Exhibit No.:	
Issues:	Time-of-Use Rates
Witness:	Martin R. Hyman
Sponsoring Party:	Missouri Department of Natural Resources – Division of Energy
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Case No.:	ER-2019-0335

MISSOURI PUBLIC SERVICE COMMISSION

UNION ELECTRIC COMPANY d/b/a AMEREN MISSOURI

CASE NO. ER-2019-0335

DIRECT TESTIMONY

OF

MARTIN R. HYMAN

ON

BEHALF OF

MISSOURI DEPARTMENT OF NATURAL RESOURCES

DIVISION OF ENERGY

Jefferson City, Missouri
December 18, 2019

(Rate Design)

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

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

AFFIDAVIT OF MARTIN R. HYMAN

STATE OF MISSOURI	)	
	)	**ss**
COUNTY OF COLE	)	

Martin R. Hyman, of lawful age, being duly sworn on his oath, deposes and states:

1. My name is Martin R. Hyman. I work in the City of Jefferson, Missouri, and I am employed by the Missouri Department of Natural Resources as a Planner III, Division of Energy.
2. Attached hereto and made a part hereof for all purposes is my Direct Testimony (Rate Design) on behalf of the Missouri Department of Natural Resources – Division of Energy.
3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge.

Martin R. Hyman

Subscribed and sworn to before me this 18th day of December, 2019.

LAURIE ANN ARNOLD
Notary Public - Notary Seal
State of Missouri
Commissioned for Callaway County
My Commission Expires: April 26, 2020
Commission Number: 16808714

Notary Public

My commission expires: 4/26/20

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Martin R. Hyman. My business address is 1101 Riverside Dr., PO Box 176, Jefferson City, Missouri 65102.

Q. By whom and in what capacity are you employed?

A. I am employed by the Missouri Department of Natural Resources – Division of Energy ("DE") as a Senior Energy Policy Analyst, Planner III.

Q. Please describe your educational background and employment experience.

A. In 2011, I graduated from the School of Public and Environmental Affairs at Indiana University in Bloomington with a Master of Public Affairs and a Master of Science in Environmental Science. There, I worked as a graduate assistant, primarily investigating issues surrounding energy-related funding under the American Recovery and Reinvestment Act of 2009. I also worked as a teaching assistant in graduate school and interned at the White House Council on Environmental Quality in the summer of 2011. I began employment with DE in September 2014. Prior to that, I worked as a contractor for the U.S. Environmental Protection Agency to coordinate intra-agency modeling discussions. Since joining DE, I have been involved in a number of utility cases and other proceedings before the Missouri Public Service Commission ("Commission") as DE's lead policy witness and have assisted DE in the review of legislation and the development of the Comprehensive State Energy Plan. Topics that I address as a part of my duties include demand-side programs, in-state energy resources, renewable energy, electric vehicles, and grid modernization.

Q. Have you previously filed testimony before the Commission on behalf of DE or any other party?

A. Yes. Please see Schedule MRH-Dir1 for a summary of my case participation.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your Direct Rate Design Testimony in this proceeding?

A. The purpose of my testimony is to provide an overview of time-of-use ("TOU") rate designs and recommend leading practices for the Commission's consideration in evaluating TOU rate proposals. DE recommends that the Commission evaluate TOU rate proposals based on customer participation structures, pricing and rate effectiveness, Union Electric Company d/b/a Ameren Missouri's ("Ameren Missouri" or "Company") implementation plans, educational approaches to increase opportunities for successful TOU deployment, the potential use of enabling technologies, benefits from additional future time-varying rates, and successful time-varying rate deployments in other utility jurisdictions.

III. TIME-OF-USE RATE OVERVIEW

Q. What are TOU rates?

A. TOU rates vary customer energy pricing based on the hours during which usage occurs. "On-peak" pricing is higher than "off-peak" pricing and can be reflective of higher costs to serve customers during particular hours.[1, 2] On-peak pricing periods can be limited in various ways, including only to weekdays. The hours and prices follow a tariffed schedule,

[1] "Peak" refers to the time period when energy consumption is highest.
[2] Lazar, Jim and Gonzalez, Wilson, 2015, *Smart Rate Design For a Smart Future*, Montpelier, VT: Regulatory Assistance Project, https://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-gonzalez-smart-rate-design-july2015.pdf, page 10.

i.e., they do not change in "real time;" thus, while TOU rates better reflect changes in system costs than flat or inclining block rates, they do not change to reflect actual costs or market conditions.[3]

Q. Are there other kinds of time-varying rates?

A. Yes. Peak-time rebates provide customers with billing relief if usage is reduced at a particular time. By contrast, under critical peak pricing, customers would pay more for usage during a few "peak events" in a year.[4] Real-time pricing charges customers based on wholesale electricity prices or short-run marginal generation costs.[5] Variable peak pricing combines TOU rates with changing peak prices. Greater peak reductions can result from critical peak pricing than from TOU rates or peak-time rebates.[6]

A. POTENTIAL BENEFITS

Q. What do TOU rates encourage?

A. TOU rates can promote load shifting through readily understandable price structures,[7] using improved price signals to incent customers to avoid usage that results in higher costs to provide service.[8] Such load shifting can improve system utilization, lower overall costs to individuals and the utility system by avoiding times with higher costs to serve, and mitigate the impacts of high-demand end uses (e.g., electric vehicle charging). Much like

[3] *Ibid*.
[4] *Ibid*.
[5] *Ibid*.
[6] Faruqui, Ahmad, 2019, "The Transformative Power of Time-Varying Rates," *Energy Central*, March 9, https://www.energycentral.com/c/em/transformative-power-time-varying-rates.
[7] Faruqui, Ahmad, Hledik, Ryan, and Palmer, Jennifer, 2012, *Time-Varying and Dynamic Rate Design*, Regulatory Assistance Project and Brattle Group, https://www.raponline.org/wp-content/uploads/2016/05/rap-faruquihledikpalmer-timevaryingdynamicratedesign-2012-jul-23.pdf, page 14.
[8] See Chitkara, Aman, Cross-Call, Dan, Li, Becky, and Sherwood, James, 2016, *A Review of Alternative Rate Designs: Industry experience with time-based and demand charge rates for mass-market customers*, Rocky Mountain Institute, https://rmi.org/insight/review-alternative-rate-designs/, page 12.

programs offered under the Missouri Energy Efficiency Investment Act, TOU rates can offer the opportunity to defer the addition of, or reduce the need for, supply-side investments. TOU rates can also enable better integration of intermittent resources by more closely matching changes in the costs of available generation resources.[9]

Q. How does advanced metering infrastructure ("AMI") relate to the deployment of TOU rates?

A. TOU rates can create benefits from the significant investments in AMI. TOU can improve resource utilization by encouraging pricing that more closely reflects utility costs for service. Ameren Missouri plans to spend approximately $245 million between 2019 and 2023 on its "Smart Meter Program."[10] The deployment of AMI meters will last through 2025.[11]

Q. In the past, has the Commission commented on TOU rates?

A. Yes. In Case No. ER-2016-0285 regarding Kansas City Power & Light Company, the Commission stated, "Time of use rates (also known as demand response rates), better reflect cost causation than the current rate design and would create beneficial incentives for customers to reduce usage during system peak times."[12]

[9] Lazar, Jim, 2016, *Teaching the "Duck" to Fly*, 2nd ed., Montpelier, VT: Regulatory Assistance Project, https://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-teachingtheduck2-2016-feb-2.pdf, pages 28-29.
[10] Missouri Public Service Commission Case No. EO-2019-0044, *In the Matter of the Compliance of Union Electric Company d/b/a Ameren Missouri with Certain Requirements related to SB 564 and Related Matters*, Ameren Missouri's Five-Year Capital Investment Plan, February 14, 2019, Exhibit 1, page 1.
[11] Missouri Public Service Commission Case No. ER-2019-0335, *In the Matter of Union Electric Company d/b/a Ameren Missouri's Tariffs to Decrease Its Revenues for Electric Service*, Direct Testimony of Steven M. Wills on Behalf of Union Electric Company d/b/a Ameren Missouri, July 3, 2019, page 12, lines 13-15.
[12] Missouri Public Service Commission Case No. ER-2016-0285, *In the Matter of Kansas City Power & Light Company's Request for Authority to Implement a General Rate Increase for Electric Service*, Report and Order, May 3, 2017, page 56.

Q. What concerns may result with the implementation of TOU rates?

A. TOU rates may result in concerns if not implemented using leading practices, such as those recommendations discussed below. For instance, poor customer education may not lead customers to shift usage in a beneficial manner or may result in customer confusion. As noted by Faruqui et al. (2012), "If the customer does not understand how the rate works, or is overburdened with information, then he or she will not be able to appropriately respond to the price signals and shift load."[13] The same source notes that, "A long peak period would be less likely to induce response, as customers would need to shift usage to the early morning or late night hours, requiring more significant behavioral changes. Many voluntary TOU rates in the industry feature very long peak periods and very few customers are enrolled in such rates."[14]

B. TIME-OF-USE RATE DESIGN AND LEADING PRACTICES

Q. What are some of the primary considerations involved in TOU rate design?

A. Some of the basic principles of TOU rate design are similar to those generally used in designing other utility rates.[15] The rates should tie ratepayer charges to the manner and timing of the incurrence of costs, a principle referred to as "cost-causation."[16] Other relevant considerations include encouraging efficient usage, improving customer control over monthly bills, and rates being easily understandable to enable customer action.[17]

[13] Faruqui et al., 2012, page 19.
[14] *Id*., page 18
[15] Chitkara et al., 2016, page 13.
[16] *Ibid*; Lazar and Gonzalez, 2015, page 36; NARUC Staff Subcommittee on Rate Design, 2016, *Distributed Energy Resources Rate Design and Compensation*, Washington, DC: The National Association of Regulatory Utility Commissioners, https://pubs.naruc.org/pub.cfm?id=19FDF48B-AA57-5160-DBA1-BE2E9C2F7EA0, page 21, citing Bonbright, James C., 1961, *Principles of Public Utility Rates*, New York: Columbia University Press, page 292.
[17] Chitkara et al., 2016, page 13; NARUC Staff Subcommittee on Rate Design, 2016, pages 20-21.

Changes to rates should be implemented gradually to avoid rate shock and encourage participation.[18] Significant customer TOU education and engagement will assist customers with understanding their options.

Q. How should peak pricing periods be established?

A. The most effective TOU rates have relatively short-duration peak period prices that correspond to times of high system costs.[19] Shorter peak pricing periods also allow customers to shift load with less inconvenience.[20] Cost-based peak prices that are sufficiently higher than off-peak rates will encourage customer action. Per the Rocky Mountain Institute, "Higher [peak to off-peak] ratios tend to elicit stronger customer response, particularly to achieve load shifting out of peak hours, while low ratios (less than 2:1) may not achieve desired results."[21]

Q. What is the role of customer education in TOU rate design?

A. Customer education can provide customers with appropriate and timely information regarding TOU rates and the beneficial information that can be conveyed through AMI. There is additional value in gaining customer "buy-in" by sharing information such as company goals, reasons for implementation, how customers may most benefit from these investments, benefits to the utility system (which ultimately benefit customers), the potential to defer or reduce supply-side investments, and possible environmental benefits.

[18] *Ibid*.
[19] See Faruqui et al., 2012, pages 18-19.
[20] *Id*., page 18.
[21] Cross-Call, Dan, Li, Becky, and Sherwood, James, 2018, *Moving to Better Rate Design: Recommendations for Improved Rate Design in Ohio's PowerForward Inquiry*, Rocky Mountain Institute, https://rmi.org/wp-content/uploads/2018/07/RMI_Better_Rate_Design_2018.pdf, page 12.

According to information from the Rocky Mountain Institute:

> Customer education is essential to help customers make informed decisions and mitigate adverse impacts. Education requires sustained efforts to overcome status quo bias and the tendency for overlooked communications, and it needs to be built on strong rate design fundamentals (i.e., underlying rates should be easy to understand and not impose undue cost risks on customers).[22]

One way to educate customers is the use of "shadow billing" and online bill calculators to inform customers about how their bills could differ under TOU rates.[23] Shadow billing would tell customers what their bills would be under TOU rates, allowing them to evaluate whether or not to participate. It is also important to have sufficiently trained personnel to respond to customer inquiries.

Q. What is the importance of making TOU rates understandable?

A. Rate structures should be relatively simple, and customer education should be clear and concise. Otherwise, as noted above, customer usage may not change as intended.[24]

Q. Are there examples of successful time-varying rates in the U.S.?

A. Yes. Voluntary TOU rates offered by Arizona Public Service ("APS") have a 57 percent subscription rate, while 20 percent of customers served by Oklahoma Gas and Electric ("OG&E") customers are on variable peak pricing rates.[25] Along with having air-conditioning load that can be affected by TOU rates, APS offers an online bill comparison

[22] *Id*., page 14.
[23] *Ibid*.
[24] Faruqui et al., 2012, page 19.
[25] Faruqui, 2019.

tool.[26] APS also customized marketing based on "customer profiles."[27] OG&E has offered, "Customers with central air … a free PCT [programmable communicating thermostat] preprogrammed to respond to OG&E's dynamic pricing signal…."[28] The use of such "enabling technologies" creates the potential for coordination between TOU rates and programs under the Missouri Energy Efficiency Investment Act.

IV. RECOMMENDED CRITERIA FOR EVALUATING TIME-OF-USE RATES

Q. How does DE recommend the Commission evaluate TOU rate proposals?

A. DE recommends that the Commission evaluate TOU rate proposals based on initial customer participation structures, the likely effectiveness of TOU rates in reducing system costs, long-term Company plans, educational approaches, the potential use of enabling technologies, and goals for additional future time-varying rates.[29]

Q. Should TOU rates be offered initially on an "opt-in" (i.e., voluntary) basis?

A. Yes. DE recommends that the Commission begin by approving TOU rates on an opt-in basis in order to gain experience with such rates. Starting with "opt-in" TOU rates (rather than "opt-out" or mandatory rates) could avoid undue customer confusion and unanticipated bill impacts.

[26] Trabish, Herman K., 2018, "As California leads way with TOU rates, some call for simpler solutions," *Utility Dive*, September 20, https://www.utilitydive.com/news/as-california-leads-way-with-tou-rates-some-call-for-simpler-solutions/532436/.
[27] Huber, Lon, 2017, "TOU Pilot Strategies and Lessons," Strategen Consulting, presentation at Xcel Energy Alternative Rate Design Pilot Stakeholder Engagement Meeting, Saint Paul, Minnesota, May 5, https://e21initiative.org/wp-content/uploads/2018/01/e21_Forum_TOUPilotBestPractices_5.05.17.pdf, slide 29.
[28] *Id.*, slide 32.
[29] See: Faruqui et al., 2012, pages 18-19 and 25; Chitkara et al., 2016, pages 6, 8, and 41-43; Cross-Call et al., 2018, pages 10-15; Trabish, 2018; and, Huber, 2017, slides 29 and 32.

Q. What does DE recommend that the Commission examine with regards to pricing and rate effectiveness?

A. TOU rates should have cost-based, short, high-impact peak price signals to encourage load shifting. A pricing differential that is too low may not encourage changes in customer usage, and a peak price period that is too long may discourage customer participation, since changing usage patterns would be too cumbersome.[30]

Q. How does DE recommend that the Commission evaluate Company TOU rate plans?

A. DE recommends that TOU rate plans clearly identify goals, and that these goals be effectively articulated to customers so that they understand how TOU rates fit into the Company's load management. A well-defined plan would provide a "roadmap" that sets out timelines, goals, and activities for time-varying rate deployment in conjunction with AMI and customer information system investments to set stakeholder expectations for the implementation, evaluation, and refinement of TOU rates. We recommend that the Company monitor customer adoption, successes, and areas for improvement. Flexibility to adjust program implementation, education, and engagement would enable a more responsive program.

Q. What educational elements does DE recommend that the Commission consider?

A. DE recommends the measurement of educational success, as well as consideration of the following types of approaches:[31]

- Web-based information and bill calculation tools, call center personnel training, on-bill information, text message campaigns, and social media outreach;

[30] Faruqui et al., 2012, pages 18-19; Cross-Call et al., 2018, page 12.
[31] See: Faruqui et al., 2012, page 25; Cross-Call et al., 2018, page 14; Trabish, 2018; and, Huber, 2018, slides 29 and 32.

- The use of sources that "touch" various customer segments, including customers served by community action agencies and home-bound customers who may benefit from TOU rates but who also may have other impediments to adoption;
- Adopting outreach techniques from companies that have successful TOU rate programs with quantifiable benefits; and,
- The use of shadow billing to show customers how they could benefit from modifying their usage and participating in TOU rates.

Q. Could the Commission look to additional technologies and rate design developments?

A. Yes. "Enabling technologies" (e.g., in-home displays and programmable thermostats) could lead to a greater peak reduction potential.[32] The use of such technologies could occur in conjunction with AMI deployment and planning for demand-side programs. The Commission could also evaluate the benefits of additional time-varying rate offerings (i.e., critical peak pricing, peak-time rebates, and real-time pricing) that improve price signals, potentially create greater peak reductions, make additional use of AMI and customer information system investments, and offer alternative rate structures that meet the diversity of customer interests and needs.

V. CONCLUSIONS

Q. Please summarize your conclusions and the positions of DE.

A. DE recommends that the Commission evaluate TOU rate proposals based on customer participation structures, pricing and rate effectiveness, Company implementation plans, educational approaches, the potential use of enabling technologies, benefits from additional

[32] Chitkara et al., 2016, pages 41-43.

future time-varying rates, and successful time-varying rate deployments in other utility jurisdictions.

Q. Does this conclude your Direct Rate Design Testimony?

A. Yes.