reflection of costs" and "economically efficient price signals"?

A No. On the contrary, the NCP demand charge that is the distinctive element of Ameren's proposed three-part rate is not cost-reflective. The proposed demand charge would provide inefficient price signals that could lead to unnecessary increases in system costs. I explain why in further detail below.

Q What types of costs does Ameren propose to recover through the demand charge element of its proposed three-part rate?

A Ameren is proposing to use a demand charge to recover demand-related distribution system costs.[62]

Q Are these distribution costs generally driven by the NCP demand of residential customers?

A No. In the residential sector, demand-related distribution costs are generally associated with distribution investments that are shared across many different customers. Such costs are

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[60] Direct Testimony of Steven M. Wills at 59.

[61] *Id.* at 63.

[62] *Id.* at 26; Ameren Response to Data Request No. SC 3.8 (*see* Ex. AA-D-36).

driven by local coincident peak demands, not individual NCP demands. For example, capital investments incurred to upgrade a substation are driven by the coincident peak demand within the area served by that substation. An individual customer's demand only affects distribution system costs to the extent that it occurs during the same time as the local coincident peak demand. It therefore does not make sense to recover distribution costs through an NCP demand charge.

Q Is Ameren's proposed demand charge targeted at periods when the distribution system is likely to be at or near its peak?

A No. Ameren stated that the demand charge window was set "to encourage customer behavior that reduces demand placed on the distribution system during the hours when system and residential class loads tend to be high,"[63] and that the demand charge window was set to capture any hours "where specific transformers, circuits or substations may be experiencing peak load conditions."[64] However, my analysis shows that the proposed window is unnecessarily large, as I explain below.

Q Has Ameren provided any evidence to support its claim that its proposed demand charge window matches up with the "hours when system and residential class loads tend to be high"?

A No. On the contrary, the only workpaper that Ameren provided in support of its proposed demand charge window demonstrates that system and residential class loads both tend to be at their highest during a much narrower set of hours than the window covered by the

[63] Ameren Response to Data Request No. SC 3.9(a) (*see* Ex. AA-D-36).

[64] *Id.*

proposed demand charge.[65] Ameren's workpaper identifies the 10 highest-load days in 2018 for both the residential class and the Company's system as a whole. The workpaper also identifies the peak hours within each of those highest-load days. For both the system and the residential class, each of the 10 highest-load days occurred in the summer months of June, July, and August.[66] And for both the system and the residential class, the peak hour in each of the 10 highest-load days occurred between the hours of 3 p.m. and 6 p.m.

Q Have you performed additional analysis to assess when Ameren's system and residential class loads tend to be high?

A Yes. I used Ameren's load data from 2018 to assess when the Company's system and residential class loads tend to be near their peaks.[67] I focused on the number of hours in each hour of the day in each month when system and residential loads were within 5 percent of their annual peak level.[68]

Q What were the results of your analysis of system peak hours?

A Figure 4 summarizes the results of my analysis of the top system peak hours. This heat map shows that every single 2018 hour in which Ameren's system load was within 5 percent of its

[65] Attachment "Sierra_2-SC_0002_27-Att-MPSC 0002.27 Attach Load analysis for TOU.xlsm" to Ameren Response to Data Request No. SC 2.27 (also provided in response to Data Request Nos. SC 2.29(d) and SC 3.9(b).) (*see* Ex. AA-D-36).

[66] Attachment "Sierra_2-SC_0002_27-Att-MPSC 0002.27 Attach Load analysis for TOU.xlsm" to Ameren Response to Data Request No. SC 2.27, tabs "System load - top days" and "Res load - top days." (*see* Ex. AA-D-36).

[67] Attachment "Sierra_2-SC_0002_44-Att-SC 0002.44 Attach AMMO_SYSTEM_LOAD.xlsx" to Ameren Response to Data Request No. SC 2.44; Attachment "Sierra_2-SC_0002_45-Att-SC 0002.45 Attachment.xlsx" to Data Request No. SC 2.45. (*see* Ex. AA-D-36).

[68] The 5 percent threshold is inherently arbitrary. But my findings are similar for alternative reasonable thresholds.

annual peak occurred during summer afternoon and early evening hours. I calculate that 87 percent of these high-load hours occurred between 2 p.m. and 6 p.m. and 100 percent of the high-load hours occurred between 1 p.m. and 7 p.m.

Figure 4. Number of hours with system load within 5 percent of annual system peak, 2018

	Month											
Hour	1	2	3	4	5	6	7	8	9	10	11	12
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	1	2	0	0	0	0	0
15	0	0	0	0	0	2	3	2	0	0	0	0
16	0	0	0	0	0	2	6	3	0	0	0	0
17	0	0	0	0	0	3	6	3	0	0	0	0
18	0	0	0	0	0	1	6	2	0	0	0	0
19	0	0	0	0	0	1	2	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0

Source: Attachment to Ameren Responses to Data Request N0. SC 2.44.(see Ex. AA-D-36)

Q What were the results of your analysis of residential class peak hours?

A Figure 5 summarizes the results of my analysis of the top 2018 residential class peak hours. This heat map shows that the highest-load hours for the residential class were also heavily concentrated in summer afternoons and early evenings. I calculate that 91 percent of these highest-load hours occurred between 2 p.m. and 7 p.m. and 84 percent occurred on summer days between 3 p.m. and 7 p.m.

Figure 5. Number of hours with residential class load within 5 percent of class peak, 2018

Hour	Month 1	2	3	4	5	6	7	8	9	10	11	12
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	1	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	1	0	0	0	0	0
15	0	0	0	0	0	0	1	0	0	0	0	0
16	0	0	0	0	0	2	3	1	0	0	0	0
17	0	0	0	0	0	4	4	2	0	0	0	0
18	1	0	0	0	0	4	6	4	0	0	0	0
19	1	0	0	0	0	2	3	1	0	0	0	0
20	1	0	0	0	0	0	0	0	0	0	0	0
21	1	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0

Source: Attachment to Ameren Responses to Data Request No. SC 2.45 (see Ex. AA-D-36).

Q Has Ameren provided any evidence to support its claim that its proposed demand charge window matches up with the hours in which its circuits and substations tend to experience peak conditions?

A No. When asked in discovery for data relating to the peak load hours of its substations and circuits, Ameren stated that it was unable to provide any such data.[69] In addition, when asked for all data used to set its proposed demand charge window, Ameren did not provide any data relating to the peak load times of its substations, circuits, or other distribution system

[69] Ameren Response to Data Request No. SC 3.9(e-f) (*see* Ex. AA-D-36).

components.[70] It is unreasonable for Ameren to base its demand charge window on the *possibility* that different distribution components may peak in different hours without providing any evidence that those peaks are in fact spread across such a broad range of hours.

Q If Ameren were to find that a small number of its substations or circuits experience peaks during times that differ from system and residential class peak hours, would that justify Ameren's broad demand charge window?

A No. Ameren's system includes more than 800 substations and more than 2,800 circuits.[71] It would not be reasonable for Ameren to provide a distorted price signal to the vast majority of its customers in an attempt to minimize local peaks affecting a small fraction of its distribution system.

Q Are Ameren's analyses of the cost to serve customers consistent with its proposed demand charge window?

A No. The calculations that Ameren used to estimate the contribution of individual customers to distribution costs indicate that the Company is aware that its proposed demand charge window is inconsistent with cost causation. Ameren's workpapers allocate demand-related distribution costs to individual customers based on each customer's demand during the top 30 residential peak load hours of 2018.[72] Every one of those top 30 hours occurred between 2 p.m. and 8 p.m., and 27 of the 30 hours occurred on summer months between 2 p.m. and 6

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[70] Ameren Response to Data Request No. SC 3.9(b) (*see* Ex. AA-D-36).

[71] Ameren Response to Data Request No. SC 3.9(d) (*see* Ex. AA-D-36).

[72] Ameren Workpaper "Residential Research - Individual COS and COS Based Rate Calcs.xlsx," tab "Distribution Demand." There are small discrepancies between these preliminary top 30 hours and those identified in response to other data requests. But the conclusions regarding the general timing of peak hours remain the same.

p.m. Thus, Ameren allocated demand-related distribution costs almost entirely based on customer demand levels during certain summer afternoon hours. This indicates that Ameren's proposed demand charge window is at odds with its own assessment of the cause of its demand-related distribution system costs.

Q Would Ameren's proposed NCP demand charge provide inefficient price signals?

A Yes. Ameren's proposed demand charge would perversely incentivize some customers to shift consumption from low-load hours to high-load hours in order to reduce their individual peak demand. While this would lower the customers' bills, it would result in unnecessary increases in system costs. As an example of how this could happen, imagine a family that starts running its washing machine at 11 a.m. on a summer weekday. Suppose that it takes three hours for the family's washing machine and dryer to run. Suppose also that the family wishes to operate other energy-intensive appliances, such as its dishwasher. Under Ameren's proposed three-part rate, the family could be reluctant to run its dishwasher at 11 a.m., for fear of setting a new NCP demand for which it would be charged $6.86 per kW. Instead, the family would be incentivized to wait to run its dishwasher until 2 p.m., after it has finished washing its clothes yet before the TOU peak energy charge sets in.[73] Yet 2 to 3 p.m. on a summer weekday is one of the highest-load hours, whereas the hour from 11 a.m. to 12 p.m. is not. Shifting residential energy use from 11 a.m. to 2 p.m. to minimize the proposed demand charge could result in increased distribution system costs, as well as increased generation and transmission costs. Yet this is the result that Ameren's demand charge proposal would encourage, so long as it reduced the family's NCP demand.

[73] Note that to entirely avoid the risk of increasing its demand charge, the family would have to shift its use of energy-intensive appliances to the extraordinarily inconvenient hours between 10 p.m. and 6 a.m.

Q Would narrowing the demand charge window fully address your concerns with the cost basis for Ameren's proposed residential demand charge?

No. Narrowing the demand charge window to hours when Ameren's distribution system is likely to be at or near its peak would certainly improve the Company's proposal. But even if limited to peak hours, a residential demand charge fails to account for the impact of the length of time that a customer uses shared distribution equipment during peak hours. It is a principle of rate design that the longer the period of time that customers pre-empt the use of capacity by other customers, the more they should pay for the use of that capacity.[74] If two customers have the same peak demand but one customer is using the distribution system much more extensively during peak hours, then that customer should pay more. But a demand charge—even a coincident peak demand charge—cannot capture this. Since a residential customer's contribution to distribution system costs is primarily based on the extent to which that customer uses the system during peak hours, and since the exact timing of future peaks cannot be known in advance, a more reasonable approach is to charge residential customers a higher energy rate during all potential peak hours, not just the possible peak hour in which the customer's demand happens to be highest.

ii. Residential demand charges are unnecessarily complex and poorly understood.

Q Do you have any other general concerns with the use of residential demand charge, beyond your concerns that they are inefficient?

A Yes. I am also concerned that residential demand charges are unnecessarily complex. In order to respond to a demand charge, residential customers must consider and manage not

[74] Ex. AA-D-46, Garfield, Paul J. and Lovejoy, Wallace F. *Public Utility Economics* at 163 (1964).

just the quantity of their energy consumption and not just the timing of their energy consumption but also their maximum hourly energy consumption. Past surveys and focus groups have found that the idea of demand charges is poorly understood and frequently raises concerns among residential customers.[75] In the above example of the harried family trying to manage its appliances, it is entirely possible that the family would misunderstand, forget about, or ignore the incentives associated with a three-part rate and decide to operate all its appliances at 11 a.m. That single hour of high usage could then set the family's demand charge bill for an entire month.

Q Has Ameren acknowledged these general concerns with the understandability and acceptability of residential demand charges?

A Yes. Although Ameren witness Steven Wills portrays these concerns as "greatly overstated," he commits Ameren to studying them as part of Ameren's proposed pilot rate project.[76] Interestingly, elsewhere in his testimony Mr. Wills asserts that "most customers don't generally fully understand utility rate design."[77] It is unclear why Mr. Wills would believe that residential customers generally poorly understand utility rate design but have a relatively

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[75] A 2016 survey found that approximately 50 percent of residential customers do not understand the terms "kW" and "kWh". LeBlanc, Bill. "Do Customers Understand Their Power Bill? Do They Care? What Utilities Need to Know." Blog summary of E Source Survey. January 21, 2016. https://www.esource.com/email/ENEWS/2016/Billing. In addition, focus groups in Ontario found that the notion of maximum use during peak hours "is difficult for people to understand and raised concern among a few. There is no template for measuring maximum use that people are used to in the way they understand TOU." Customers also raised fairness concerns regarding the concept "that small lapses in their conservation efforts will mean they will have to pay a high price." Gandalf Group, Ontario Energy Board Distribution Charge Focus Groups Final Report, October 9, 2013. Available at http://www.ontarioenergyboard.ca/oeb/_Documents/EB-

[76] Direct Testimony of Steven M. Wills at 60.

[77] *Id.* at 74.

better understanding of more complex, unconventional residential rate designs that include demand charges.

iii. The fact that Ameren is proposing its three-part rate as a pilot should not exempt that rate from scrutiny.

Q Does the fact that Ameren is proposing to implement its three-part rate as a pilot rate mean that the proposed rate merits a lower level of scrutiny?

A No. The proposed pilot will require time and resources from Ameren, ratepayers, the Commission, and stakeholders. It is only worth investing such time and resources in a pilot rate that has a reasonable fundamental design. For the reasons described above, Ameren's proposed three-part rate does not meet that standard.

Q Are there reasons to apply particular scrutiny to Ameren's proposed three-part pilot rate?

A Yes. Ameren is presenting the proposed three-part pilot rate as a potential "future default rate."[78] Any proposed rate to which that designation is applied deserves particular scrutiny.

[78] *Id.* at 61.

iv. <u>There are better alternatives for recovering demand-related distribution costs than an NCP demand charge.</u>

Q Are there more efficient and equitable alternatives for recovering demand-related distribution costs than an NCP demand charge?

A Yes. There are several possibilities for recovering demand-related distribution costs that would be preferable to an NCP demand charge. However, the two that I would highlight are TOU energy rates and CPP.

Q Why would TOU rates be preferable to an NCP demand charge?

A TOU rates would be preferable to an NCP demand charge in two ways. First, TOU rates can be designed to focus cost recovery on hours when Ameren's distribution system tends to be at or near its peak. In contrast, Ameren's proposed demand charge applies to many hours that have little to no impact on demand-related distribution costs. Second, TOU rates incentivize customers to reduce consumption during all potential peak hours, not just the single hour in which the customer's demand happens to be highest.

Q Why would CPP be preferable to an NCP demand charge?

A Under a CPP rate, Ameren would have the ability to call a certain number of critical events a year during time periods when loads are observed or anticipated to be unusually high. This rate has the primary advantage of focusing price signals and cost recovery on the hours when the distribution system is *actually* at or near its peak.[79] This is an improvement not just

[79] The hours to which CPP applies could be determined in any number of ways. For example, CPP events could be called based on system load conditions, class load conditions, or even conditions within a particular region of the distribution system.

relative to NCP demand charges but also relative to peak-coincident demand charges, which recover costs based on a single hour of consumption that occurs during a relatively broad range of possible peak hours within a given month.

Q Would a coincident peak demand charge be a preferable alternative to an NCP demand charge for recovering demand-related distribution costs?

A Yes. Although I do not recommend that the Commission allow the Company to impose residential demand charges of any form, a demand charge with a narrower demand charge window timed to be consistent with Ameren's peak hours would be an improvement relative to Ameren's proposal. My analysis suggests that if the Commission decides to allow Ameren to implement a pilot three-part rate, it should require Ameren to limit the demand charge window to the hours between 2 p.m. and 7 p.m.

v. Any Commission-approved pilot rate should require the collection and transparent presentation of detailed data on the pilot rate's impacts.

Q Does Ameren's pilot three-part rate proposal include plans to study the impacts of the pilot rate?

A Yes. Ameren has stated that it plans to use surveys and load data to evaluate whether customers understand and accept demand charges, how demand charges affect customer consumption patterns, and whether providing additional information to customers helps them better manage their load.[80]

[80] Direct Testimony of Steven M. Wills at 61.

Q Are you generally supportive of the Company's plans for data collection and analysis?

A Yes. If the Commission permits Ameren to implement a pilot three-part rate, it should require Ameren to collect detailed information regarding the above topics that the Company is proposing to study.

Q Are there specific types of data that are especially important for the Company to collect if it implements a pilot three-part rate?

A Yes. It is particularly important that the Company collect the following types of data:

1. 8760 hourly load data for at least one full year preceding the transition to the three-part rate and one full year following the transition to the pilot rate for all customers who are placed on the pilot rate and for all customers who are included in a "control group."

2. Demographic data including age, education, income, and number of residents for all participants in the pilot rate and all customers who are included in a control group.

3. Data on customer understanding and acceptance of the mechanisms and incentives associated with demand charges.

Q Do you have any further recommendations regarding the data collection component of any three-part rate pilot program?

A Yes. All data should be collected and publicly reported in a transparent manner that enables thorough stakeholder review. The Company should redact sensitive, personal identifying information but should otherwise provide all the data it collects in an analysis-friendly format.

vi. <u>Recommendations regarding Ameren's three-part rate proposal</u>

Q What are your overall recommendations regarding Ameren's proposed residential three-part rate?

A I recommend that the Commission reject Ameren's proposal to implement a three-part rate for residential customers. If the Commission decides to permit Ameren to implement a pilot three-part rate, I recommend that the Commission require Ameren to (1) apply any demand charge to a narrower set of hours that is more consistent with Ameren's peak hours and (2) collect and make available detailed information regarding the effects of the pilot rate.

Q Does this conclude your rate design direct testimony?

A Yes, it does.