Exhibit No.:
Issue: Weather Normalization; Customer Annualization of Unit Sales
Witness: Albert R. Bass, Jr.
Type of Exhibit: Direct Testimony
Sponsoring Party: Kansas City Power & Light Company
Case No.: ER-2016-0285
Date Testimony Prepared: July 1, 2016



**MISSOURI PUBLIC SERVICE COMMISSION**

**CASE NO.: ER-2016-0285**

# DIRECT TESTIMONY

**OF**

**ALBERT R. BASS, JR.**

**ON BEHALF OF**

**KANSAS CITY POWER & LIGHT COMPANY**

**Kansas City, Missouri**
**July 2016**

**DIRECT TESTIMONY**

**OF**

**ALBERT R. BASS, JR.**

**Case No. ER-2016-0285**

**Q: Please state your name and business address.**

A: My name is Albert R. Bass, Jr. My business address is 1200 Main, Kansas City, Missouri 64105.

**Q: By whom and in what capacity are you employed?**

A: I am employed by Kansas City Power & Light Company ("KCP&L" or "Company") as Manager of Market Assessment.

**Q: On whose behalf are you testifying?**

A: I am testifying on behalf of KCP&L.

**Q: What are your responsibilities?**

A: My responsibilities include supervising two employees with responsibility for short-term electric load forecasting, long-term electric load forecasting, weather normalization, and various other analytical tasks.

**Q: Please describe your education, experience and employment history.**

A: I received a Bachelor of Science in Business Administration degree with emphasis in Marketing from Missouri Western State University in 1989. I earned a Master of Business Administration degree from William Woods University in 1995.

Prior to joining KCP&L, I worked for APS Technologies developing product forecast models and conducting market analysis. In June 1998, I joined KCP&L as a Technical Professional. In this role, I conducted market analysis, developed market

options studies, and research. In May 2000, I assumed the responsibilities for short-term budget forecasting, long-term load forecasting for the Integrated Resource Plan, monthly kilowatt-hour ("kWh") sales and peak weather normalization, and weather normalization for rate case filings. As part of these duties, I assisted with the creation of the weather normalization testimony filed by KCP&L. In July 2013, I was promoted to my current position as Manager of Market Assessment.

**Q: Have you previously testified in a proceeding before the Missouri Public Service Commission ("Commission" or "MPSC") or before any other utility regulatory agency?**

A: Yes, I provided written testimony in KCP&L's Greater Missouri Operation Company rate case (MPSC – Case No. ER-2016-0156) and KCP&L's 2014 rate cases (MPSC – Case No. ER-2014-0370 and the Kansas Corporation Commission – Docket No. 15-KCPE-116-RTS).

**Q: What is the purpose of your testimony?**

A: The purposes of my testimony are to:

I. Sponsor the weather normalization, customer growth, rate switching, and energy efficiency adjustments of test year monthly kWh sales and peak loads in Schedules ARB-1 through ARB-4. I recommend that the Commission adopt these results in the current case.

II. Sponsor schedules showing the decline in average per-customer usage in Schedules ARB-5 through ARB-8.

## I. WEATHER NORMALIZATION, CUSTOMER GROWTH

**Q: What normalizations are you making to kWh sales and peak loads?**

A: Both monthly and hourly kWh sales are adjusted to reflect normal weather conditions. This is called a weather adjustment. KWh sales are further adjusted for customer growth that occurs between the test year and the true-up date of December 2016, and for customers who were switched from one rate to another during or after the test year. These customers are known as rate switchers. An additional adjustment to the kWh sales is made for energy efficiency that occurs between the test year and two months prior to the true-up date of December 2016.

**Q: What is the purpose of making a weather adjustment?**

A: Abnormal weather can increase or decrease a utility company's revenues, fuel costs and rate of return. Therefore, revenues and expenses are typically adjusted to reflect normal weather to determine a company's future electric rates. These adjustments are made by first adjusting kWh sales and hourly loads and then using these results to adjust test-year revenues and incremental costs (*i.e.*, fuel and purchased power).

During the test year, January 2015 through December 2015, there were 14.4% less heating degree days and 1.2% less cooling degree days than normal at the Kansas City International Airport. Thus, heating load was significantly lower than normal while cooling load was closer to, but still lower than, normal.

**Q: What method was used to weather-normalize kWh sales?**

A: The method was based on load research ("LR") data, which was derived by measuring hourly loads for a sample of KCP&L's customers representing the Residential, Small General Service ("GS"), Medium GS, Large GS, and Large Power classes. The hourly

loads were grossed up by the ratio of the number of customers for each of these classes divided by the number sampled.

In the first step, the hourly loads for the sample were calibrated to the annual billed sales of all customers in each class. The ratio of the billed sales divided by the sum of the hourly loads was multiplied by the load in each hour.

In the second step, the hourly loads were estimated for lighting tariffs and the loads for all tariffs, including sales for resale, were grossed up for losses and compared to Net System Input ("NSI"). The difference between this sum and the NSI then was allocated back to the LR data in proportion to the hourly precisions that were estimated for the LR data.

In the third step, regression analysis was used to model the hourly loads for each rate class. These models included a piecewise linear temperature response function of a two-day weighted mean temperature.

In the fourth step, this temperature response function was used to compute daily weather adjustments as the difference between loads predicted with normal weather and loads predicted with actual weather. Normal weather was derived using spreadsheets provided by the MPSC Staff. The normal weather represents average weather conditions over the 1981-2010 time period.

In the fifth step, the daily weather adjustments were split into hourly adjustments and these were added to NSI to weather-normalize that series.

In the sixth step, the daily weather adjustments were split into billing months based on the percentage of sales on each billing cycle and the meter reading schedule for

the test year period. These weather adjustments then are summed by billing month and added to billed kWh sales to weather-normalize that data.

**Q: What adjustment did you make for rate switchers?**

A: Each year a small percentage of customers are switched from their current tariff to another that is expected to reduce their electric bills. We adjusted kWh sales for the Large Power tariff for customers that switched into or out of this tariff. The customer growth adjustment accounted for rate switchers in the other tariffs.

**Q: What adjustment did you make for customer growth?**

A: For each month in the test year, the weather-normalized sales per customer were multiplied by the number of customers projected for the true-up date. This adjustment is made to weather-normalized sales to the Residential, Small GS, Medium GS, and Large GS classes. When the numbers become available, I will revise this adjustment using the actual number of customers as of the true-up date. Sales to Large Power customers are adjusted by plotting each customer's monthly kWh sales and looking for any changes in sales that appear to be or are known to be permanent. If any such changes are identified, sales during the test year are adjusted to reflect the change. The adjustments for growth to Large Power sales will be revised using the most current data for the true-up.

**Q: Were any other adjustments made besides the adjustment for rate switchers and customer growth?**

A: Yes, an additional adjustment is made to annualize the impact of the Company's energy efficiency programs on test year sales. During the test year, KCP&L invested significantly on programs designed to help customers use energy more efficiently. The result of this investment in energy efficiency programs is a decline in the sales made by

the Company relative to the level of sales that would be made absent the programs. Because the Company programs generated customer savings during the test year and true-up period, the impact of those efficiency measures installed during the test year should be annualized to reflect the full impact of the measures on the Company's sales.

**Q: Do installed efficiency measures in the test year affect the test year sales and why is it necessary to further adjust sales to fully reflect the impact of the programs?**

A: Yes, if a residential customer who is not participating in any Company energy efficiency programs has an annual average usage of 10,500 kWh and then decided to participate in the Company programs with four months left in the test year, which now reduces their actual test year usage to 10,000 kWh, the Company would only see a reduction of 500 kWh in the test year. In this example on an annual basis going forward, however, the customer's true annual average consumption is actually reduced by 1,500 kWh due to the energy efficiency actions promoted by the Company. The reason is the change took place during the test year, but the impacts of the installed measures are only reflected in one-third of the test year load. The effect can be extreme when you start looking at all customer participation rates and the fact that they sign up and participate in various programs throughout the test year. Since the Company has documented participation rates and measures installed in the test year, the annualized energy savings of those measures, and the installation dates of the measures, it is appropriate to reflect the full energy impact of the measures in the test year. This is a known and measurable change in the energy consumption that occurred before the end of the test year, which will continue going forward and should be annualized.

**Q: What are the adjustments to annualize the impact of the Company's energy efficiency programs on test year's sales?**

A: Upon filing a rate case, the cumulative, annualized, normalized kWh and kilowatt ("kW") savings will be included in the unit sales and sales revenues used in setting rates as of an appropriate time (most likely two months prior to the true-up date) where actual results are known prior to the true-up period, to reflect energy and demand savings in the billing determinants and sales revenues used in setting the revenue requirements and tariffed rates in the case.

**Q: Describe how you calculated the energy efficiency adjustment.**

A: The calculation of the energy efficiency adjustment is based on the stipulation in Case No. EO-2015-0240[1]:

In the first step, KCP&L will take test period weather normalized kWh usage for each customer class by billing month and adjust it by[2] adding back the monthly kWh energy savings by customer class incurred during the test period from all active Missouri Energy Efficiency Investment Act ("MEEIA") programs, excluding Home Energy Reports and Income-Eligible Home Energy Reports programs which have a one year measure life, determined using the same methodology as described in Tariff Sheet 49 through 49P (KCP&L) except that calendar month load shape percentages by program by month will be converted to reflect billing month load shape percentages by program,

[1] Non-Unanimous Stipulation and Agreement Resolving MEEIA Filings, Case No. EO-2015-0240, pp. 13-15.

[2] Step 1. Begin with Weather Normalized kWh per class provided by Company. Step 2. Compute Monthly Savings kWh (MS) per program in the same manner as used for TD calculation. Step 3. Weather Normalized kWh before application of Energy Efficiency (EE) adjustment. Step 4. Cumulative Annual Savings kWh (CAS) per program computed in the same manner as TD calculation as of Rebase Date. Step 5. Monthly Load Shape percentage per program converted to billing month equivalent by using a weighted average calendar month Load Shape percentage based on billing cycle information of the rate case. Step 6. Monthly EE Rebase Adjustment. Step 7. Weather Normalized kWh rebased for EE.
Non-Unanimous Stipulation and Agreement Resolving MEEIA Filings, Case No. EO-2015-0240, -0241, p. 13.

calculated by computing a weighted average of the current and succeeding month percentages.

In the second step, the adjusted test period sales from above will be annualized for customers and additionally be adjusted further by subtracting the cumulative annual kWh energy savings from the first month of the test period through the month ending where actual results are available (most likely two months prior to the true-up date) by customer class from all active MEEIA programs, excluding Home Energy Reports and Income-Eligible Home Energy Reports, determined using the same methodology as described in Tariff Sheet 49 through 49P (KCP&L) except that calendar month load shape percentages by program by month are converted to reflect billing month load shape percentages by program, calculated by computing a weighted average of the current and succeeding month percentages.

In the third step, the test period kW demand for each customer class will be adjusted by[3] adding back the monthly kW demand savings by customer class incurred during the test period from all active MEEIA programs, excluding Home Energy Reports, Income-Eligible Home Energy Reports and Demand Response Incentive programs, determined using the same methodology as described for kWh savings in Tariff Sheet 49 through 49P (KCP&L) and then subtracting the cumulative annual kW demand savings from the first month of the test period through the month ending where actual results are available (most likely two months prior to the true-up date) by customer class from all

[3] Step 1. Begin with kW demand per class provided by Company. Step 2. Compute Monthly kW demand per program in the same manner as used for TD calculation. Step 3. kW demand before application of Energy Efficiency (EE) adjustment. Step 4. Cumulative Annual kW demand per program computed in the same manner as TD calculation as of Rebase Date. Step 5. Monthly Load Shape percentage per program converted to billing month equivalent by using a weighted average calendar month Load Shape percentage based on billing cycle information of the rate case. Step 6. Monthly EE Rebase Adjustment. Step 7. kW demand rebased for EE.
Non-Unanimous Stipulation and Agreement Resolving MEEIA Filings, Case No. EO-2015-0240, -0241, p. 13.

active MEEIA programs, excluding Home Energy Reports, Income-Eligible Home Energy Reports and Demand Response Incentive programs, determined using the same methodology as described for kWh savings in Tariff Sheet 49 through 49P (KCP&L).

In the fourth step, after the energy efficiency adjustment for kWh and kW has been determined, weather normalized kWh and kW are rebased with the energy efficiency adjustment. kWh sales are rebased by subtracting the energy efficiency adjustment from the weather normalized kWh and kW (demand) is determined by taking the monthly kWh and spreading it across an hourly load shape to determine the monthly peak demand.

The impacts that are applied to the weather normalized and customer adjusted kWh used to rebase the weather normalized sales are shown in Schedule ARB-2.

**Q: What are the results of these normalizations?**

A: Schedule ARB-1 shows the monthly adjustments for normalization on kWh sales. Schedule ARB-2 shows the annualized kWh energy efficiency impact. Schedule ARB-3 shows weather-normalized customer annualized monthly peaks by class. Schedule ARB-4 shows weather-normalized customer annualized loads by class at the time of the monthly system peak load.

**Q: How are the results used?**

A: Weather-normalized, customer-annualized kWh sales are used to calculate test year revenues and fuel costs.

## II. DECLINE IN AVERAGE PER-CUSTOMER USAGE

**Q: What is the trend in average use?**

A: Prior to the 2008 economic recession the KCP&L MO service territory was experiencing compounded annual growth rates ("CAGR") in residential weather normalized billed kWh sales at 2.0% and average per-customer usage at 1.4% during the time period of 2000-2007. During the same time period the commercial sector was seeing similar growth with weather normalized billed kWh sales growing at 1.4% and average per-customer usage at 0.1% while the industrial sector weather normalized billed kWh sales was growing at 0.6% and average per-customer usage at 2.2%.

During the time period 2010-2015, CAGR in the KCP&L MO service territory has essentially flattened or stalled out: residential weather normalized billed kWh sales were -0.3% and average per-customer usage was -0.6%, commercial weather normalized billed kWh sales were 0.0% and average per-customer usage was -0.1% and industrial weather normalized billed kWh sale were -0.8% and average per-customer usage was 0.7%. Weather normalized billed kWh sales and weather normalized average use per-customer is shown in Schedule ARB-5 through Schedule ARB-7.

The year-over-year growth in retail average use per-customer for the KCP&L MO service area has steadily declined since the 2008 recession. Prior to the recession and energy efficiency it had been experiencing growth. Figures 1 and 2 illustrate the decline in weather normalized retail average use per-customer and weather normalized billed MWh sales.

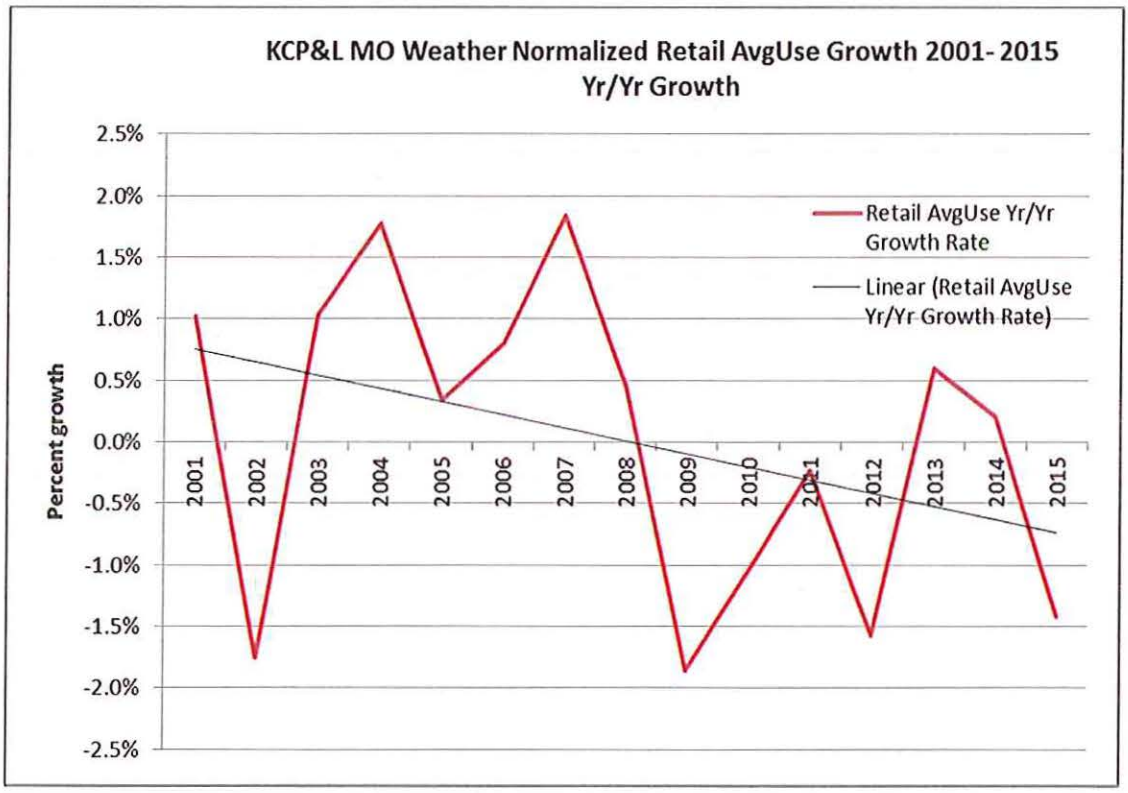


Figure 1: KCP&L MO Weather Normalized Retail Growth Rates for Average Use per Customer 2001-2015

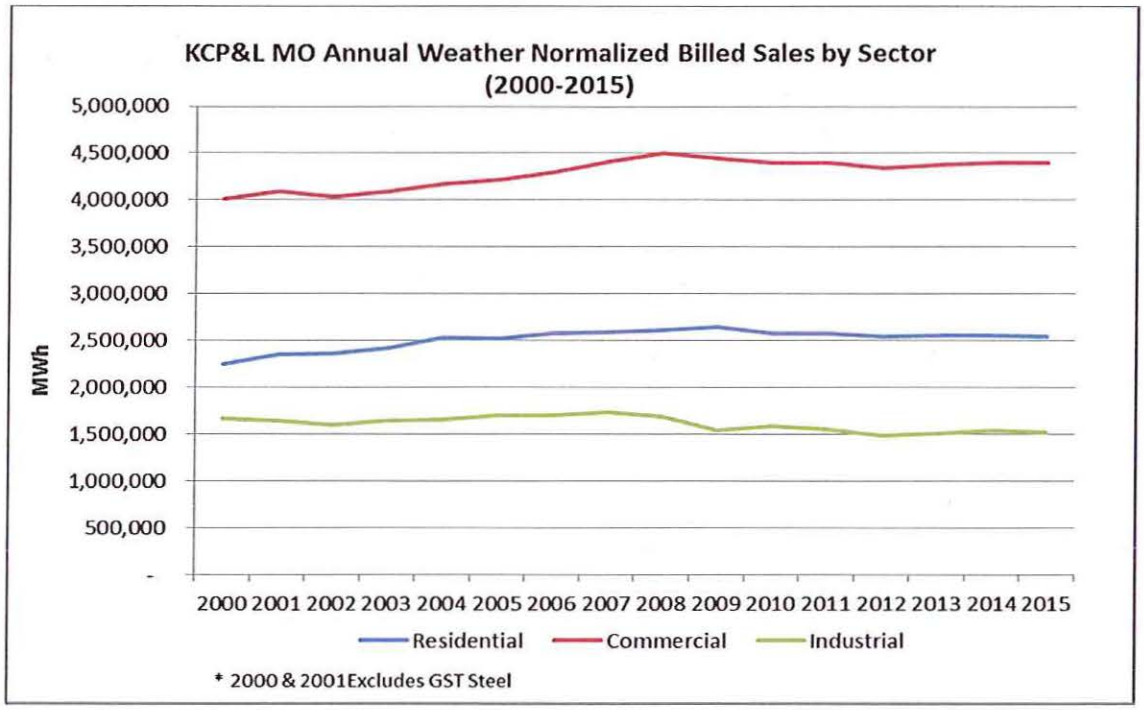


Figure 2: KCP&L MO Weather Normalized Class Billed MWh Sales 2000-2015

**Q: What is the cause of this trend?**

A: A single cause is unclear. However there are several potential contributory explanations:

Recession Lag: We have never fully recovered from the 2008-2009 recession. But, the recession alone does not explain the recent decline, rather a variety of changes in the market place due to the recession and demographic changes after the recession have contributed to the decline in average per-customer usage.

Federal Standards: The Federal Standards promulgated to date have saved consumers $58 billion in utility bill savings which amounts to nearly $250 per household per year in energy bill savings. Today there are over 60 covered products which account for 90% of residential energy use, 60% of commercial energy use, and 30% of industrial energy use. These standards have had a dramatic impact on the average use per-customer over the last several years. For example, a typical new refrigerator uses one-third the energy today compared to in 1973 with 20% more storage capacity and at half the retail cost and a new air conditioner today uses about 50% less energy than in 1990. The Company has seen these impacts within its own service territory with rebates being offered for both new refrigerators and air conditioners. Based on the last appliance saturation survey conducted by the Company, 28% of its customers have replaced their air conditioner in the past five years with a more efficient unit. Federal standard programs have put downward pressure on average use per customer.

Company Sponsored Energy Efficiency Programs: Over the past ten years energy efficiency has reduced residential load by 95,576,147 kWh, commercial by 167,752,497 kWh and industrial by 57,117,802 kWh as of December 31, 2015. These impacts can be found in Schedule ARB-8. Company sponsored programs continue to

have an impact due to implementation of new programs and persistence from existing programs.

Housing Market: The housing market has never fully recovered since the recession. Even though the housing market has picked up, it has not been enough to offset the decline in average use per customer. Interest rates continue to be lower than they were during the housing boom. In fact, interest rates have been at all-time low for an unprecedented period with inflation at or below 2%. The unemployment rate is lower than it was prior to the recession. Even with favorable factors, there has not been a marked increase in single family housing.

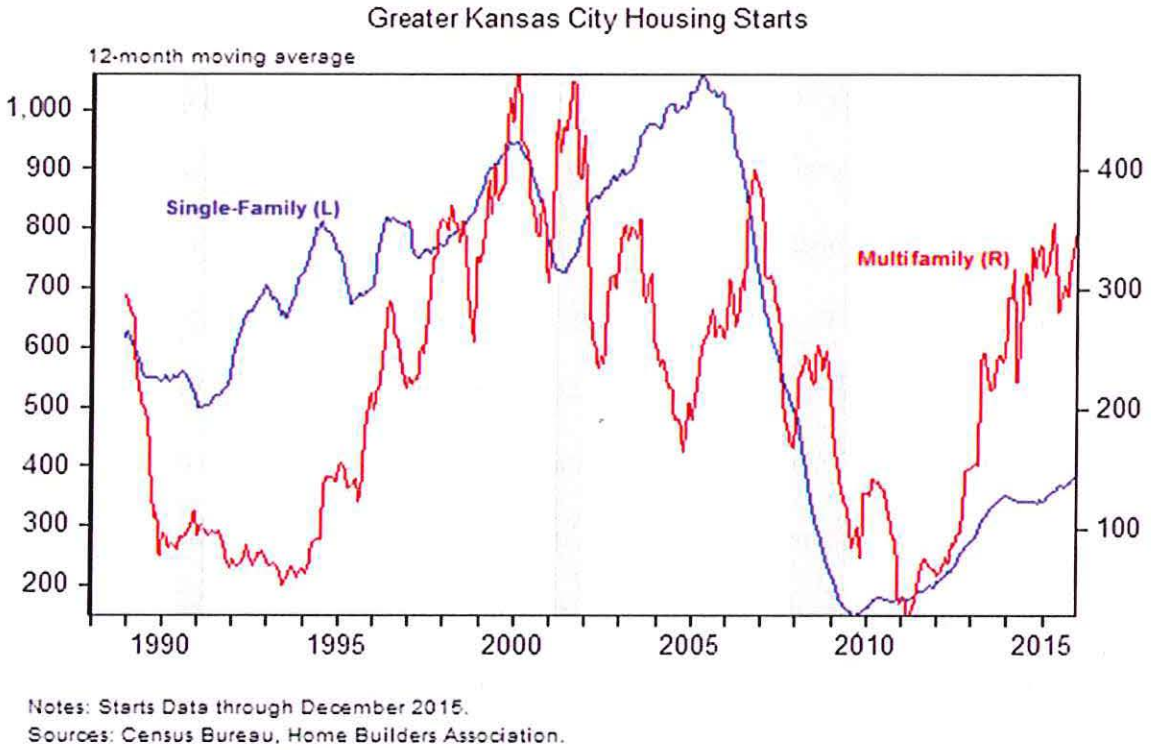


Figure 3: Single-Family & Multifamily - 12 Month Moving Average Housing Starts[4]

[4] Kansas City National Association of Home Builders – Monthly Housing Starts Report. "http://www.census.gov/construction/nrc/index.html" and "http://www.kchba.org/news/permit-reports"

The current rate of single-family housing starts still remains almost two-thirds below its peak prior to the housing crisis and more than one-third below its peak during the 1990s, applying downward pressure to average use per customer. In sharp contrast, multifamily housing starts have rebounded strong from their low during the housing crisis (Figure 3). The smaller square-footage of multifamily applies more downward pressure to average use per customer. Millennial and young adults have primarily driven the recent rebound in multifamily home construction, reversing their earlier swing towards single family homes during the housing boom. From 2002 to 2007, young adults vacated multifamily units, thereby depressing multifamily construction. From 2010 to 2015, however, young adults began moving out of their parents' houses, requiring builders to construct new units. Some have interpreted the recent increase in young adults' multifamily occupancy as reflecting millennials' stronger preference for living in apartments. However, most of the increase simply reflects a return to trend behavior and the impact of other factors such as stricter lending standards, low wage growth and under-employment.

In contrast to young adults, multifamily occupancy among older adults is increasing. However, the rate of construction needed to meet their increasing demand rose only modestly during the period of 2010 to 2015 compared with the period of 2002 to 2007, and so older adults did not drive the recent multifamily rebound. However, the rate at which baby boomers retire should increase. As the senior population expands — and more seniors decide to down-size from larger single family homes to smaller single family homes or apartments, seniors will likely supplement young adults as the main driver of growth in multifamily construction. This demographic behavior should

continue to put downward pressure on average use per customer. By the end of 2017 it is expected that Missouri will only return to 74% - 85% of normal housing production levels[5].

Electric Price: Recent rate increases, largely driven by environmental mandates, have impacted the perceived value of electric energy causing customers to consider higher levels of efficiency or conservation.

In summary, the decline in average usage per-customer is a result of several factors: federal standards (efficiency improvements resulting from appliance efficiency), company efficiency programs, the housing market and electricity price. These factors have decreased consumption per household, despite increases in the number of customers, the average size of homes, and increased use of electronics.

**Q: Do you expect the trend to change in the future?**

A: It is not expected that the Company will return to the previous trend prior to 2008 due to continued federal standards initiatives, company sponsored energy efficiency programs and increasing electricity prices.

Federal Standards: The U.S. Department of Energy ("DOE") issued 10 final rules in 2014 which was the most ever in one calendar year. The cumulative utility bill savings to consumer from these new standards issued are estimated to save consumers $78 billion through 2030[6]. In December 2015, the DOE announced historic new efficiency standards for commercial air conditioners and furnaces which is the largest energy saving standard in history. This standard was developed with industry, utilities, and environmental

[5] David Crowe, Chief Economist, Kansas, City National Association of Home Builders, "Economic and Housing Outlook" presentation January 13, 2016.
[6] John Cymbalsky, U.S. Department of Energy, "The U.S. Appliance Standards Program" presentation to Energy Forecasting Group meeting in May 2015.

groups to save more energy than any other standard issued to date by the DOE. It is estimated that over the lifetime of these products it will save businesses over $167 billion on their utility bills. The new commercial air conditioning and furnace standards will occur in two phases starting in 2018 with a 13 percent efficiency improvement and five years later with an additional 15 percent increase in efficiency[7]. Federal Standards will continue to impact sales over the next 10-20 years resulting in $1.8 trillion (128 quadrillion British thermal units of energy) in cumulative utility bill savings to consumers through 2030[8].

Company Energy Efficiency Programs: The persistence from Company's current efficiency programs and new programs adopted in the future will continue to put downward pressure on average use per customer. Further, the Company's preferred plan from the most recent Integrated Resource Plan shows that energy efficiency is expected to continue to be a least cost resource.

Electric Price: If the price of electricity continues to increase due to environmental or other mandates, consumers will continue to respond and adjust their usage to meet their individual monetary situation.

The above impacts will continue to hold down the growth in average use per customer in the future.

**Q: Does that conclude your testimony?**

A: Yes, it does.

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[7] http://www.energy.gov/articles/energy-department-announces-largest-energy-efficiency-standard-history

[8] John Cymbalsky, U.S. Department of Energy, "The U.S. Appliance Standards Program" presentation to Energy Forecasting Group meeting in May 2015.

**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. ER-2016-0285 |

**AFFIDAVIT OF ALBERT R. BASS, JR.**

**STATE OF MISSOURI** )
) **ss**
**COUNTY OF JACKSON** )

Albert R. Bass, Jr., being first duly sworn on his oath, states:

1. My name is Albert R. Bass, Jr. I work in Kansas City, Missouri, and I am employed by Kansas City Power & Light Company as Manager of Market Assessment.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Kansas City Power & Light Company consisting of Sixteen (16) pages, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

Albert R. Bass, Jr.

Subscribed and sworn before me this 1st day of July, 2016.

Notary Public

My commission expires: Feb. 4 2019

NICOLE A. WEHRY
Notary Public - Notary Seal
State of Missouri
Commissioned for Jackson County
My Commission Expires: February 04, 2019
Commission Number: 14391200

# WEATHER ADJUSTMENTS TO MONTHLY BILLED SALES OF KCP&L

NORMALIZATIONS TO MONTHLY MWH SALES

| | | Weather Adjustments to Monthly Billed Sales | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Tariff | Jan-15 | Feb-15 | Mar-15 | Apr-15 | May-15 | Jun-15 | Jul-15 | Aug-15 | Sep-15 | Oct-15 | Nov-15 | Dec-15 | Test Year |
| KS | Residential | -11,369 | 10,876 | 7,557 | -12,497 | -7,786 | 3,034 | -4,135 | -27,197 | 7,140 | 20,629 | -7,966 | -25,188 | -46,902 |
| KS | Small GS | -620 | 568 | 542 | -509 | -351 | 135 | -193 | -1,305 | 279 | 1,157 | -265 | -1,266 | -1,828 |
| KS | Medium GS | -994 | 893 | 988 | -661 | -474 | 178 | -305 | -2,147 | 672 | 2,598 | -91 | -1,949 | -1,291 |
| KS | Large GS | -3,414 | 3,077 | 3,176 | -2,329 | -1,858 | 416 | -513 | -4,623 | 1,222 | 5,196 | -960 | -6,794 | -7,405 |
| KS | Large Power | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Off Peak Lighting | | | | | | | | | | | | | |
| | Total | -16,397 | 15,414 | 12,263 | -15,995 | -10,470 | 3,763 | -5,146 | -35,272 | 9,313 | 29,580 | -9,282 | -35,199 | -57,426 |
| MO | Residential | -9,771 | 7,440 | 8,294 | -10,474 | -7,587 | 3,071 | -2,658 | -24,834 | 2,500 | 19,896 | -6,321 | -21,026 | -41,469 |
| MO | Small GS | -798 | 565 | 714 | -846 | -552 | 131 | -186 | -1,499 | 232 | 1,505 | -432 | -1,706 | -2,873 |
| MO | Medium GS | -1,681 | 1,164 | 1,852 | -1,511 | -1,202 | 80 | -357 | -3,280 | 532 | 4,049 | -8 | -3,230 | -3,591 |
| MO | Large GS | -3,787 | 2,695 | 4,074 | -2,914 | -1,865 | 118 | -593 | -4,461 | 740 | 4,677 | -1,104 | -7,448 | -9,868 |
| MO | Large Power | 0 | 0 | 98 | -258 | -598 | 316 | -587 | -2,605 | 1,643 | 2,360 | 577 | 58 | 1,005 |
| | Total | -16,037 | 11,864 | 15,032 | -16,003 | -11,805 | 3,717 | -4,379 | -36,678 | 5,648 | 32,487 | -7,288 | -33,353 | -56,795 |

# ANNUALIZED ENERGY EFFICIENCY IMPACTS FOR KCP&L

ENERGY EFFICIENCY ADJUSTMENT TO MONTHLY MWH SALES

| | | Energy Efficiency Adjustments to Monthly Billed Sales | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Tariff | Jan-15 | Feb-15 | Mar-15 | Apr-15 | May-15 | Jun-15 | Jul-15 | Aug-15 | Sep-15 | Oct-15 | Nov-15 | Dec-15 | Test Year |
| KS | Residential | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Small GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Medium GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Large GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Large Power | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Off Peak Lighting | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MO | Residential | -2,449 | -2,103 | -1,828 | -1,649 | -1,585 | -1,792 | -2,063 | -2,020 | -1,620 | -1,294 | -1,121 | -1,074 | -20,597 |
| MO | Small GS | -698 | -673 | -686 | -698 | -732 | -824 | -876 | -870 | -753 | -610 | -512 | -459 | -8,392 |
| MO | Medium GS | -1,596 | -1,533 | -1,559 | -1,567 | -1,682 | -1,966 | -2,136 | -2,147 | -1,805 | -1,291 | -940 | -797 | -19,018 |
| MO | Large GS | -3,404 | -3,295 | -3,368 | -3,398 | -3,555 | -4,002 | -4,233 | -4,309 | -3,812 | -3,053 | -2,552 | -2,278 | -41,260 |
| MO | Large Power | -3,085 | -3,031 | -3,130 | -3,086 | -3,165 | -3,723 | -4,200 | -4,227 | -3,648 | -2,523 | -1,779 | -1,664 | -37,261 |
| | Total | -11,233 | -10,635 | -10,572 | -10,399 | -10,718 | -12,306 | -13,508 | -13,572 | -11,638 | -8,771 | -6,903 | -6,272 | -126,528 |

# WEATHER NORMALIZED MONTHLY PEAK LOADS (MW) for KCP&L

WEATHER NORMALIZED MONTHLY PEAK LOADS WITH CUSTOMER GROWTH THROUGH December 2016 (MW)

| State | Tariff | Jan-15 | Feb-15 | Mar-15 | Apr-15 | May-15 | Jun-15 | Jul-15 | Aug-15 | Sep-15 | Oct-15 | Nov-15 | Dec-15 | Test Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KS | Residential | 713 | 644 | 531 | 477 | 611 | 960 | 1,034 | 1,056 | 772 | 483 | 484 | 638 | 1,056 |
| KS | Small GS | 90 | 78 | 77 | 68 | 76 | 92 | 104 | 97 | 92 | 72 | 65 | 80 | 104 |
| KS | Medium GS | 156 | 153 | 139 | 146 | 143 | 179 | 186 | 185 | 169 | 149 | 127 | 133 | 186 |
| KS | Large GS | 469 | 434 | 392 | 378 | 412 | 450 | 463 | 476 | 433 | 408 | 388 | 399 | 476 |
| KS | Street Lights | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| KS | Traffic Signals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Area Lights | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| KS | Off Peak Lighti | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | | | | | | | | | |
| MO | Residential | 572 | 461 | 429 | 359 | 442 | 805 | 879 | 856 | 608 | 335 | 450 | 536 | 879 |
| MO | Small GS | 88 | 77 | 72 | 65 | 77 | 103 | 119 | 109 | 96 | 82 | 75 | 88 | 119 |
| MO | Medium GS | 236 | 209 | 199 | 205 | 211 | 255 | 279 | 270 | 250 | 218 | 191 | 214 | 279 |
| MO | Large GS | 389 | 359 | 333 | 322 | 334 | 366 | 393 | 408 | 360 | 337 | 347 | 350 | 408 |
| MO | Large Power | 253 | 259 | 261 | 269 | 276 | 306 | 317 | 327 | 301 | 279 | 267 | 258 | 327 |
| MO | Street Lights | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| MO | Traffic Signals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MO | Area Lights | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Note: These numbers include losses.

# WEATHER NORMALIZED MONTHLY COINCIDENT PEAK LOADS (MW) for KCP&L

WEATHER NORMALIZED MONTHLY COINCIDENT PEAK LOADS WITH CUSTOMER GROWTH THROUGH December 2016 (MW)

| State | Tariff | Jan-15 | Feb-15 | Mar-15 | Apr-15 | May-15 | Jun-15 | Jul-15 | Aug-15 | Sep-15 | Oct-15 | Nov-15 | Dec-15 | Test Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KS | Residential | 679 | 586 | 531 | 477 | 501 | 917 | 995 | 912 | 746 | 393 | 457 | 632 | 995 |
| KS | Small GS | 74 | 62 | 52 | 41 | 70 | 82 | 94 | 97 | 75 | 64 | 51 | 53 | 97 |
| KS | Medium GS | 137 | 123 | 104 | 98 | 135 | 168 | 177 | 180 | 155 | 129 | 103 | 99 | 180 |
| KS | Large GS | 465 | 424 | 323 | 302 | 386 | 422 | 444 | 462 | 392 | 379 | 354 | 341 | 465 |
| KS | Street Lights | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |
| KS | Traffic Signals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KS | Area Lights | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| KS | Off Peak Lighti | 2 | 0 | 9 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 | 10 |
| | Total Retail | 1,357 | 1,195 | 1,022 | 931 | 1,093 | 1,589 | 1,711 | 1,651 | 1,368 | 966 | 978 | 1,139 | 1,711 |
| MO | Residential | 512 | 438 | 415 | 359 | 399 | 759 | 811 | 799 | 594 | 296 | 409 | 536 | 811 |
| MO | Small GS | 77 | 64 | 55 | 41 | 71 | 93 | 101 | 109 | 77 | 73 | 59 | 60 | 109 |
| MO | Medium GS | 198 | 178 | 154 | 145 | 197 | 235 | 254 | 262 | 228 | 197 | 161 | 159 | 262 |
| MO | Large GS | 389 | 353 | 298 | 247 | 311 | 343 | 364 | 395 | 333 | 320 | 311 | 315 | 395 |
| MO | Large Power | 234 | 240 | 236 | 257 | 270 | 289 | 313 | 322 | 298 | 277 | 246 | 207 | 322 |
| MO | Street Lights | 3 | 0 | 15 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 18 | 18 |
| MO | Traffic Signals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MO | Area Lights | 1 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 3 |
| | | 1,414 | 1,273 | 1,176 | 1,070 | 1,248 | 1,719 | 1,843 | 1,888 | 1,531 | 1,163 | 1,207 | 1,299 | 1,888 |

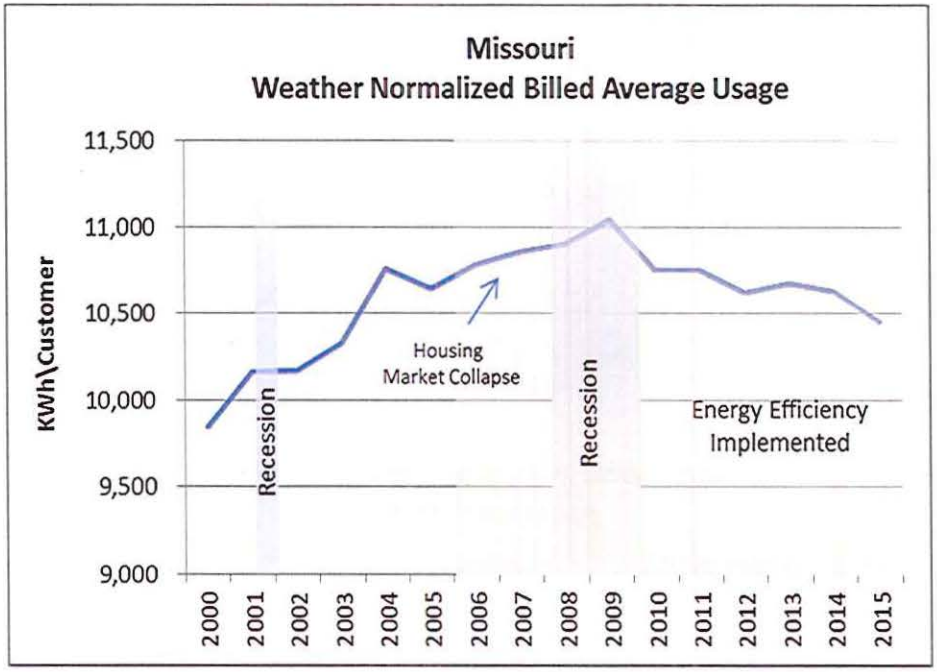
Schedule ARB-4

# KCP&L MO RESIDENTIAL WEATHER NORMALIZED BILLED KWH SALES, AVERAGE USE AND CUSTOMERS

KCPL Jurisidiciton
WN Residential Billed KWh Sales and Average Usage

| | Missouri | | | | | |
|---|---|---|---|---|---|---|
| Year | Missouri KWh | KWh Yr/Yr Growth | # of Cust | Customer Yr/Yr Growth | AvgUse | AvgUse Yr/Yr Growth |
| 2000 | 2,250,636,274 | | 228,625 | | 9,844 | |
| 2001 | 2,348,249,676 | 4.3% | 231,005 | 1.0% | 10,165 | 3.3% |
| 2002 | 2,363,765,482 | 0.7% | 232,406 | 0.6% | 10,171 | 0.1% |
| 2003 | 2,418,634,930 | 2.3% | 234,170 | 0.8% | 10,329 | 1.6% |
| 2004 | 2,531,487,965 | 4.7% | 235,351 | 0.5% | 10,756 | 4.1% |
| 2005 | 2,517,831,168 | -0.5% | 236,612 | 0.5% | 10,641 | -1.1% |
| 2006 | 2,570,270,761 | 2.1% | 238,389 | 0.8% | 10,782 | 1.3% |
| 2007 | 2,590,704,186 | 0.8% | 238,659 | 0.1% | 10,855 | 0.7% |
| 2008 | 2,605,165,129 | 0.6% | 238,921 | 0.1% | 10,904 | 0.4% |
| 2009 | 2,639,670,143 | 1.3% | 239,070 | 0.1% | 11,041 | 1.3% |
| 2010 | 2,575,296,709 | -2.4% | 239,600 | 0.2% | 10,748 | -2.7% |
| 2011 | 2,570,812,091 | -0.2% | 239,105 | -0.2% | 10,752 | 0.0% |
| 2012 | 2,536,652,900 | -1.3% | 238,776 | -0.1% | 10,624 | -1.2% |
| 2013 | 2,552,669,206 | 0.6% | 239,108 | 0.1% | 10,676 | 0.5% |
| 2014 | 2,555,313,201 | 0.1% | 240,422 | 0.5% | 10,628 | -0.4% |
| 2015 | 2,542,777,319 | -0.5% | 243,292 | 1.2% | 10,452 | -1.7% |

| Compound Annual Growth Rates | | | |
|---|---|---|---|
| 00—05 | 2.3% | 0.7% | 1.6% |
| 05—10 | 0.5% | 0.3% | 0.2% |
| 10—15 | -0.3% | 0.3% | -0.6% |

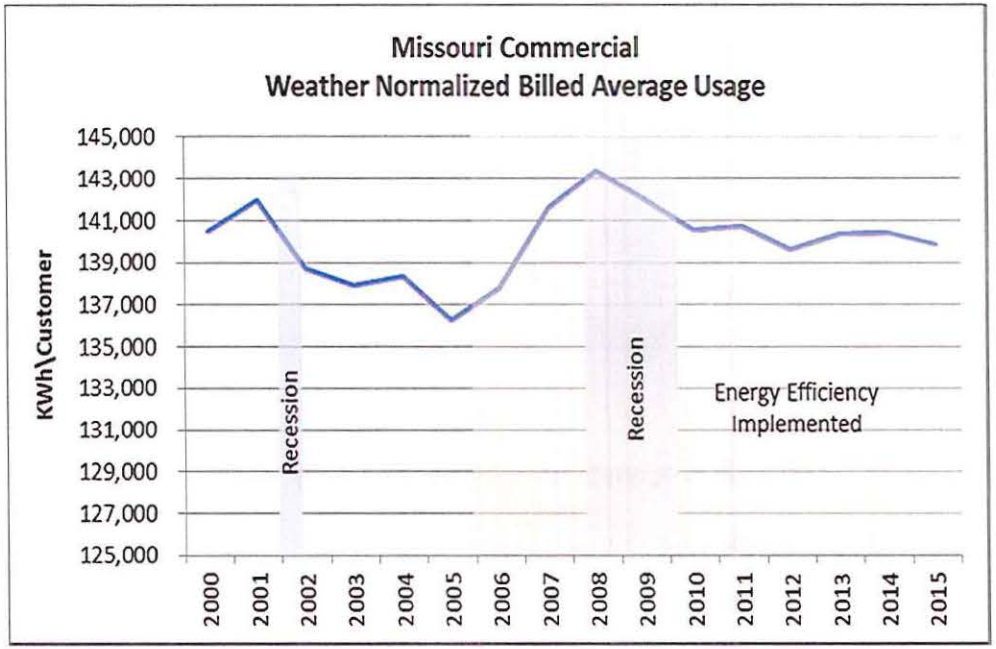


# KCP&L MO COMMERCIAL WEATHER NORMALIZED BILLED KWH SALES, AVERAGE USE AND CUSTOMERS

KCPL Jurisidiciton
WN Commercial Billed KWh Sales and Average Usage

| | Missouri | | | | | |
|---|---|---|---|---|---|---|
| Year | MPS KWh | KWh Yr/Yr Growth | # of Cust | Customer Yr/Yr Growth | AvgUse | AvgUse Yr/Yr Growth |
| 2000 | 4,012,026,110 | | 28,555 | | 140,502 | |
| 2001 | 4,093,511,010 | 2.0% | 28,845 | 1.0% | 141,913 | 1.0% |
| 2002 | 4,036,978,599 | -1.4% | 29,108 | 0.9% | 138,691 | -2.3% |
| 2003 | 4,090,720,104 | 1.3% | 29,669 | 1.9% | 137,877 | -0.6% |
| 2004 | 4,163,801,351 | 1.8% | 30,103 | 1.5% | 138,320 | 0.3% |
| 2005 | 4,217,756,315 | 1.3% | 30,958 | 2.8% | 136,241 | -1.5% |
| 2006 | 4,299,222,702 | 1.9% | 31,196 | 0.8% | 137,813 | 1.2% |
| 2007 | 4,412,412,603 | 2.6% | 31,167 | -0.1% | 141,575 | 2.7% |
| 2008 | 4,495,042,523 | 1.9% | 31,352 | 0.6% | 143,374 | 1.3% |
| 2009 | 4,447,102,004 | -1.1% | 31,312 | -0.1% | 142,026 | -0.9% |
| 2010 | 4,392,797,612 | -1.2% | 31,264 | -0.2% | 140,507 | -1.1% |
| 2011 | 4,394,522,874 | 0.0% | 31,228 | -0.1% | 140,724 | 0.2% |
| 2012 | 4,343,786,324 | -1.2% | 31,116 | -0.4% | 139,598 | -0.8% |
| 2013 | 4,369,094,393 | 0.6% | 31,126 | 0.0% | 140,366 | 0.6% |
| 2014 | 4,396,528,277 | 0.6% | 31,307 | 0.6% | 140,435 | 0.0% |
| 2015 | 4,400,076,551 | 0.1% | 31,460 | 0.5% | 139,864 | -0.4% |

| Compound Annual Growth Rates | | | |
|---|---|---|---|
| 00—05 | 1.0% | 1.6% | -0.6% |
| 05—10 | 0.8% | 0.2% | 0.6% |
| 10—15 | 0.0% | 0.1% | -0.1% |



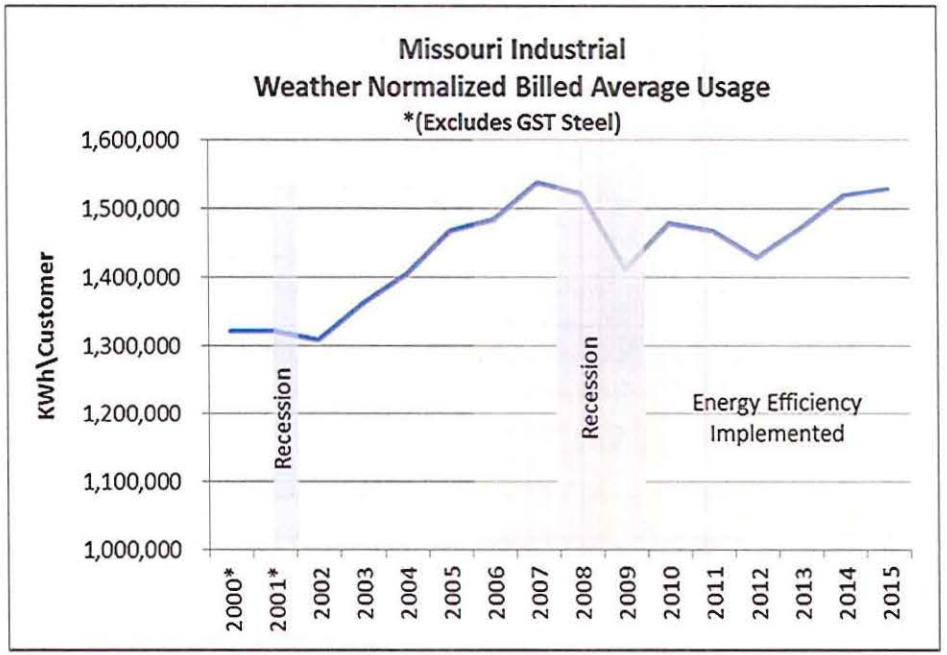
# KCP&L MO INDUSTRIAL WEATHER NORMALIZED BILLED KWH SALES, AVERAGE USE AND CUSTOMERS

KCPL Jurisidiciton
WN Industrial Billed KWh Sales and Average Usage

| | Missouri | | | | | |
|---|---|---|---|---|---|---|
| Year | MPS KWh | KWh Yr/Yr Growth | # of Cust | Customer Yr/Yr Growth | AvgUse | AvgUse Yr/Yr Growth |
| 2000* | 1,663,646,582 | | 1,259 | | 1,321,316 | |
| 2001* | 1,647,412,833 | -1.0% | 1,246 | -1.0% | 1,322,073 | 0.1% |
| 2002 | 1,596,725,872 | -3.1% | 1,221 | -2.0% | 1,307,631 | -1.1% |
| 2003 | 1,641,804,826 | 2.8% | 1,205 | -1.3% | 1,362,682 | 4.2% |
| 2004 | 1,650,248,271 | 0.5% | 1,175 | -2.5% | 1,404,965 | 3.1% |
| 2005 | 1,704,184,570 | 3.3% | 1,162 | -1.1% | 1,466,281 | 4.4% |
| 2006 | 1,700,708,106 | -0.2% | 1,146 | -1.4% | 1,483,715 | 1.2% |
| 2007 | 1,731,682,632 | 1.8% | 1,127 | -1.7% | 1,536,315 | 3.5% |
| 2008 | 1,688,827,094 | -2.5% | 1,111 | -1.4% | 1,519,527 | -1.1% |
| 2009 | 1,541,550,030 | -8.7% | 1,093 | -1.7% | 1,410,922 | -7.1% |
| 2010 | 1,584,359,329 | 2.8% | 1,072 | -1.9% | 1,478,522 | 4.8% |
| 2011 | 1,549,728,403 | -2.2% | 1,057 | -1.4% | 1,466,851 | -0.8% |
| 2012 | 1,487,144,321 | -4.0% | 1,042 | -1.4% | 1,427,316 | -2.7% |
| 2013 | 1,505,939,397 | 1.3% | 1,024 | -1.7% | 1,471,003 | 3.1% |
| 2014 | 1,539,463,428 | 2.2% | 1,014 | -1.0% | 1,518,833 | 3.3% |
| 2015 | 1,520,518,628 | -1.2% | 996 | -1.8% | 1,527,392 | 0.6% |

*Excludes GST Steel

| Compound Annual Growth Rates | | | |
|---|---|---|---|
| 00—05 | 0.5% | -1.6% | 2.1% |
| 05—10 | -1.4% | -1.6% | 0.2% |
| 10—15 | -0.8% | -1.5% | 0.7% |



# KCP&L MO PAST ENERGY EFFICIENCY PROGRAM SAVINGS

**Savings from Company's current efficiency programs**
**All kWh @ customer meter**

| | Total kWh | | | | | |
|---|---|---|---|---|---|---|
| Date | KCPL-MO Residential | KCPL-MO C&I | KCPL-MO Small Commercial | KCPL-MO Large Commercial | KCPL-MO Industrial | Total kWh |
| 2005 | 360,306 | - | - | - | - | 360,306 |
| 2006 | 1,601,187 | 166,301 | 11,142 | 112,918 | 42,240 | 1,767,488 |
| 2007 | 2,043,984 | 6,967,422 | 466,817 | 4,730,880 | 1,769,725 | 9,011,406 |
| 2008 | 4,118,708 | 13,481,824 | 903,282 | 9,154,158 | 3,424,383 | 17,600,532 |
| 2009 | 6,334,082 | 21,523,683 | 1,442,087 | 14,614,581 | 5,467,015 | 27,857,765 |
| 2010 | 5,794,352 | 28,446,678 | 1,905,927 | 19,315,294 | 7,225,456 | 34,241,030 |
| 2011 | 4,598,128 | 22,064,912 | 1,478,349 | 14,982,075 | 5,604,488 | 26,663,040 |
| 2012 | 3,838,902 | 30,103,551 | 2,016,938 | 20,440,311 | 7,646,302 | 33,942,453 |
| 2013 | 2,548,798 | 14,623,032 | 979,743 | 9,929,039 | 3,714,250 | 17,171,830 |
| 2014 | 28,908,701 | 29,761,354 | 1,994,011 | 20,207,959 | 7,559,384 | 58,670,055 |
| 2015 | 32,429,000 | 57,730,542 | 3,867,946 | 39,199,038 | 14,663,558 | 90,159,542 |
| Total | 92,576,147 | 224,869,299 | 15,066,243 | 152,686,254 | 57,116,802 | 317,445,446 |