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Issues:	Residential Rate Design
Witness:	Douglas B. Jester
Sponsoring Party:	Renew Missouri and The Sierra Club
Type of Exhibit:	Direct Testimony
Case No.:	ER-2016-0258
Date Testimony Prepared:	December 14, 2016

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. ER-2016-0258

DIRECT TESTIMONY

OF

DOUGLAS B. JESTER

ON BEHALF OF

RENEW MISSOURI

AND

THE SIERRA CLUB

December 14, 2016

Q. State your name, business name and address.

A. My name is Douglas B. Jester. I am a principal of 5 Lakes Energy LLC, a Michigan limited liability corporation, located at Suite 710, 115 W Allegan Street, Lansing, Michigan 48933.

Q. What is the purpose of your testimony?

A. In my testimony, I recommend that:

1. The Commission reject increases in residential customer charges or the fixed portion of customers' bills;
2. The Commission migrate KCP&L residential tariffs away from declining and toward inclining block rates; and
3. The Commission initiate a process to work toward use of time-varying rates for all customers in future rate cases.

Q. On whose behalf are you appearing in this case?

A. I am testifying on behalf of Renew Missouri and the Sierra Club.

Q. Summarize your experience in the field of electric utility regulation.

A. I have worked for more than 20 years in regulating the electricity industry and in related fields. My work experience is summarized in my resume, attached as Exhibit DJ-RD-1.

Q. Have you testified before this Commission or as an expert in any other proceeding?

A. I recently filed testimony before this Commission in case ET-2016-0246, concerning Ameren Missouri's proposal to deploy electric vehicle charging stations in its service territory. I also earlier filed direct testimony concerning revenue requirements in this case, File No. ER-2016-0285.

I have testified in twenty cases before the Michigan Public Service Commission, concerning plant retirement securitization, power supply cost recovery, renewable energy plans, cost of service and rate design, energy efficiency plans, and general rate increases.

I have testified before the Public Utility Commission of Nevada in Case 16-07001 (NV Energy 2017-2036 Integrated Resource Plan).

In the past, I have testified as an expert witness on behalf of the State of Michigan before the Federal Energy Regulatory Commission in cases relating to the relicensing of hydro-electric generation. I also have been listed as a witness on behalf of the State of Michigan, prepared case files and submissions, and been deposed in cases before the United States District Court for the Western District of Michigan and the Ingham County Circuit Court of the State of Michigan, concerning electricity generation matters in which the cases were settled before trial.

Q. Are you sponsoring any exhibits?

A. DJ-RD-1 Resume of Douglas B. Jester

DJ-RD-2 NCLC Missouri Data from 2009 Residential Energy Consumption Study

DJ-RD-3 Synapse Energy Economics, Caught in a Fix

DJ-RD-4 Rate Design Study for Kansas Commerce Commission

DJ-RD-5 Regulatory Assistance Project, Rate Design Best Practices Paper

DJ-RD-6 BC Hydro Evaluation of Inclining Block Rates

DJ-RD-7 Rate Design Good Practices Letter to NARUC

Q. What materials have you reviewed in preparation for your testimony?

A. I reviewed KCP&L's application in this case, subsequent submissions to the docket, and responses to various discovery requests. I also reviewed various studies from my personal collection of relevant literature, which I cite where they are applicable.

THE COMMISSION SHOULD REJECT INCREASES IN CUSTOMER CHARGES

Q. Please summarize the effects of KCP&L's proposed tariff changes with respect to customer charges.

A. By comparison of KCP&L's current tariff sheets to those proposed in this case, KCP&L is requesting that monthly customer charges for Schedule R Residential General Use customers be increased from $11.88 to $13.18, Residential General Use and Space Heat -One Meter customers be increased from $11.88 to $13.18, and Residential General Use and Space Heat – 2 Meters be increased from $14.13 to $15.68. KCP&L is further requesting that monthly customer charges for Schedule ROU Residential Other Use customers be increased from $11.88 to $13.18 and for Schedule RTOD Residential Time of Day be increased from $15.39 to $17.07.

Q. On what basis did KCP&L propose to increase fixed charges?

A. KCP&L have applied a proportional increase to all billing components.

Q. How has this Commission previously ruled concerning fixed charges?

A. In its Report and Order in ER-2014-0370, the Commission articulated[1] the general principle that I agree with, which is that the customer charge should be "designed to include those costs necessary to make electric service available to the customer, regardless of the level of electric service utilized. Examples of such costs include monthly meter reading, billing, postage, customer accounting expenses, a portion of costs associated with meter investment, and the service line."

In that case, the Commission further found that "KCP&L's residential customer-related costs are $11.88 per month, which is based on Staff's cost of service study."

Q. You recommend that the Commission reject the Company's proposal to increase its customer charges. Why?

[1] See page 88.

A. In this case, KCP&L have proposed an increase in customer charges based on a proportional increase to all billing components and without demonstrating that this increase reflects a specific increase in the costs that this Commission has previously ruled are appropriate to include in the customer charge.[2]

Fixed monthly customer charges above the marginal cost of customer connection and service are unreasonable and unjust and are an abuse of market power that has adverse effects on public policy, including:

- low-usage and distributed generation customers will pay more;
- low-income customers tend to be lower usage customers;
- fixed charges effectively discriminate against apartment-dwellers;
- fixed charges weaken incentives for energy efficiency;
- customers have less opportunity to control their bills;
- net metering is devalued; and
- these reduce the opportunities for innovation and competition.

Q. Why are high customer charges unreasonable and unjust?

A. Most important sectors of our economy have very substantial costs that are fixed over various terms but pricing is nonetheless volumetric. Grocery stores don't charge you by the month for the privilege of shopping, nor even charge you per visit; they charge for the goods you purchase without regard to how much you buy at one or how often you visit the store. Nor do airlines charge you by the year or month to be a "customer;" they charge for the flights you take. In ordinary markets prices reflect marginal costs, whether those costs are fixed or variable.

[2] See File No. ER-2014-0370, "Report and Order." September 2, 2015.

Further, consumer welfare is maximized when price equals marginal cost. That this is the appropriate analysis for electric utilities is also well established.[3]

Advanced economic texts regard affine pricing – which is the technical label for combinations of fixed plus variable charges like those proposed by the Company – as a form of price discrimination. They show that affine pricing is only feasible under no-arbitrage conditions, usually associated with monopolies, and will examine the degree to which such pricing reduces customer welfare. Under the special condition that it reduces variable unit pricing from levels that include monopoly rents toward variable unit prices that equal marginal costs, affine pricing can be welfare-improving. However, the purpose of cost-of service regulation is to reduce or eliminate monopoly rents and provide the Company a fair return on its investments so these special conditions should not apply. The fact that pricing like that proposed by the Company is considered as price discrimination in the standard texts should give the Commission pause that it may be unjust and unreasonable and should therefore be particularly cautious about setting customer charges above the marginal cost of adding a customer to the system.

Q. Why are fixed customer charges an abuse of market power?

A. This is simply because fixed customer charges are not sustainable without provisions of law that protect the Company's monopoly and other barriers to arbitrage. An example will serve to show how the fixed customer charge would be undermined if resale were allowed, but a competitive market would also serve to prevent the use of high customer fixed charges. If a customer of the Company were permitted to resell power to her neighbor, the fixed customer charge would be easily subverted by that customer buying enough power for her own needs and that of one or more neighbors for one fixed customer charge, then reselling power to the

[3] See, for example, Cicchetti, Charles J., W. Gillen and P. Smolensky. *The Marginal Cost and Pricing of Electricity: An Applied Approach. Ballenger Publishing Company 1977.*

neighbors at a markup over the variable price of power but at a total cost to the neighbors less than the combined cost of the fixed customer and variable charges the Company would charge the neighbor. The neighbor who resells could even price resale at profitable rates while still saving money for the buying neighbor. Thus it is the monopoly position of the Company that enables the use of fixed customer charges.

It is an abuse of market power because it uses the Company's monopoly position to induce greater payments to the Company and to shift ordinary business risks onto the customer. Because modern life makes electricity nearly essential, the fixed customer charge functions like an unavoidable tax, reducing income available for useful goods and services without providing direct value. The associated lower price of power (volumetric rate) then changes the customer's optimum mix of goods toward greater purchase of power, because it is cheaper than it otherwise would have been. This increases revenue to the Company but reduces the customer's overall welfare.

Q. Why does a fixed customer charge adversely affect public policy?

A. Increased fixed charges impose greater cost increases on low-usage customers than on higher-usage customers. Because low-income customers tend to be low-usage customers, as shown below, the increases in fixed charges tend to have a disproportionate, hence unjust and unreasonable impact on them.

In addition, increased fixed charges and comparatively lower variable charges reduce the economic benefits of distributed (self-service) generation as it reduces the customer costs that distributed generation avoids, especially in the case of net-metering customers. Similarly, reducing the variable charge for electricity and increasing fixed charges weakens customer incentives for energy conservation and efficiency. Because distributed generation, supported by net metering and energy efficiency are specifically supported by both Federal law, especially in the form of the Public Utility Regulatory Policy Act (PURPA), and Missouri law, in the form of the "Net Metering and Easy Connection Act" (MRS 386.890.1), an increase in fixed charges pushes against the direction of current law. Indeed, one intent of PURPA Title 1 was to encourage pricing reforms that promote energy conservation, optimal efficiency in use of utility resources, and equitable rates[4] – all of which argue for reduced fixed charges and increased variable charges. The Commission should be wary of subverting these policies, particularly where no compelling need for high fixed charges has been demonstrated.

Q. What is your evidence that low-income customers tend to be low-usage customers?

A. In 2009, the Energy Information Administration, on behalf of the U.S. Department of Energy, performed a Residential Energy Consumption Survey using statistically sound methods. General information and numerous data compilations are available from http://www.eia.gov/consumption/residential/index.cfm. National Consumer Law Center has compiled state-level summaries of data from the Residential Energy Consumption Survey, including Missouri. Exhibit DJ-RD-2 is their summary for Missouri.[5] The following table extracts from Exhibit DJ-RD-2 Total Electricity Consumption in kWh per household in relation to 2009 Annual Household Income:

[4] Rose, K. and K. Meeusen. Reference Manual and Procedures for Implementation of the "PURPA Standards" in the Energy Policy Act of 2005. Available from U. S. Department of Energy at http://energy.gov/sites/prod/files/Manual%20for%20Implementation%20of%20PURPA%20Standards%20in%20EPACT%202005%20%28March%202006%29.pdf.

[5] Available from http://www.nclc.org/images/pdf/energy_utility_telecom/rate_design/MO-FINAL2.pdf.

Housing Unit Characteristics	Median Electricity Consumption (kWh per Household)
2009 Annual Household Income	
Less than $25,000	10,399
$25,000 to $49,999	10,821
$50,000 to $74,999	12,072
$75,000 to $99,999	14,200
$100,000 or more	16,695

This table clearly illustrates that low-income customers use less electricity than higher-income customers.

Q. Why are fixed charges effectively discriminatory against apartment dwellers?

A. There are two reasons. First, the costs associated with distributing power to apartment dwellers are lower than for customers living in single-family homes. Although KCP&L's cost of service study and rate design posit that certain distribution costs are customer related, this is not accurate. Apartment buildings generally are constructed so that service transformers are shared amongst all of the included apartments and most "service lines" that distribute power to individual apartments are behind the meter and not paid for by the utility. A significant portion of the cost of the distribution system is to reach all service endpoints, with costs that are proportional to distance rather than the number of customers served. Thus, any collection of distribution costs through a fixed charge allocation of distribution system costs to customers is discriminatory against higher density housing including apartments, because the costs attributed to customers are actually costs of the geographic extent of the distribution system and proportional to customer lot size. As a result, the costs allocated by KCP&L to residential customers overstate a fair allocation of such costs to apartment dwellers and understate a fair allocation to detached homes. Second, this misallocation is exacerbated by the fact that apartments typically use less electricity than detached housing. Indeed, the relative proportionality of distribution system costs and energy use in detached homes versus apartments argues for recovery of distribution costs based on energy consumption.

Q. What effect does revenue recovery through fixed charges rather than volumetric charges have on energy conservation?

A. Use of higher fixed charges enables lower prices for energy used, which weakens incentives for energy conservation. A number of studies have demonstrated this, but perhaps the most immediately relevant is an analysis of rate design done by Christensen Associates for the Kansas Corporation Commission that separately considered each major utility serving Kansas, including Kansas City Power & Light.[6] That study included an estimate of the difference in residential electricity usage when the rate design changed from a base rate with a monthly customer charge of $9.07 to a straight fixed variable tariff with a customer charge of $19.72. Christensen Associates present the following table of impacts on usage for the principal utilities serving portions of Kansas:

Table 5.1: Percentage Changes in Usage by Season and Utility, *SFV*

Utility	Summer	Winter
KCP&L	+3.0%	+1.1%
Westar	+6.8%	+2.5%
Midwest	+4.5%	+2.6%

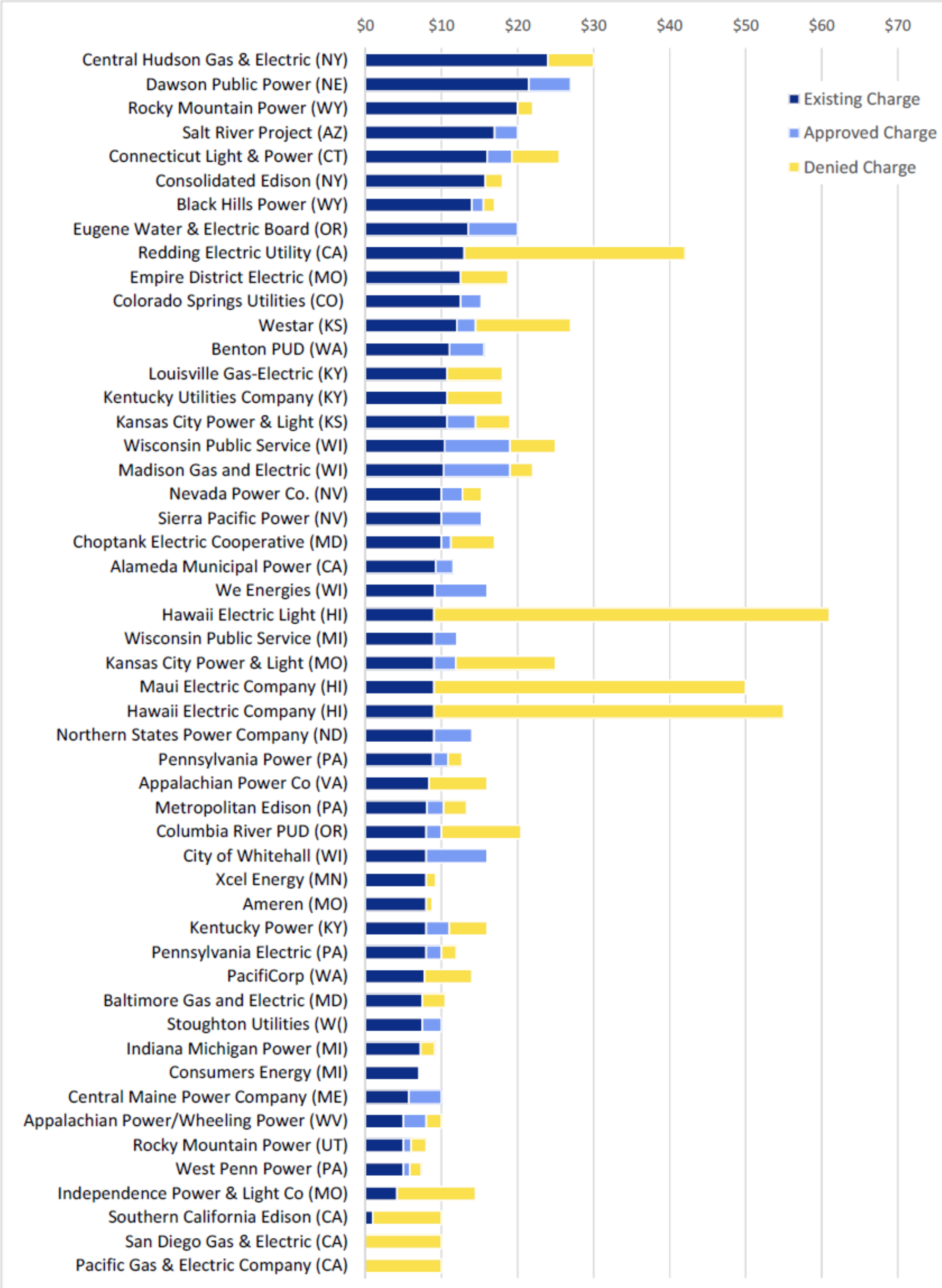
[6] Hansen, D. and M. O'Sheasey. Residential Rate Study for the Kansas Corporation Commission Final Report. Christensen Associates Energy Consulting. 2012. Available from http://www.kcc.state.ks.us/electric/residential_rate_study_final_20120411.pdf. Offered as Exhibit DJ-RD-4.

Thus, switching to a straight fixed variable rate design would result in substantial increases in energy usage, especially during the peak summer season. Their analysis was based on short-term customer responses, so long-term effects would be even larger.

Q. How have other Commissions decided about fixed customer charges?

A. There has been a recent effort across the utility industry to increase residential fixed charges. A recent report by Synapse Energy Economics, attached here as Exhibit DJ-RD-3, reviewed some of those decisions and found that commissions have largely rejected utility proposals to increase fixed charges, granting much smaller increases or no increases in many cases. The figure below, taken from that report, summarizes some of those decisions. The dark blue bar represents approved customer charges prior to utility requests to increase them, while the yellow bars represent fixed charge increases rejected by those Commissions either after fully litigated cases or settlements.

Figure 4. Recent decisions regarding fixed charge proposals



Notes: "Denied" includes settlements that did not increase the fixed charge. Source: See Appendix B

THE COMMISSION SHOULD MIGRATE AWAY FROM DECLINING AND TOWARD INCLINING BLOCK RATES FOR RESIDENTIAL CUSTOMERS

Q. What is KCP&L's current block rate structure for residential customers?

A KCP&L currently uses a flat rate in summer, , while the winter tariff consists of declining blocks with the highest rate for the first 600 kWh in a month. A somewhat lower rate applies to incremental kWh above 600 kWh and up to 1000 kWh per month, and a still lower rate applies to usage above 1000 kWh per month.

Q. Why should the Commission migrate away from declining and toward inclining block rates for residential customers?

A. The core reason that the Commission should migrate away from declining and toward inclining block rates for residential rates is to better reflect cost causation. Declining block rates signal to customers that the more electricity a customer uses, the cheaper it is. In fact, both seasonally higher uses and increments to total load are generally more expensive to serve than base levels of supply. Since most customers use more than the first block in most months, a declining block rate essentially functions as a disguised fixed charge with all of the adverse consequences of a high fixed charge.

KCP&L load is weather sensitive with summer peaks driven by air conditioning and other cooling loads. These weather sensitive loads are not as stable through the day and through the seasons compared to basic lighting and appliance usage. Thus weather-related loads drive incremental investments in capacity and create costs. Declining block rates tend to reduce the marginal cost of electricity for customers and in months with high weather-related demands. In contrast, inclining block rates tend to increase the marginal cost of electricity for customers and in months with high weather-related demands. Thus a shift away from declining block rates and toward inclining block rates will serve to better align customer charges with cost causation.

Shifting from declining to inclining block rates will also better align customer incentives with the avoidance of future cost increases. This happens through two mechanisms. First, inclining block rates increase the marginal cost of electricity for those who use it in larger quantities and therefore have greater scope for energy efficiency. Second, by increasing the marginal cost of electricity during billing months when weather-related demand is most significant, inclining block rates create incentives for investment in weather-related energy efficiency. This reduces peak demands and increases overall system load factor, reducing the average cost of electricity.

In addition, because detached houses are generally more weather-sensitive than apartments, a shift away from declining and toward inclining block rates will also generally reduce bills for low-income customers relative to higher-income customers. For these reasons, inclining block rates are considered as amongst best practices in utility rate design using traditional metering capabilities.[7]

Q. How common are inclining block rates?

A. I am not aware of a comprehensive inventory of current use of block rates. I am personally aware that inclining block rates are in general use in, Michigan, New Hampshire, British Columbia, California and Oregon. Jim Lazar, in Exhibit DJ-RD-5 reports that inclining block rates are common worldwide.

Q. What effect will migration from declining block rates to inclining block rates have

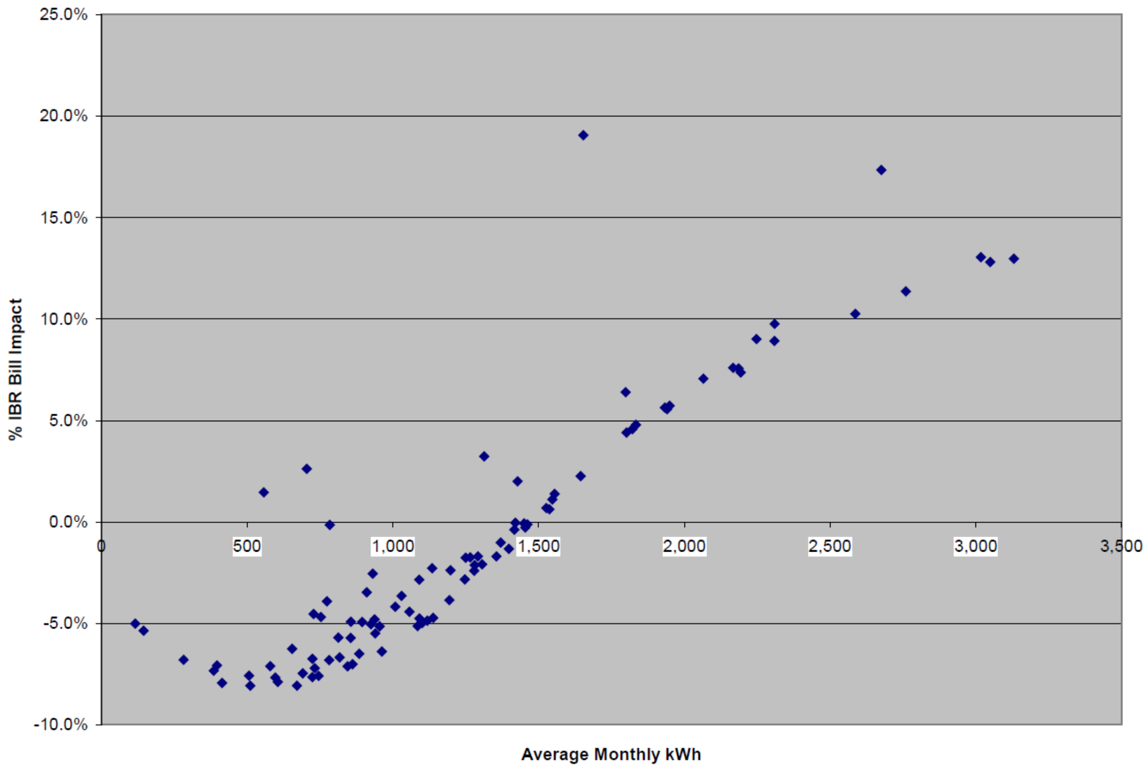
[7] Exhibit DJ-RD-5, Lazar, J. 2013. Rate Design Where Advanced Metering Has Not Been Fully Deployed. Regulatory Assistance Project. Available from http://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-ratedesignconventionalmeters-2013-apr-8.pdf.

on customer bills?

A. Since any change in rate design will still be anchored in the allocated costs of service for the residential rate class, average bills will not change in the short term though they might decline in the long term due to incentive effects. This shift will, however, reduce bills for customers with low usage and increase bills for customers with higher usage. To see this more clearly, a useful way to think about a declining block rate is that it is like having a fixed charge that is spread across the energy use in the first block. It therefore raises the bills of low usage customers and lowers the bills of high usage customers as compared to flat or inclining block rates. Thus switching from a declining block rate to an inclining block rate will lower the bills of low usage customers and increase the bills of high usage customers. This effect is nicely illustrated in an analysis of rate design done by Christensen Associates for the Kansas Corporation Commission that separately considered each major utility serving Kansas, including Kansas City Power & Light.[8] That study included analysis of switching from a flat rate design to an inclining block rate design and illustrated bill impact with the following graph.

[8] Exhibit DJ-RD-4.

Figure 4.8: Percentage IBR Bill Impacts, *KCP&L*



Since electricity usage is positively correlated with income, as I showed above, shifting from declining to inclining block rates will significantly lower bills for most low-income customers.

Consequently, declining block rates are objectionable for the same reasons that fixed customer charges are objectionable:

- low-usage and distributed generation customers will pay more;
- low-income customers tend to be lower usage customers;
- fixed charges effectively discriminate against apartment-dwellers;
- fixed charges weaken incentives for energy efficiency;
- customers have less opportunity to control their bills;
- net metering is devalued; and
- these reduce the opportunities for innovation and competition.

Q. What effect will migration to an inclining block rate have on demand?

A. In theory, an inclining block rate will reduce individual customer demand for higher levels of electricity consumption, which in aggregate will reduce overall system demand. There is a limited literature that evaluates changes to inclining block rates after they have actually been implemented. The best evaluation work of which I am aware is a paper prepared for BC Hydro by Mark Rebman,[9] which I offer as Exhibit DJ-RD-6. He found a short-term elasticity of -0.111 for a block applied to consumption above 1350 kWh per bi-monthly billing period and an annual consumption savings for BC Hydro's residential customers of 229.7 GWh. Elasticity is the percentage change in demand associated with a percentage price change and describes how sensitive customers are to such price changes. Although the elasticity identified in the BC Hydro is dependent on weather and other factors and cannot be presumed to apply to KCP&L, it does provide sound evidence that an inclining block rate encourages energy conservation. It also indicates that modest changes in the price of the higher-usage block will have modest short-term effects, so that there should not be big shifts that affect cost recovery within the period affected by a single rate case.

The Christensen Associates study for the Kansas Commerce Commission[10] prospectively estimated that a specific inclining block rate design for KCP&L's Kansas service territory would reduce summer energy sales by 2.3% and winter sales by 3.4% through near-term customer response. These results were based on full movement to an inclining block rate design and with different specifications than I recommend the Missouri Commission adopt, so these should just be taken as indicative of the effectiveness of this rate design.

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[9] Rebman, M. The Residential Energy Savings Effect of a 2-Step Inclining Block Electricity Rate. 2011 International Energy Program Evaluation Conference. Available at http://www.iepec.org/conf-docs/papers/2011PapersTOC/papers/044.pdf. Offered as Exhibit DJ-RD-6.

[10] Exhibit DJ-RD-4.

Q. How do you recommend that the Commission migrate away from declining block rates and toward inclining block rates for residential customers?

A. Based on average monthly electricity consumption by KCP&L's residential customers, it appears that the average consumption that isn't weather-related is just above 600 kWh per month. 600 kWh therefore seems an appropriate limit for the first block in an inclining block rate design. This is consistent with the block structure used in the existing declining block rate design so that it is reasonable to continue using the current block structure but begin shifting the rates downward for the first block and upward for the last block.

Preliminary calculations suggest that moving to an inclining block rate that approximately allocates the costs of weather-related demand to the higher usage blocks would be a fairly substantial shift in unit prices with likely substantial changes in bills for various customers. I recognize that the Commission is likely to follow a gradual course so as not to create "bill shock." I therefore recommend that the Commission calibrate rate shifts so as to limit bill impacts of this shift to about 5% for customers at the 95th percentile of consumption. Limiting bill impacts based on the few customers with even higher demand is likely to prevent forward progress because of a few extreme cases.

THE COMMISSION SHOULD DIRECT KCP&L TO WORK TOWARD USE OF TIME-VARYING RATES IN FUTURE RATE CASES

Q. In addition to migrating away from declining and toward inclining block rates for residential customers, what rate design strategies do you recommend to the Commission?

A. I recommend that the Commission begin working toward much greater use of time-varying rate designs.

Q. Why?

A. A substantial body of research on the economics of electric utilities has been published since 1992 and clearly demonstrates that dynamic and time-of-use methods to allocate costs and charge customers produce superior cost allocation and incent customer behavior that increases customer welfare, generally by decreasing overall cost of service. Time-of-use rates incentivize customers to consume less electricity during peak periods, thereby reducing that peak and costs associated with serving it. As a result, many jurisdictions are moving toward time-of-use rates as standard practice, including California, Ontario, and Illinois. Many others are at least providing time-of-use rates as an option. Utilities reporting to the U. S. Department of Energy, Energy Information Administration using Form 861 indicate whether they offer time of use pricing. By my count, 235 of 601 reporting utilities offer time of use rates for residential customers.

Use of marginal costs in the development of dynamic or time-of-use rates provide the most accurate incentives to customers and therefore produce maximum customer welfare while meeting the utility's revenue requirements.

In addition, the embedded cost methods described in NARUC's 1992 manual,[11] including those used in KCP&L's past and current cost allocation methods, are constrained by the belief that "the three principal cost classifications for an electric utility are demand costs (costs that vary with the KW demand imposed by the customer), energy costs (costs that vary with the energy or KWH that the utility provides), and customer costs (costs that are directly related to the number of customers served)."[12]

Almost none of the costs commonly assigned as "individual customer demand" costs are driven by an individual customer's demand. Rather, these "demand costs" are typically driven by

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[11] NARUC. Electric Utility Cost Allocation Manual. 1992. Available from NARUC.
[12] See the NARUC manual at page 20.

peaks in the aggregated coincident demand, or load, attributable to various groups of customers. Production costs, in particular, are driven by the aggregate demand of all customers.

With the availability and broad deployment of smart meters capable of interval metering of an individual customer's actual demand and energy use, it is practical to allocate costs based on demand in time-specific pricing intervals where the prices relate to appropriately aggregated loads. It is then no longer necessary to approximate the cost of serving an individual by clumping her – through an increasingly arcane methodology – into a rate class, assigning her to a specific tariff, and charging her a generic price based entirely on how other customers use energy. Time of use rates come much closer to assigning each individual customer their cost of service and reduce intra-class cross-subsidization.

Cost allocation based on time-specific metering rather than aggregate demand measurements can be used in either embedded cost or marginal cost approaches to cost allocation and rate design to better ensure rates are equal to the cost of service. Further, if individual customers are actually billed based on time-specific metering, they will be incented and enabled to avoid these more accurately assigned costs, and thereby better support affordable and competitive electric rates for all customer classes.

Q. If the total revenue to a utility is to remain the same as a result of the changes in rate design, how can rate design both give customers the opportunity to reduce their own cost of service and provide them incentives to reduce the cost of service to other customers?

A. Total revenue to a utility will remain the same in the short run as a result of an initial shift to time-varying rates. The principles that determine required revenue will also remain unchanged. However, these pricing reforms will lead to reduced need for the utility to make future investments in generation capacity and in transmission and distribution capacity; will reduce energy costs for line-losses; and will reduce distribution system maintenance costs. These reduced future costs will largely result from the use of time-based rates reflecting full marginal costs at high-load times, to which customers will respond by either being more efficient in their use of electricity at high cost times or by shifting their uses of electricity to lower cost times. This customer response to pricing incentives will reduce system peak loads and increase system load factors.

The availability of low-cost electricity at non-peak-load times will also likely encourage customers to shift to electricity from other energy sources by, for example, increasing their use of pluggable electric vehicles or of electricity-based space heating technologies. If they are able to make these switches voluntarily because of these lower electricity prices that reflect lower marginal costs, then customer welfare will increase. The utility may even increase its revenue in the long-run as the pricing reforms lead to greater productivity in its investments due to the leveling of load and the increased responsiveness of load to power supply conditions.

Q. So the use of time-varying rates is the key to a rate design in which billing determinants and rates better reflect cost causation, that provides customers an opportunity to reduce their own cost of service, and that incents customers to reduce the cost of service to other customers?

A. Yes.

Q. If the transition to dynamic and time-of-use rates need not produce different average rates for each class, how can this rate design better ensure rates are equal to the cost of service?

A. By better allocating costs within the major rate classes.

Within the residential customer class, customers who use air conditioning, high-powered televisions, pump water for pools, and similar uses that tend to occur at peak times will pay more than they would under the traditional rate design; residential customers who use power more evenly or off-peak for such end-uses as water heating and lighting will pay less than they would under traditional rate design. Similarly, customers in multiple-dwelling units or who have weather-resistant building shells will pay less while those in detached housing with poor building shell quality will pay more.

Within the commercial customer class, customers such as grocery stores, restaurants, and general retail that use electricity for refrigeration and other continuous functions or that operate on weekends and in evenings will pay less than under traditional rate design while office buildings and other commercial customers who operate primarily daytime on weekdays will pay more than under traditional rate design.

Within the industrial class, off-peak operations like ski resorts and agricultural commodity processors will pay much less than under traditional rate design, energy-intensive process industries will pay similarly to what they pay under traditional rate design, and day-shift manufacturers will pay more than they would pay under traditional rate design.

Within each of these classes, these changes will better reflect the cost of service than the traditional rate design. Thus, while transitioning to dynamic and time-of-use rates need not produce different average rates for each class, the differences within each class mean that rate design premised on time-varying rates will better ensure rates are equal to the cost of service.

Q. If the transition to dynamic and time-of-use rates need not produce different average rates for each class, how can it be a superior method of cost allocation and general rate design to support affordable and competitive electric rates for all customer classes?

A. By providing customers greater opportunity to reduce the rates they pay and their total electricity bill. Current rate designs do not provide price signals to customers to guide them as to what changes in their usage patterns will reduce their cost of service, nor do they reward customers who take those actions. Dynamic or time-of-use rates that are properly constructed will give customers that opportunity. As a result, customers will be able to achieve more affordable and competitive electric rates through their own actions. Furthermore, their efforts to do so will lower total system costs and be either neutral or an improvement for other customers as well.

Q. What steps can a customer take, confronted with time-varying rates, to reduce their own cost of service?

A. There is a wide variety of steps they can take. Even if the rate structure is dynamic and subject to variations from day-to-day or season-to-season, there are understandable patterns and people can make adjustments in their activity schedules. For example, I co-owned a small printing plant in Reno, Nevada for several years, one specialty of which was producing raised print. The process to produce raised print is more energy-intensive than the process to produce flat print. When Nevada Pacific established dynamic rates, we changed our job scheduling practices so that we ran raised-print jobs in the morning when rates were lower and flat-print jobs in the afternoon. This reduced our annual electricity bill by about $20,000, did not add to any other costs, and did not take additional attention once we established the practice.

Time varying rates will also incent customers to make better and more socially constructive investment decisions, such as investing in energy efficiency or choosing differently when purchasing equipment for other reasons. For example, cost-saving equipment to reduce energy usage during weekday summer afternoons include:

- awnings, window films, white roofs, shade plantings, and other means to reduce building solar gain;
- intelligent thermostats that can pre-cool buildings before high-price times and raise set points during high price times;
- automated energy management systems to better schedule building functions;
- tighter building shells and ventilation systems with enthalpy exchangers;
- more efficient building cooling equipment;
- daylighting or more energy-efficient daytime lighting.

Depending upon the customer's operations and building(s), there is a very long list of available options that would reduce their electricity demand at high-cost times or shift demand to lower-cost times.

Q. Won't these changes be complicated for customers? Won't some of them prefer to pay more rather than deal with this complexity?

A. Just because the rate design changes and rates become time-varying does not mean that customers are required to pay attention to the time-variation of rates. Since these will be changes that don't increase total revenue, the average customer bill will be essentially unchanged in the short term. Some customers will pay more and some will pay less, but because those changes will better reflect cost of service, the rate design will still be improved even if the customers choose not to pay attention to the time-variation of rates.

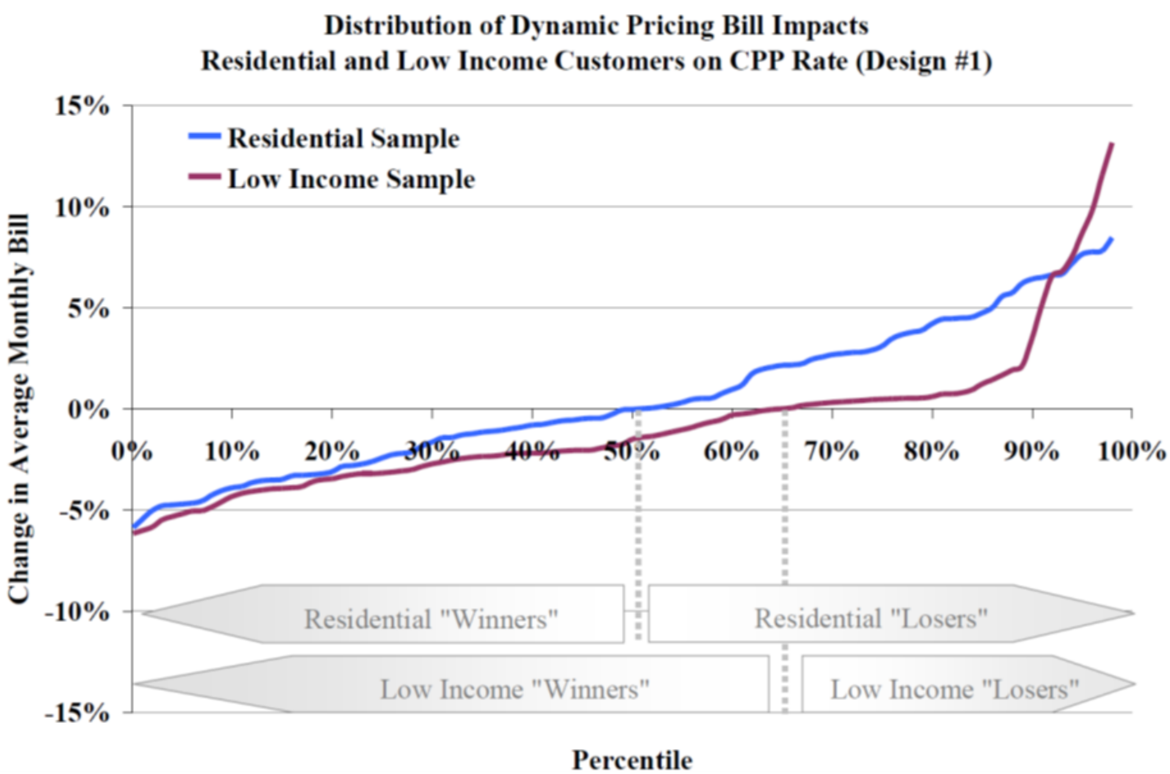
Even customers who ignore the time-variation of rates are likely to eventually benefit either because the responses of other customers will reduce overall rates or because the existence of time-varying rates will drive responsive changes in the energy-consuming products and services supplied in the market. Further, if time-varying rates are ubiquitous in a utility's service territory, customers will likely be presented offers in the marketplace that will reduce their energy costs and will be able to accept those offers without investing much of their own time and attention in those decisions.

Customers who do pay attention to time-varying rates need not find them complex if the utility or others communicate appropriate responsive strategies to them.

Q. Will a change to dynamic or time-of-use rates adversely affect low-income customers?

A. Generally, no. I anticipate that a significant majority of low-income customers will enjoy an immediate reduction in their utility bills upon transition into the time-of-use rate. A good example of the evidence for that expectation is the 2010 IEE whitepaper "The Impact of Dynamic Pricing on Low-Income Customers" by Ahmad Faruqui, Sanem Sergici, and Jennifer Palmer.[13] The following figure from that article aptly summarizes the results of an analysis they performed on one particular dynamic rate construct.

[13] Available from http://www.edisonfoundation.net/IEE/Documents/IEE_LowIncomeDynamicPricing_0910.pdf



The literature suggests that approximately 80% of low-income customers will automatically have lower bills as a result of a time of use rate design, but I cannot know the actual results for KCP&L's low-income customers without a fully-specified rate design and access to their records for individual customers. Of course, we must be concerned about the remaining low-income customers whose bills would increase as a result of exposure to time-of-use rates without customer adaptation. I therefore also recommend that adoption of time-of-use rates be accompanied by programs specifically targeting appropriate education and physical energy efficiency and peak load management measures to those low-income customers whose bills would increase with the adoption of time-of-use rates.

Q. How do you recommend that the Commission proceed to examine time-varying rates?

A. It is my view that good rate design is mostly likely to emerge from good process. Together with some of my colleagues, I recently submitted a letter to the National Association of

Regulatory Utility Commissioners on this topic, which I commend to the Commission's attention. I offer that letter as Exhibit DJ-RD-7. I particularly want to highlight the following overall recommendations for ensuring good process in implementing rate design changes:

- Assessment and analysis of state conditions and sound data when determining the need and pace for rate-design change;
- Collaborative, upfront, open, docketed processes that explore the range of rate-design options in advance of or in lieu of rate cases;
- Data-driven rate-design inquiries;
- Pilots and testing for novel or untested rate designs prior to wide-scale adoption;
- Consideration and accommodation for low-income and vulnerable customers in rate design; and
- Sufficient opportunity to educate customers on new/shifting rate designs well in advance of their implementation and the development of tools to do so.

These recommendations were based on our collective experience with time-of-use rates, which ranges from pilots to recent decisions by some utilities to make time-of-use rates the default tariff.

My own experience in Michigan is that the Commission has sanctioned pilot projects using time-of-use tariffs, then moved to make them universally available on an opt-in basis, and is now requiring utilities to developing marketing programs to accelerate adoption. The Commission has also indicated that it may in future make time-of-use tariffs the default rate design, on an opt-out basis. I should note as well that most Commissions that have adopted time-of-use tariffs have approved or mandated utility programs to deploy technology that enables customers to adapt to these tariffs and avoid electricity usage at high-priced times.

I therefore recommend that the Commission initiate a separate process to explore time-varying rate design through a collaborative, data-driven process prior to considering such designs in a formal case.

Q. In your experience, how should Commissions approached establishing time-of-use rates?

A. Generally, they should and have developed rates that reflect long-term marginal costs and then made appropriate adjustments to provide for recovery of the utility's full required revenue.

Q. What do you mean by marginal cost?

A. Marginal cost is the incremental cost to the utility of providing an additional unit of service. Thus marginal cost of energy at any given time is the cost of running and fueling the generator that would be least costly to run to produce that additional increment of energy, given the generators that are available and in use.

Q. Why does assigning rates based on marginal cost better reflect cost causation than traditional rate designs?

A. With only a few exceptions, a change in the service required by one customer will only change the utility's total costs by the marginal cost of that service. Connecting a new customer who is adjacent to an existing distribution line will only add costs of the service drop, metering, billing, and customer service. A customer who increases or decreases energy consumption at non-peak times only changes the utility's costs of production by the fuel, environmental allowances, and variable maintenance associated with operating the marginal plant at that time. Thus, a change in the amount of service to a customer, as measured by a billing determinant, only costs the utility the marginal cost of the billing determinant and does not cause any other costs.

On the other hand, when a utility uses a single energy rate for its customers within a class regardless of whether or not energy consumption is during peak-load or non-peak-load time, it fails to reflect cost causation because it undercharges every customer in the class at peak-load times and overcharges every customer in the class at non-peak-load times. This discord between charges and cost causation has two important consequences.

First, the rates charged mislead customers about the costs of services, and cause them to consume too much or too little of the services relative to their actual cost and value to the customers. This inefficiency misallocates the resources of those customers but also leads to misallocation of business investment and hurts overall economic well-being. For example, investments in reducing an individual customer's demand charge may be useless or even harmful to the reduction of power system costs if the customer's individual non-coincident peak demand occurs at times other than the system coincident peak.

Second, certain customers are variously overcharged or undercharged relative to other customers for the services they receive. Thus, combining production capacity and generation costs into a constant energy charge for customers in a class causes those customers whose consumption occurs disproportionally at peak times to be subsidized by those customers whose consumption occurs disproportionally at non-peak times.

Q. How should rates be designed using marginal costs so that the utility will receive the revenue it requires?

A. The most important point is that marginal pricing should be used to the extent that it is practicable and then certain adjustments should be made to bring revenues into line with revenue requirements. There are two reasons why marginal cost pricing will not supply an electric utility its full required revenue.

First, an electric utility has certain shared and joint expenses that are not susceptible to marginal pricing. The best example of this is that distribution lines connect numerous customers to a substation. Because most of the cost of a distribution line is incurred to cover the relevant geography and is little affected by the number of customers connected to the line nor the amount of power they use, these costs cannot be recovered through marginal pricing of either customer connections or power consumption.

Second, because a utility must invest for the future, it will inevitably make “mistakes” by investing based on forecasts that turn out to be wrong. Thus, while a utility with an optimal generation portfolio would recover its required revenue through marginal cost pricing of capacity and energy, an actual utility will not have an optimal portfolio in any given year and will therefore not be able to obtain its revenue requirements, as conventionally defined for regulated utilities, through marginal cost pricing. It should be noted that in unregulated markets for any goods or services, these kinds of investment mistakes are considered ordinary business risks, so it is appropriate that the Commission determine authorized rates of return in light of the business risks that utilities do or don’t incur.

However, the existence of large fixed investments such as generation capacity does not imply any problem with the utility obtaining its required revenue based on marginal costs. In the long run, capacity investment costs are driven by incremental changes in peak load so the relevant costs can be recovered through marginal capacity cost pricing of that load. Thus, it is principally the transmission and distribution networks, with their shared and joint costs, that prevent full cost recovery through marginal cost pricing.

In those instances where marginal cost pricing does not fully recover required revenue, then the appropriate allocation of the extra costs is through either Ramsey-Boiteaux pricing (also identified as the Inverse Elasticity Method) or Equi-Proportional (Percentage) Adjustment, both of which are discussed in Chapter 11 of the NARUC Manual in relation to class cost assignments but apply equally within a class.

Q. What is Ramsey-Boiteux pricing?

A. Ramsey-Boiteux pricing is an economics theorem concerning the prices a monopolist should set in order to maximize social welfare while recovering its revenue requirements when marginal cost pricing won't meet the monopolist's revenue requirements. Ensuring that a utility meets its revenue requirements in a manner that maximizes social welfare should undoubtedly be the Commission's objective in setting rates. Under Ramsey-Boiteux pricing, required revenue that won't be recovered through marginal cost pricing (or through excess revenue from marginal cost pricing) should be allocated to products or customers who benefit from shared and joint costs in inverse proportion to the own-price demand elasticity of those products by those customers. "Own-price demand elasticity," means the ratio of percentage change in quantity demanded as a result of a price change to the percentage change in price. If elasticity is assumed to be uniform across times of use, then Ramsey-Boiteaux pricing is the same as Equi-Proportional Adjustment.

SUMMARY OF RECOMMENDATIONS

Q. Please summarize your recommendations to the Commission regarding KCP&L's proposed rate design.

A. I recommend that the Commission:

1) Deny KCP&L's request to increase residential customer charges;

2) Migrate away from declining block rates and toward inclining block rates to the extent that bill impact does not exceed 5% for the 95th percentile of customers; and

3) Initiate a process to evaluate and potentially move toward time-of-use rates.

Q. Does that complete your testimony regarding KCP&L's residential tariffs?

A. Yes.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Kansas City Power & Light Company's Request for Authority to Implement a General Rate Increase for Electric Service	)))	**Case No. ET-2016-0285**

County of Ingham)

State of Michigan)

MARIE E. WICKS
Notary Public, State of Michigan
County of Ingham
My Commission Expires Oct. 28, 2017
Acting in the County of INGHAM

AFFIDAVIT OF DOUGLAS B. JESTER

Douglas B. Jester, of lawful age, on his oath states: that he has participated in the preparation of the following direct testimony in question and answer form, which is attached hereto and made a part hereof for all purposes, and is to be presented in the above case; that the answers in the following direct testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such answers are true to the best of his knowledge and belief.

Douglas B. Jester

Douglas B. Jester

In witness whereof I have hereunto subscribed my name and affixed my official seal this 14TH day of December, 2016.

Marie E. Wicks