VOLUME 3:

LOAD ANALYSIS AND FORECASTING

KCP&L

INTEGRATED RESOURCE PLAN

4 CSR 240-22.030

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VOLUME 3 – LOAD FORECAST

SECTION 1: EXECUTIVE SUMMARY

Table 1 summarizes Kansas City Power & Light Company's 2008-2030 load forecast. System energy (NSI) is expected to increase by an average of 1.3 percent per year and the annual peak demand is expected to grow by 0.5 percent per year over the 2007-2030 period. This forecast includes the impact of demand-side management (DSM) programs and dynamic voltage control (DVC) that have been adopted by KCP&L. The DSM impacts shown in Table 1 and Table 2 below reflect collaborative inputs from KCP&L's Energy Solutions, Energy Resource Management and Load Forecasting Departments as of September 2007. These numbers reflect the combined projected impacts of continued growth in existing programs and anticipated new DSM and Energy Efficiency measures.

For most internal applications of the load forecast, for example budget preparation, it is important to include the anticipated levels of future DSM programs. In order to provide for these applications, the load forecast presented here includes projections of expanding the existing DSM programs and adding new Energy Efficiency (EE) programs. This is the anticipated level of impacts for budgeting purposes. For Integrated Resource Planning (IRP), the application of the load forecast is different and the assumptions around DSM penetrations need to change.

One of the objectives of the IRP process is to evaluate the benefits of new resources including new or expanded DSM/EE programs. To accomplish this objective, the starting level or "base case" assumptions for DSM/EE penetrations were established based on the expected performance of the programs approved under the Stipulation and Agreements associated with KCP&L's Comprehensive Energy Plan (CEP). The Commission Report and Order approving the Stipulation and Agreement was issued on July 28, 2005 in Case No. EO-2005-0329. These DSM/EE levels approved in the CEP are significantly lower than the projections discussed below for the long term load forecast.

This change was necessary for the IRP modeling conducted under Rule 22.060, Integrated Resource Analysis and Rule 22.070, Risk Analysis and Strategy Selection. By starting with the CEP programs as the “base case”, varying levels of new or expanded DSM/EE programs can be evaluated in alternative resource plans.

Table 1: 2008-2030 Load Forecast; Demand, & Energy

Year	Gross Peak Demand (MW)	DSM Impacts (MW)	DVC (MW)	Net Peak Demand (MW)	Gross NSI (Gwh)	DSM Impacts (Gwh)	Net NSI (Gwh)	Gross Load Factor	Net Load Factor
1990	2,723			2,723	10,822.3		10,822.3	45.4%	45.4%
1995	2,910			2,910	12,340.3		12,340.3	48.4%	48.4%
2000	3,290			3,290	14,436.8		14,436.8	50.1%	50.1%
2005	3,572			3,572	15,735.4		15,735.4	50.3%	50.3%
2006	3,673			3,673	15,960.8		15,960.8	49.6%	49.6%
2007	3,696			3,696	16,286.9		16,286.9	50.3%	50.3%
2010	3,837	158	66	3,613	17,077.3	48.4	17,028.9	50.8%	53.8%
2015	4,034	229	66	3,739	18,602.5	75.4	18,527.1	52.6%	56.6%
2020	4,201	254	66	3,881	19,969.9	76.5	19,893.4	54.3%	58.5%
2025	4,345	283	66	3,996	20,881.0	77.7	20,803.3	54.9%	59.4%
2030	4,529	289	66	4,174	21,913.6	77.9	21,835.7	55.2%	59.7%
Annual Growth Rates:									
1990-2000	1.9%			1.9%	2.9%		2.9%	1.0%	1.0%
2000-2006	1.9%			1.9%	1.7%		1.7%	-0.2%	-0.2%
2007-2015	1.1%			0.1%	1.7%		1.6%	0.6%	1.5%
2015-2030	0.8%			0.7%	1.1%		1.1%	0.3%	0.4%
2007-2030	0.9%			0.5%	1.3%		1.3%	0.4%	0.7%

** Note: The 1990 through 2007 peaks and NSI are weather-normalized.*
***DSM impacts were provided by Energy Solutions and include only currently adopted programs.*

1.1 <u>METHODOLOGY</u>

KCP&L uses detailed end-use information along with statistical techniques to construct its load forecast. End-use information is obtained from KCP&L’s semiannual appliance saturation surveys and from results published by the US Department of Energy (DOE) for the West North Central Midwest region. This information is used to construct end-use level forecasts of residential, commercial and industrial sector electricity sales based on economic forecasts of key drivers specific to the Kansas City metro area.

The forecasts of economic drivers were obtained through a contract with Moody’s Economy.com and include the number of households, population, personal income, gross metro product (GMP), manufacturing GMP, total employment, manufacturing employment, and the consumer price index (CPI). These drivers were provided for three scenarios that were used to construct base, high and low scenarios for KCP&L's load forecasts.

The end-use forecasts were calibrated to monthly billing statistics. Heating, cooling and base loads from the end-use models were each calibrated to optimize the ability of these forecasts to explain the monthly billing data. These calibrated models are then used to forecast monthly electric energy sales. Using load research data collected from a sample of KCP&L's customers, this end-use forecast is allocated to each hour of the forecast period and peak demands are determined from these results.

Since KCP&L lost a very large industrial customer, GST Steel, in 2001, the sales and loads of this customer were subtracted from KCP&L's monthly billing statistics to improve model statistics and to smooth out trends in historical data.

1.2 KCP&L2008-2030 LOAD FORECAST RESULTS

The current KCP&L load forecast was prepared in the 2nd and 3rd quarters of 2007. Projections of weather normalized peak load and net system input are shown in Table 2.

Table 2: 2008-2030 Annual Demand & Energy Load Forecast

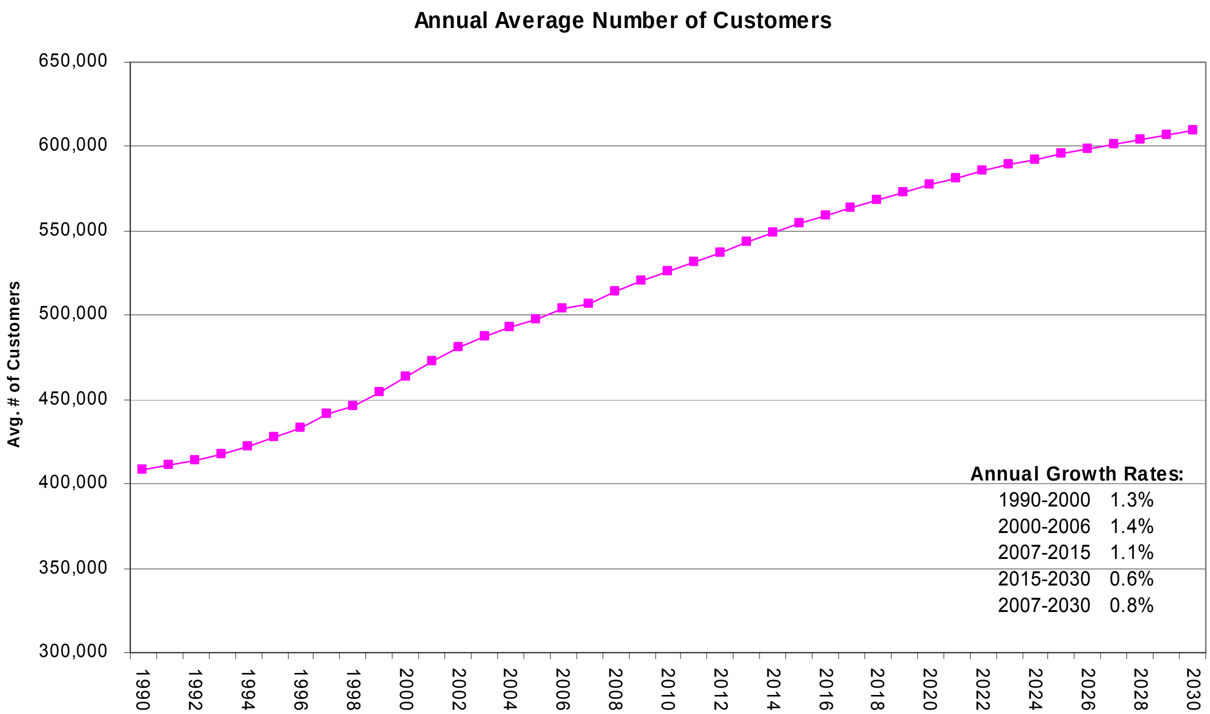
KCP&L 2008-2030 Load Forecast (Excludes GST Steel)

Year	Gross Peak Demand (MW)	DSM Impacts (MW)	DVC (MW)	Net Peak Demand (MW)	Gross NSI (Gwh)	DSM Impacts (Gwh)	Net NSI (Gwh)	Gross Load Factor	Net Load Factor
1990	2,723			2,723	10,822.3		10,822.3	45.4%	45.4%
1991	2,750			2,750	11,048.2		11,048.2	45.9%	45.9%
1992	2,807			2,807	11,573.4		11,573.4	47.1%	47.1%
1993	2,853			2,853	11,654.5		11,654.5	46.6%	46.6%
1994	2,889			2,889	11,831.0		11,831.0	46.7%	46.7%
1995	2,910			2,910	12,340.3		12,340.3	48.4%	48.4%
1996	2,983			2,983	12,800.2		12,800.2	49.0%	49.0%
1997	3,104			3,104	13,199.9		13,199.9	48.5%	48.5%
1998	3,204			3,204	13,599.4		13,599.4	48.5%	48.5%
1999	3,209			3,209	13,822.5		13,822.5	49.2%	49.2%
2000	3,290			3,290	14,436.8		14,436.8	50.1%	50.1%
2001	3,361			3,361	14,603.3		14,603.3	49.6%	49.6%
2002	3,311			3,311	14,810.2		14,810.2	51.1%	51.1%
2003	3,436			3,436	15,100.0		15,100.0	50.2%	50.2%
2004	3,532			3,532	15,434.7		15,434.7	49.9%	49.9%
2005	3,572			3,572	15,735.4		15,735.4	50.3%	50.3%
2006	3,673			3,673	15,960.8		15,960.8	49.6%	49.6%
2007	3,696			3,696	16,286.9		16,286.9	50.3%	50.3%
2008	3,759	94	66	3,600	16,499.1	16.2	16,482.9	50.1%	52.3%
2009	3,803	132	66	3,604	16,775.6	31.9	16,743.7	50.4%	53.0%
2010	3,837	158	66	3,613	17,077.3	48.4	17,028.9	50.8%	53.8%
2011	3,870	183	66	3,621	17,359.9	65.0	17,294.9	51.2%	54.5%
2012	3,907	204	66	3,637	17,701.7	74.4	17,627.3	51.7%	55.3%
2013	3,947	216	66	3,665	17,958.5	74.9	17,883.7	51.9%	55.7%
2014	3,995	224	66	3,705	18,295.4	75.2	18,220.2	52.3%	56.1%
2015	4,034	229	66	3,739	18,602.5	75.4	18,527.1	52.6%	56.6%
2016	4,071	234	66	3,771	18,942.8	75.6	18,867.2	53.1%	57.1%
2017	4,101	239	66	3,796	19,142.6	75.8	19,066.8	53.3%	57.3%
2018	4,127	244	66	3,818	19,374.6	76.0	19,298.6	53.6%	57.7%
2019	4,165	249	66	3,850	19,644.5	76.2	19,568.3	53.8%	58.0%
2020	4,201	254	66	3,881	19,969.9	76.5	19,893.4	54.3%	58.5%
2021	4,227	260	66	3,902	20,103.1	76.7	20,026.4	54.3%	58.6%
2022	4,248	265	66	3,916	20,267.6	76.9	20,190.7	54.5%	58.9%
2023	4,269	271	66	3,932	20,426.2	77.2	20,349.0	54.6%	59.1%
2024	4,305	277	66	3,962	20,710.3	77.4	20,632.9	54.9%	59.4%
2025	4,345	283	66	3,996	20,881.0	77.7	20,803.3	54.9%	59.4%
2026	4,379	289	66	4,023	21,093.7	77.9	21,015.8	55.0%	59.6%
2027	4,417	289	66	4,061	21,305.3	77.9	21,227.4	55.1%	59.7%
2028	4,458	289	66	4,103	21,599.7	77.9	21,521.8	55.3%	59.9%
2029	4,497	289	66	4,142	21,753.3	77.9	21,675.3	55.2%	59.7%
2030	4,529	289	66	4,174	21,913.6	77.9	21,835.7	55.2%	59.7%
Annual Growth Rates:									
1990-2000	1.9%			1.9%	2.9%		2.9%	1.0%	1.0%
2000-2006	1.9%			1.9%	1.7%		1.7%	-0.2%	-0.2%
2007-2015	1.1%			0.1%	1.7%		1.6%	0.6%	1.5%
2015-2030	0.8%			0.7%	1.1%		1.1%	0.3%	0.4%
2007-2030	0.9%			0.5%	1.3%		1.3%	0.4%	0.7%

1.2.1 CUSTOMERS

Between 2007 and 2030, the annual growth rate of the number of customers is projected to be 0.8%. A separate model was created to forecast the number of customers in each revenue class in Kansas and Missouri. Details of the models are presented in the section of this report that addresses each customer class.

Chart 1: Annual Average Number of Total Customers



1.2.2 ENERGY & PEAK DEMAND

Chart 2 plots the forecast of annual electric energy sales, which has a 1.3% annual growth rate over the 2007-2030 forecast horizon. Chart 3 plots the forecast of annual peak demand, which has a 0.5% annual growth over the 2007-2030 period.

Chart 2: Annual Energy Forecast (NSI)

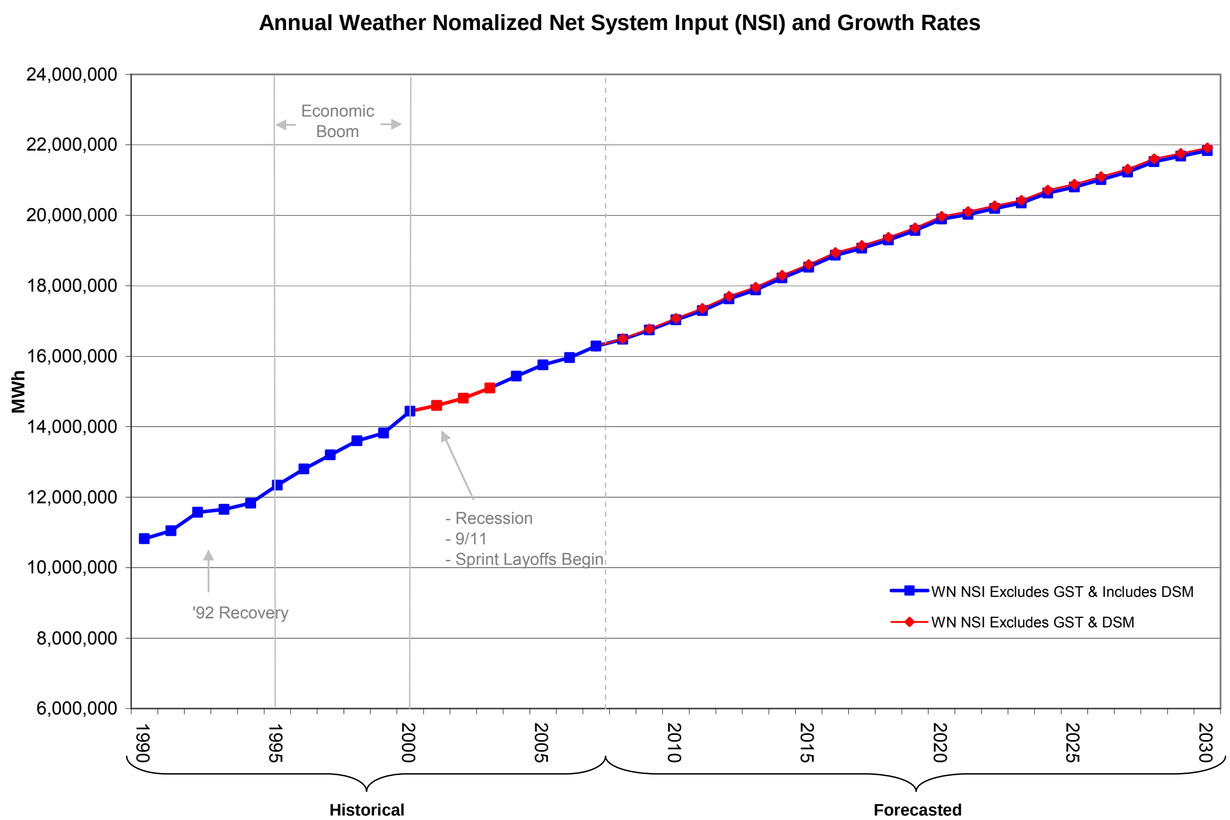
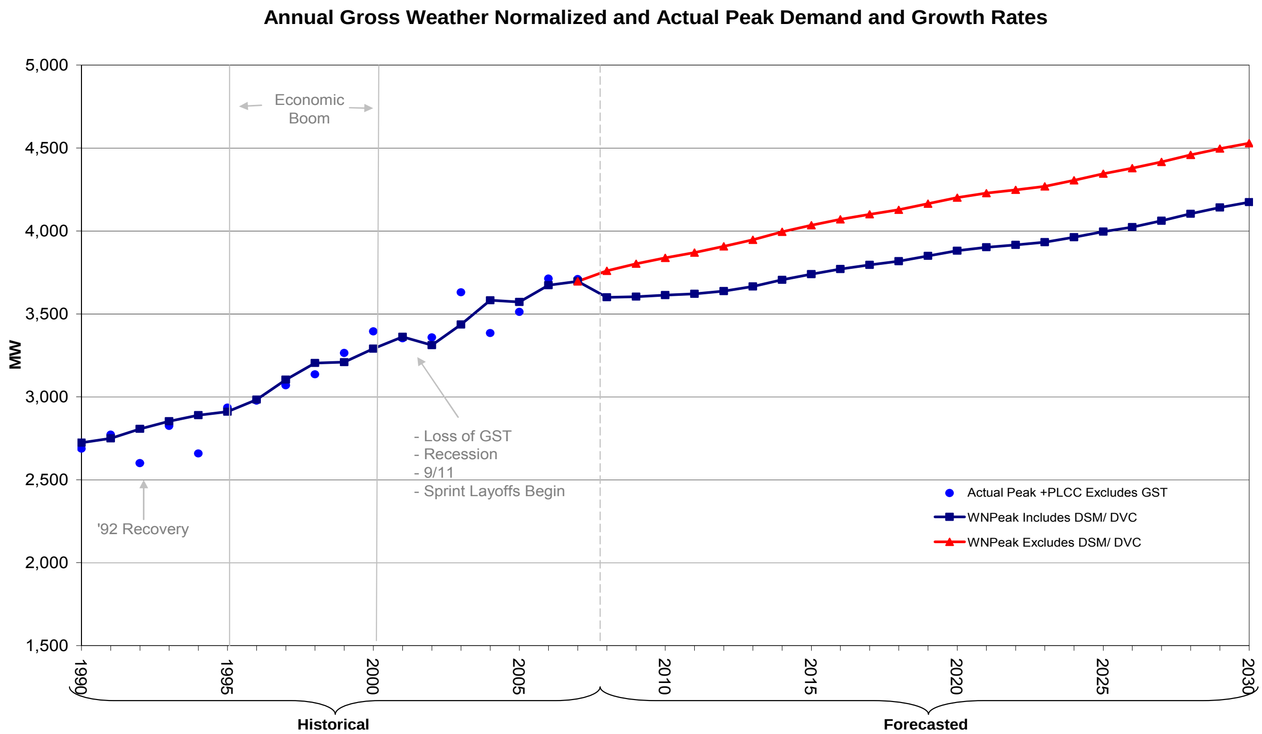


Chart 3: Annual Peak Demand Forecast



1.3 KEY FORECASTING DRIVERS/ ASSUMPTIONS

The major drivers and assumptions used in preparing KCP&L's 2008-2030 long-term forecast are the following:

- Economic Conditions – Under a contract, Moody's Economy.com provided an economic forecast for the Kansas City MSA and Service Territory Counties. The economic data used in KCP&L's forecasting models includes real personal income, the number of households, population, gross metro product (GMP), manufacturing GMP, non-manufacturing GMP, total employment, manufacturing employment, non-manufacturing employment, and the consumer price index (CPI). The outlook for the forecast period assumes slower growth than observed historically. (GMP 1.7%, personal income 1.4%, Households 0.6%, Population 0.4%, and Employment 1.0%) See Appendix 3.C.

- Electricity Prices - The price series are constructed from reported revenue per kWh data for each rate from January 1990 to May 2007. The historical price series is constructed by first adjusting average revenue per kWh by the CPI index yielding a real $ per kWh series. The price series is then calculated by taking a 24-month moving average of the real $ per kWh series. By taking a 24-month moving average we de-couple observed sales and resulting revenues. Further, a 24-month moving average assumes customers respond to changes in their bill over time – customers do not simply respond to the current or prior bill. For the forecast, we assume that prices will rise at the rate of inflation through 2010 and then escalate at rates forecasted by the Midas model.

- Demographic Factors – Projections from Economy.com indicate that the population of the Kansas City metro area will increase 0.4% between 2006 and 2030. Population declines in the Jackson County portion of the service territory will be more than offset by population increases in Johnson County Kansas and the Northland area. The overall population increase, coupled with a projected decline in average household size from 2.5 to 2.4 persons per household in the next 24 years, implies a 0.8% annual increase for residential customers during 2007-2030.

- Weather and Number of Days per Billing Period – Monthly heating and cooling degree days are used to calibrate the end-use forecast to monthly billed sales. Degree days are computed with several base temperatures for each billing cycle and then averaged for each month over the 21 billing cycles. Degree days were computed with temperatures measured at the Kansas City International Airport by the National Weather Service. In the forecast period, normal weather is computed by averaging degree days over the 30-year period 1977 to 2006.

  The daily maximum and minimum temperatures and the meter reading schedules are used to calculate revenue-month heating (HDD) and cooling

(CDD) degree day variables. The average number of billing days per billing period is also calculated using the meter reading schedules.

- Appliance Saturations and Efficiency Levels – Annual saturation estimates are derived from KCP&L's survey data and EIA's study for the West North Central Region to create residential end-use indices. Commercial indices are constructed solely using EIA's efficiency and saturation series for the West North Central Census region. Both the residential and commercial indices are created for Missouri and Kansas. Detailed explanations of the calculations and indexes are provided in each revenue class section of this report.

  The utilization of more energy-efficient appliances and energy saving devices will offset some of the rise in energy usage created by future increases in the stocks of electricity consuming equipment. Efficiency increases will result from both economic factors and legislated standards updating the national Energy Policy Act of 1992. These new efficiency standards slated for 2005-2007 include clothes washers, fluorescent lamp ballasts, and central air conditioners. See Appendix 3.B more details.

- Efficiency and Demand Response – The impact of changes to the current level of efficiency and demand response (DSM) programs is incorporated into the load forecast. These programs include the following:

Affordability

- Low-Income Affordable New Homes Program
- Low-Income Weatherization and High Efficiency Program

Energy Efficiency

Residential

- Online Energy Information and Analysis Program Using NEXUS Residential Suite
- Home Performance with Energy Star® Program Training
- Change a Light – Save The World
- Cool Homes Program
- Energy Star® Homes – New Construction

Commercial and Industrial

- Online Energy Information and Analysis Program using NEXUS Commercial Suite
- C&I Energy Audit
- C&I Custom Rebate – Retrofit
- C&I Customer Rebate – New Construction
- Building Operator Certification Program
- Market Research

Demand Response

Residential and Small Commercial

- Air Conditioning Cycling

Commercial and Industrial

- Mpower (PLCC)

Dynamic Voltage Control (DVC)

Efficiency and demand response impacts are adjusted each year based on market penetration. An explanation of the impact of efficiency and demand response can be found in Section 6, Energy and Demand.

1.4 FORECAST UNCERTAINTY ANALYSIS

Forecast uncertainty is quantified through the use of alternative economic scenarios. Moody's Economy.com provided three economic scenarios named Low, Base and High that represent a 95% confidence range around the base case for economic growth. These economic scenarios were each used to forecast load growth and these forecasts represent a 95% confidence interval around load growth based on the uncertainty due to economic growth.

Table 3: Energy Uncertainty Analysis - Excluding DSM Impacts

NSI (GWh): Excluding DSM Impact		Low Range	Base	High Range
WN	2005		15,734	
WN	2006		15,961	
WN	2007		16,287	
	2008	16,388	16,499	16,611
	2010	16,851	17,077	17,311
	2015	18,067	18,603	19,185
	2020	19,048	19,970	21,014
	2025	19,503	20,881	22,493
	2030	19,975	21,914	24,242
CAGR % Growth				
	05-'06		1.4%	
	06-'07		2.0%	
	07-'10	1.1%	1.6%	2.1%
	10-'15	1.4%	1.7%	2.1%
	15-'20	1.1%	1.4%	1.8%
	20-'25	0.5%	0.9%	1.4%
	25-'30	0.5%	1.0%	1.5%
	07-'30	0.9%	1.3%	1.7%

Chart 4: Energy Uncertainty Analysis - Excluding DSM Impacts

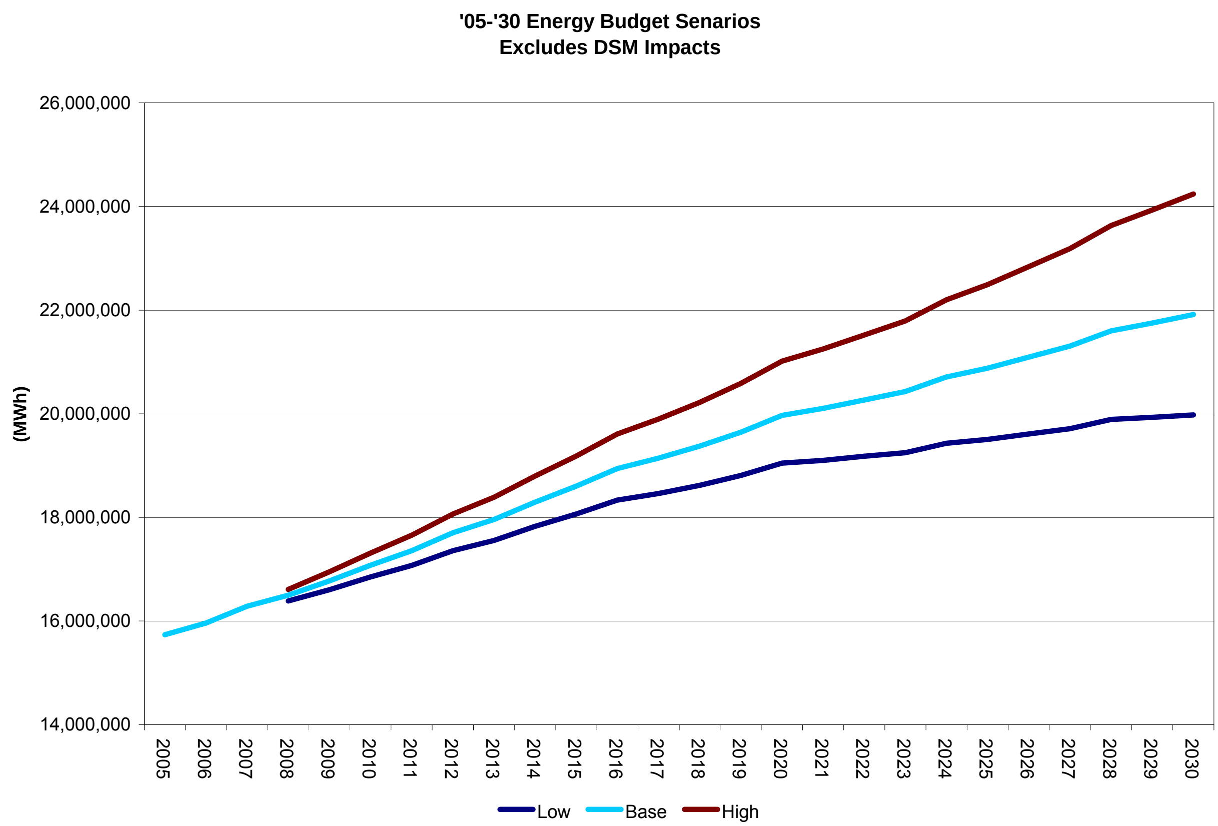


Table 4: Energy Uncertainty Analysis - Including DSM / DVC Impacts

NSI (GWh): Including DSM Impact		Low Range	Base	High Range	DSM Impact on NSI
WN	2005		15,734		
WN	2006		15,961		
WN	2007		16,287		
	2008	16,372	16,483	16,595	(16)
	2010	16,802	17,029	17,263	(48)
	2015	17,991	18,527	19,109	(75)
	2020	18,972	19,893	20,938	(76)
	2025	19,425	20,803	22,415	(78)
	2030	19,897	21,836	24,164	(78)

CAGR % Growth	Low Range	Base	High Range
05-'06		1.4%	
06-'07		2.0%	
07-'10	1.0%	1.5%	2.0%
10-'15	1.4%	1.7%	2.1%
15-'20	1.1%	1.4%	1.8%
20-'25	0.5%	0.9%	1.4%
25-'30	0.5%	1.0%	1.5%
07-'30	0.9%	1.3%	1.7%

Chart 5: Energy Uncertainty Analysis - Including DSM Impacts

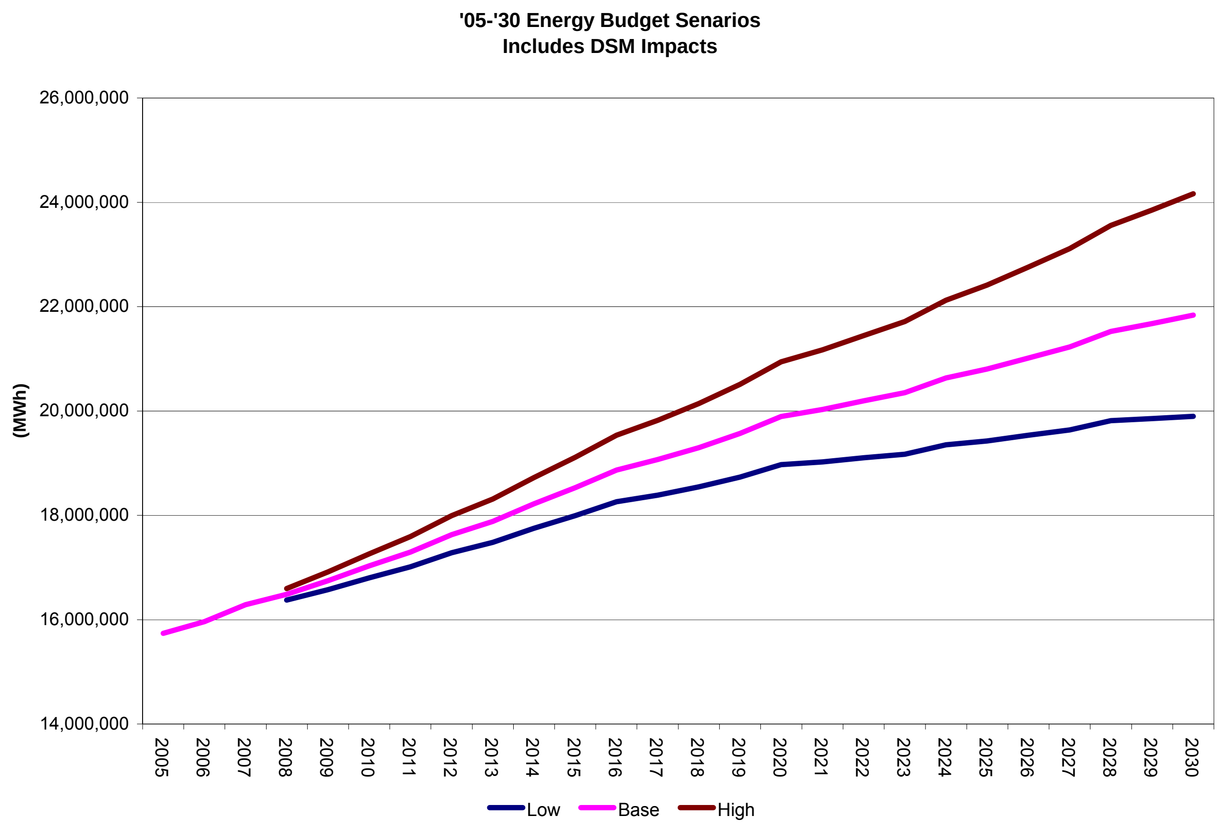


Table 5: Peak Uncertainty Analysis - Excluding DSM Impacts

Peak (MW): Excluding DSM Impact		Low Range	Base	High Range
WN	2005		3,572	
WN	2006		3,673	
WN	2007		3,696	
	2008	3,747	3,759	3,772
	2010	3,803	3,837	3,873
	2015	3,942	4,034	4,134
	2020	4,038	4,201	4,385
	2025	4,095	4,345	4,634
	2030	4,172	4,529	4,952
CAGR % Growth				
	05-'06		2.8%	
	06-'07		0.6%	
	07-'10	1.0%	1.3%	1.6%
	10-'15	0.7%	1.0%	1.3%
	15-'20	0.5%	0.8%	1.2%
	20-'25	0.3%	0.7%	1.1%
	25-'30	0.4%	0.8%	1.3%
	07-'30	0.5%	0.9%	1.3%

Chart 6: Peak Uncertainty Analysis - Excluding DSM Impacts

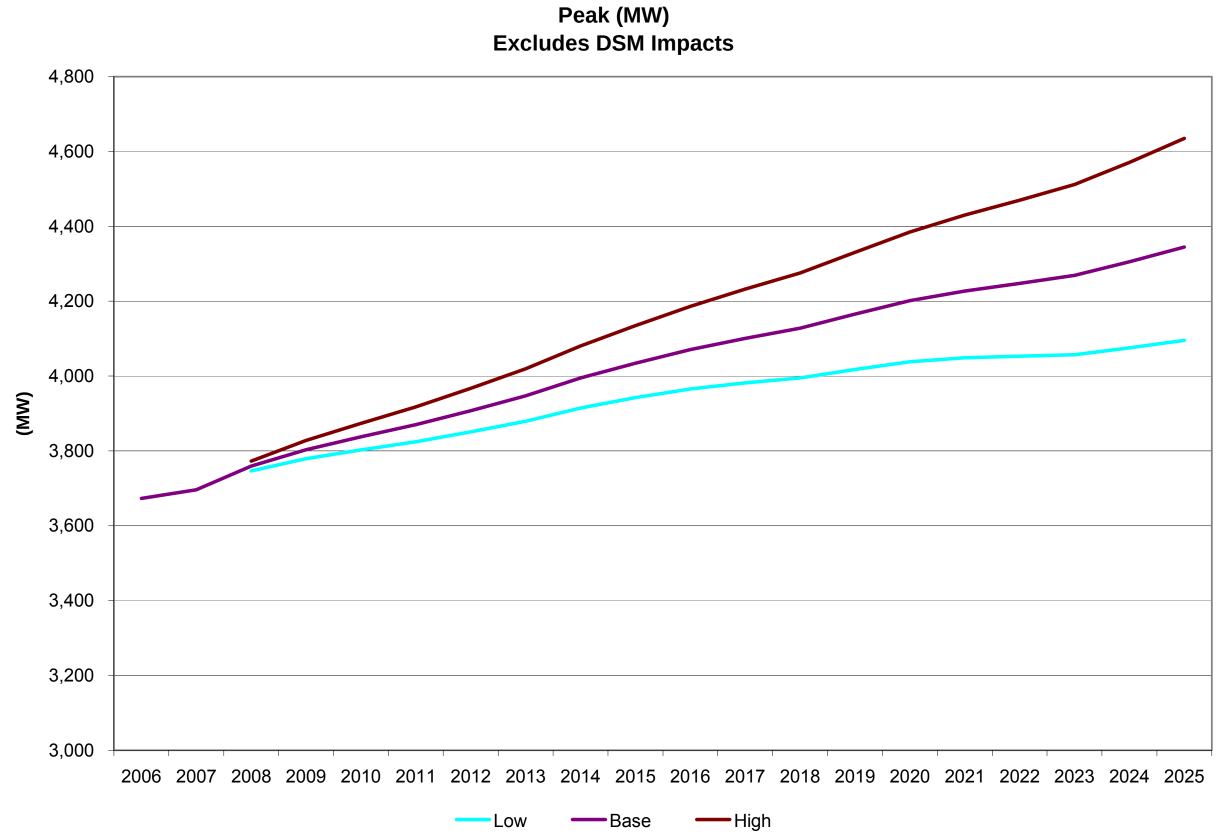
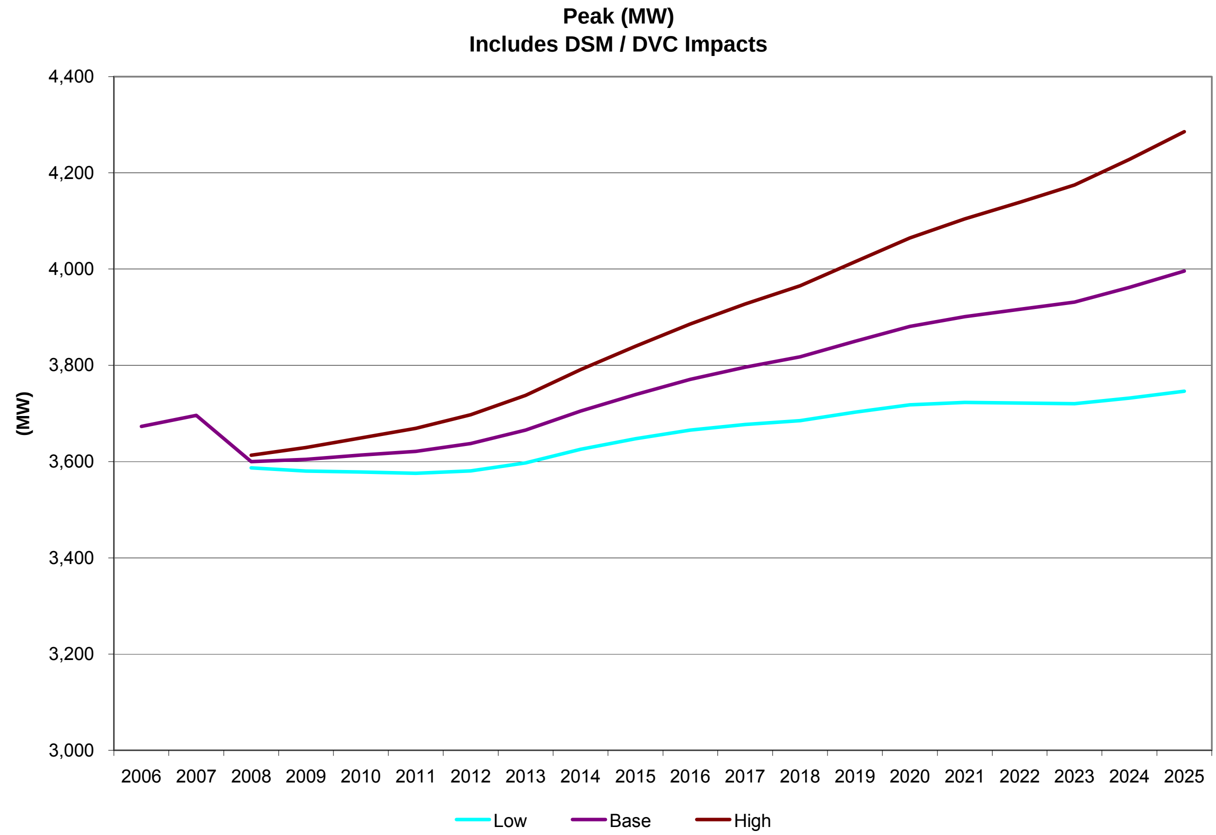


Table 6: Peak Uncertainty Analysis - Including DSM Impacts

Peak (MW): Including DSM Impact		Low Range	Base	High Range	DSM Impact on Peak	DVC Impact on Peak
WN	2005		3,572			
WN	2006		3,673			
WN	2007		3,696			
	2008	3,587	3,600	3,613	(94)	(66)
	2010	3,578	3,613	3,649	(158)	(66)
	2015	3,647	3,739	3,839	(229)	(66)
	2020	3,718	3,881	4,065	(254)	(66)
	2025	3,746	3,996	4,286	(283)	(66)
	2030	3,817	4,174	4,597	(289)	(66)
CAGR % Growth						
	05-'06		2.8%			
	06-'07		0.6%			
	07-'10	-1.1%	-0.8%	-0.4%		
	10-'15	0.4%	0.7%	1.0%		
	15-'20	0.4%	0.7%	1.1%		
	20-'25	0.2%	0.6%	1.1%		
	25-'30	0.4%	0.9%	1.4%		
	07-'30	0.1%	0.5%	1.0%		

Chart 7: Peak Uncertainty Analysis - Including DSM Impacts



1.5 <u>CLASS PROJECTIONS</u>

Table 7 shows historical and forecasted sales for the customer classes as well as for total retail sales. A more detailed explanation of class demand and peak demand can be found in the Energy and Demand section of this report.

Table 7: Revenue Class Projections (Actual)

Historical and Forecasted GWh Usage						
Year	Residential	Commercial	Industrial	Other Retail	Sales for Resale	Total Retail Sales
1990	3,315	4,841	1,702	70	114	10,042
1995	3,887	5,463	2,012	65	78	11,506
2000	4,550	6,558	2,071	76	128	13,383
2005	5,214	7,223	2,107	82	138	14,764
2006	5,312	7,374	2,132	86	115	15,018
2007	5,383	7,539	2,129	95	98	15,244
2010	5,715	8,014	2,221	102	104	16,158
2015	6,175	8,850	2,347	114	117	17,603
2020	6,589	9,562	2,449	122	126	18,847
2025	6,891	10,095	2,519	127	131	19,763
2030	7,227	10,674	2,596	130	135	20,762

Annual Growth Rates						
1990-1995	3.2%	2.4%	3.4%	-1.3%	-7.2%	2.8%
1995-2000	3.2%	3.7%	0.6%	3.0%	10.3%	3.1%
2000-2005	2.8%	2.0%	0.3%	1.6%	1.5%	2.0%
2006-2007	1.3%	2.2%	-0.1%	10.3%	-14.4%	1.5%
2007-2010	2.0%	2.1%	1.4%	2.5%	2.1%	2.0%
2010-2015	1.6%	2.0%	1.1%	2.2%	2.3%	1.7%
2015-2020	1.3%	1.6%	0.9%	1.4%	1.4%	1.4%
2020-2025	0.9%	1.1%	0.6%	0.8%	0.9%	1.0%
2025-2030	1.0%	1.1%	0.6%	0.5%	0.5%	1.0%
2007-2030	1.3%	1.5%	0.9%	1.4%	1.4%	1.4%

1990 – 2006 Weather Normalized

SECTION 2: RESIDENTIAL

2.1 SUMMARY

Energy sales to the residential class are projected to grow at an annual rate of 1.3% between 2007-2030. This represents a decrease from the historical growth rate of 3.0% during 1990-2006.

The decline in the growth rate of residential sales is accounted for by lower overall customer growth in Kansas and by lower growth in average use per customer in both Missouri and Kansas. Table 8 summarizes Missouri and Kansas residential GWh sales.

Table 8: Residential GWh Sales

Weather Normalized Historical and Forecasted GWh Sales Residential			
Year	**Missouri**	**Kansas**	**Total Residential**
1990	1,781	1,534	3,315
1995	2,035	1,852	3,887
2000	2,263	2,287	4,550
2005	2,501	2,713	5,214
2006	2,544	2,768	5,312
2007	2,566	2,817	5,383
2010	2,699	3,016	5,715
2015	2,862	3,313	6,175
2020	3,001	3,587	6,589
2025	3,088	3,803	6,891
2030	3,197	4,030	7,227

Annual Growth Rates			
1990-1995	2.7%	3.8%	3.2%
1995-2000	2.1%	4.3%	3.2%
2000-2005	2.0%	3.5%	2.8%
2006-2007	0.8%	1.8%	1.3%
2007-2010	1.7%	2.3%	2.0%
2010-2015	1.2%	1.9%	1.6%
2015-2020	1.0%	1.6%	1.3%
2020-2025	0.6%	1.2%	0.9%
2025-2030	0.7%	1.2%	1.0%
2007-2030	1.0%	1.6%	1.3%

2.2 METHODOLOGY

Residential electrical energy projections are prepared using Statistically Adjusted End-use (SAE) models that were developed by Itron as successors to EPRI's Residential End-Use Planning System (REEPS). The SAE models were developed by the same staff that formerly developed REEPS for EPRI. Separate SAE models were developed for residential customers in Kansas and Missouri.

2.3 CUSTOMERS

Separate customer forecasting models were developed for Kansas and Missouri. Monthly regression equations were estimated that relate household projections for KCP&L's service territory counties to historical monthly customer data using monthly data over the period 1990 to 2007. The estimated model coefficients are all highly significant. Model adjusted R^2 varies from .988 to .999 with in-sample MAPE of .19% to .22%. Table 9 shows the models and fit statistics by state.

Table 9: Residential Model Results

Variable	Kansas		Missouri	
	Coefficient	T-Stat	Coefficient	T-Stat
Constant			16061	3.6
Households	2.1	2.9	32.0	3.6
Apr2002	1650	4.1		
Feb2006			2469	3.7
LagDep(1)	0.994	348.4	0.829	17.8
AR(1)	-0.383	-4.9	-0.233	-2.6
Estimation Period	1/1995-5/2007		1/1995-5/2007	
MAPE	0.19%		0.22%	
R^2	0.999		0.988	

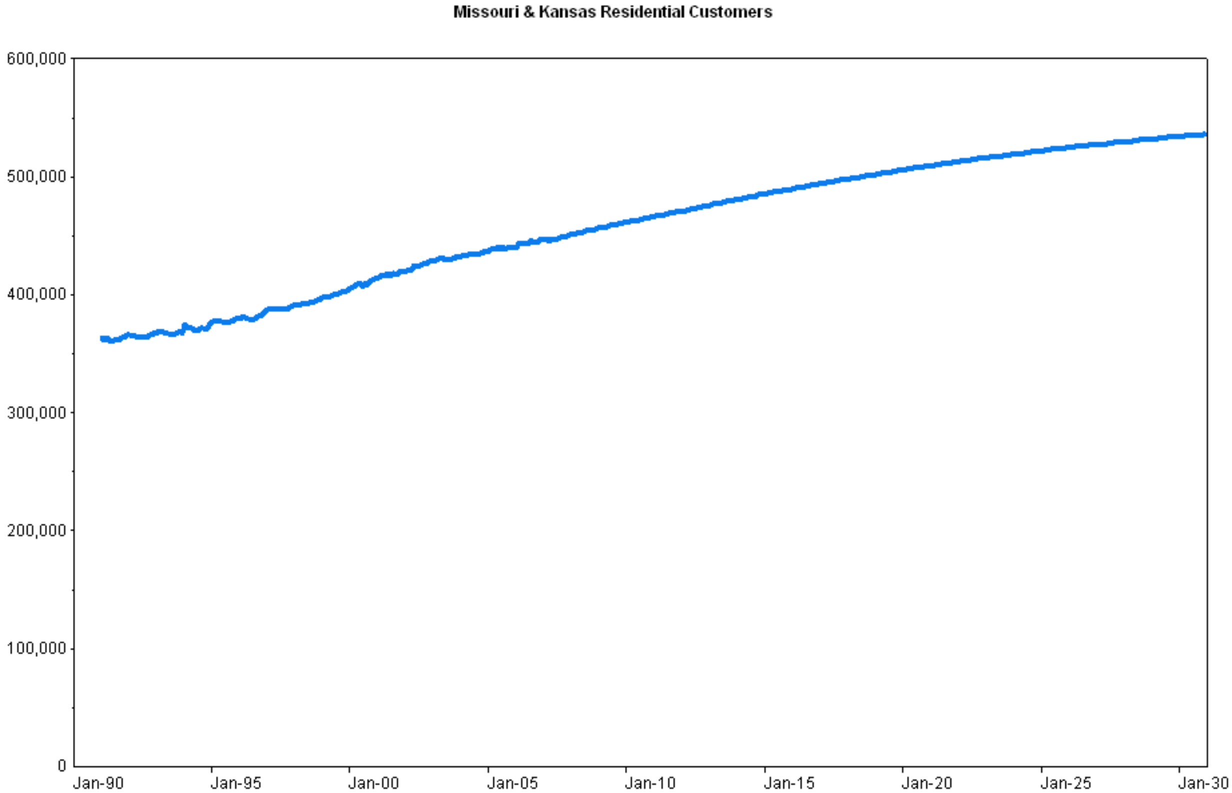
Table 10 shows historical and predicted average residential customers by state. Chart 8 shows historical and predicted values for the residential class as a whole. The gradual decline in the growth rate of new customers is due to a similar decline in the population growth rate forecasted by Economy.com for the KC metro area. They attribute this to a declining birth rate, out migration of retirees to warmer climates, declining immigration to the United States and a falling share of manufacturing in KC relative to the rest of the country.

Table 10: Annual Average Number of Residential Customers (Historical & Forecasted)

Weather Normalized Historical and Forecasted Annual Average Residential Customers			
Year	Missouri	Kansas	Total Residential
1990	217,892	141,983	359,875
1995	221,027	156,346	377,373
2000	228,625	180,977	409,602
2005	236,612	202,770	439,382
2006	238,389	205,887	444,276
2007	239,400	208,696	448,096
2010	244,556	219,164	463,720
2015	252,013	235,567	487,581
2020	257,323	250,164	507,487
2025	260,824	262,438	523,262
2030	262,984	272,166	535,150

Annual Growth Rates			
1990-1995	0.3%	1.9%	1.0%
1995-2000	0.7%	3.0%	1.7%
2000-2005	0.7%	2.3%	1.4%
2006-2007	0.4%	1.4%	0.9%
2007-2010	0.7%	1.6%	1.1%
2010-2015	0.6%	1.5%	1.0%
2015-2020	0.4%	1.2%	0.8%
2020-2025	0.3%	1.0%	0.6%
2025-2030	0.2%	0.7%	0.5%
2007-2030	0.4%	1.2%	0.8%

Chart 8: Total Missouri and Kansas Residential Customers (Historical & Forecasted)



2.4 RESIDENTIAL END-USE INDICES

Residential appliance saturation data was available from KCP&L's 1996, 1998, 2000, 2002, 2004 and 2006 surveys, which have been conducted by KCP&L since 1964. The survey results are shown in Table 11 and Table 12.

Table 11: KCP&L Residential Appliance Saturation Survey – Kansas

Kansas	1996	1998	2000	2002	2004	2006
Central A/C (CAC)	92%	94%	93%	98%	97%	97%
Room A/C (RAC)	6%	6%	12%	6%	6%	8%
Electric Water Heaters (EWHeat)	22%	25%	20%	21%	20%	20%
Electric Ranges (Ecook)	88%	87%	76%	84%	83%	86%
Second Refrigerators (Ref2)	23%	28%	21%	32%	30%	34%
Freezers (Frz)	47%	43%	43%	48%	48%	42%
Dishwashers (Dish)	91%	92%	74%	90%	90%	92%
Clothes Washers (Cwash)	95%	96%	92%	94%	95%	95%
Electric Clothes Dryers (Edry)	72%	75%	67%	75%	77%	79%
TV	246%	267%	215%	219%	240%	279%

Table 12: KCP&L Residential Appliance Saturation Survey – Missouri

Missouri	1996	1998	2000	2002	2004	2006
Central A/C (CAC)	71%	80%	88%	81%	86%	85%
Room A/C (RAC)	26%	22%	19%	23%	21%	22%
Electric Water Heaters (EWHeat)	18%	21%	24%	22%	23%	18%
Electric Ranges (Ecook)	62%	63%	67%	65%	70%	80%
Second Refrigerators (Ref2)	13%	19%	19%	20%	18%	23%
Freezers (Frz)	45%	42%	42%	39%	40%	37%
Dishwashers (Dish)	55%	57%	67%	60%	64%	67%
Clothes Washers (Cwash)	82%	99%	88%	86%	87%	88%
Electric Clothes Dryers (Edry)	52%	65%	70%	66%	62%	65%
TV	199%	234%	218%	189%	209%	240%

The EIA saturation forecasts were adjusted to fit the KCP&L appliance saturation survey results. EIA estimates are from the recent Residential Energy Consumption Survey (RECS) for the West North Central Census region, which includes Kansas and Missouri. The modified saturation trends along with the KCP&L survey results are shown in Charts 9 and 10. Appliance efficiency trends were based on EIA's historical and forecasted equipment efficiency data for West North Central Census region. The saturation and efficiency trends are combined to generate the end-use indices.

Chart 9: Forecasted Saturation Trends - Kansas

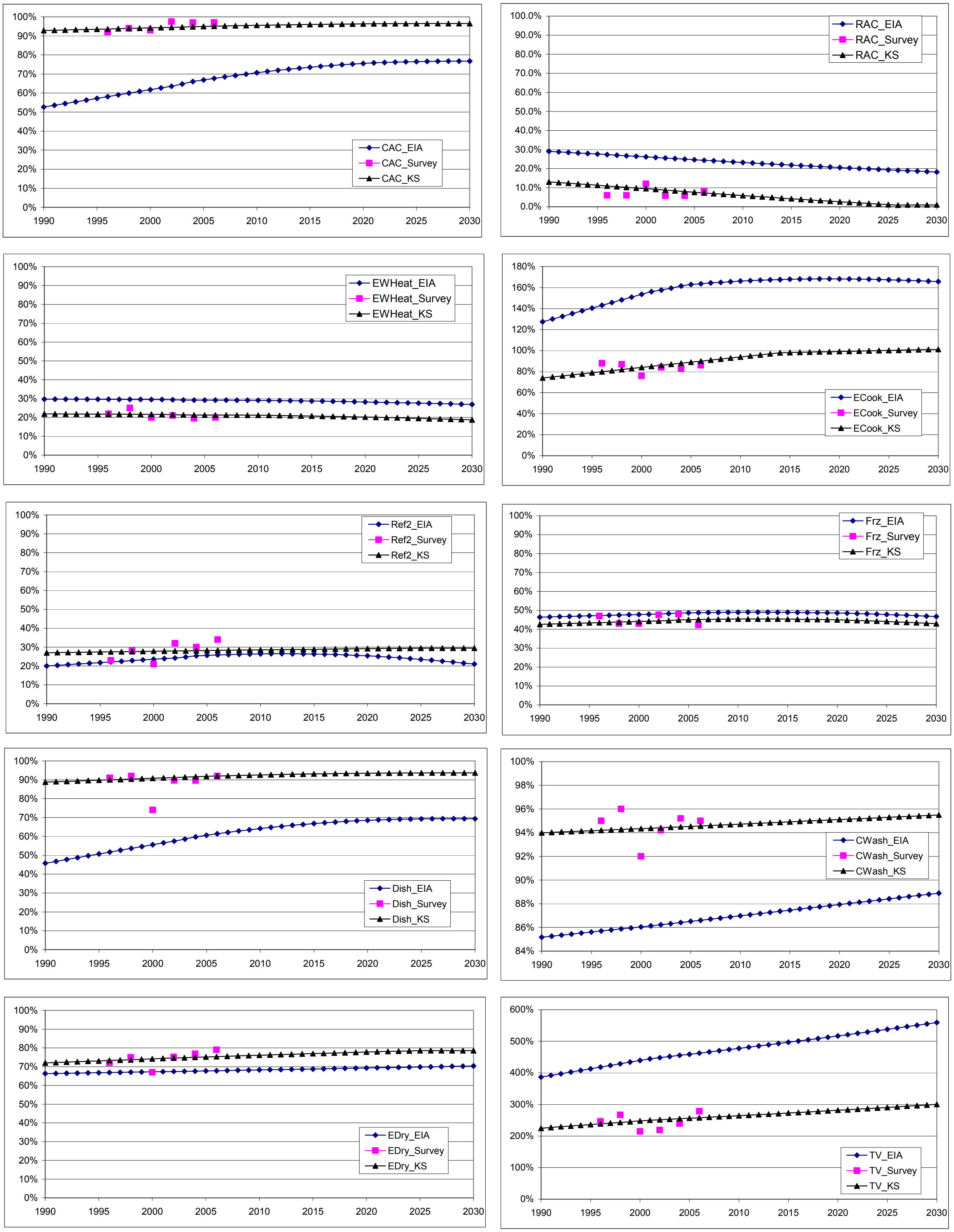
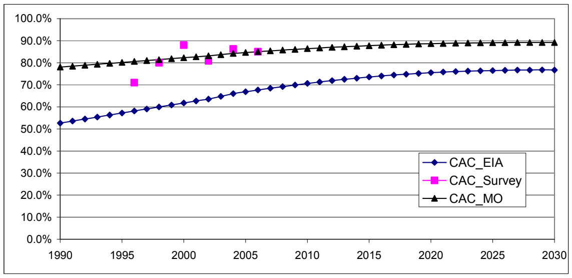
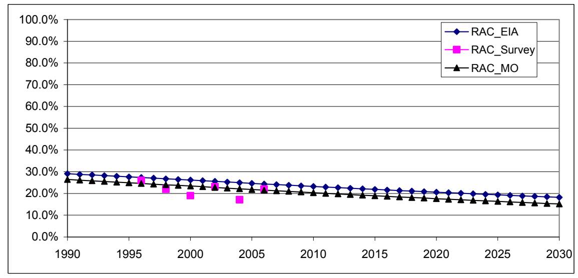
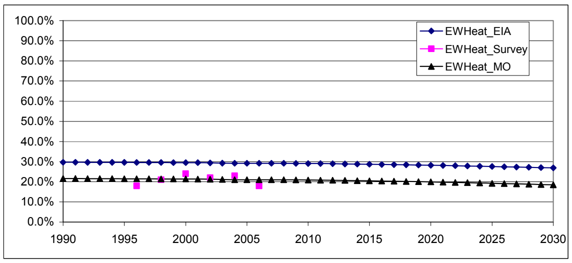
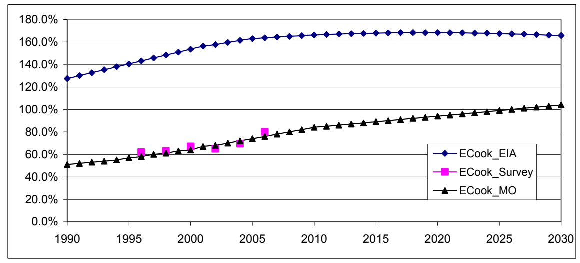


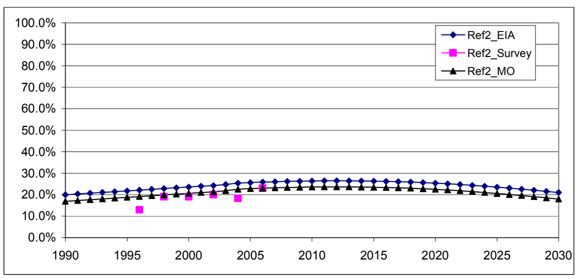
Chart 10: Forecast Saturation Trends – Missouri

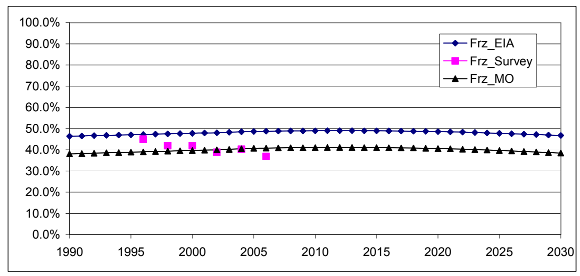


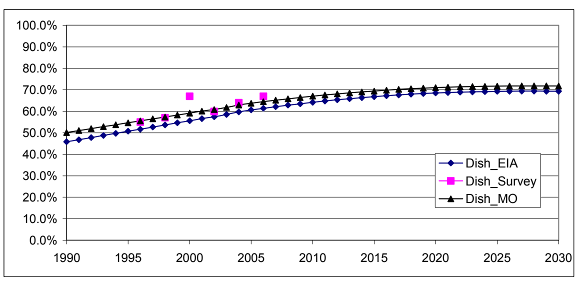


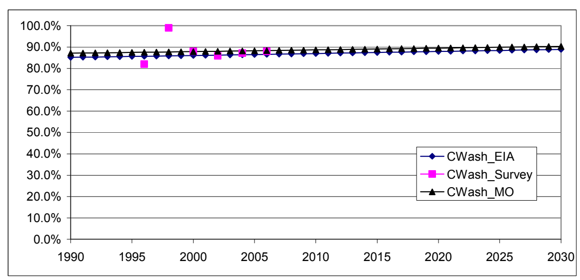


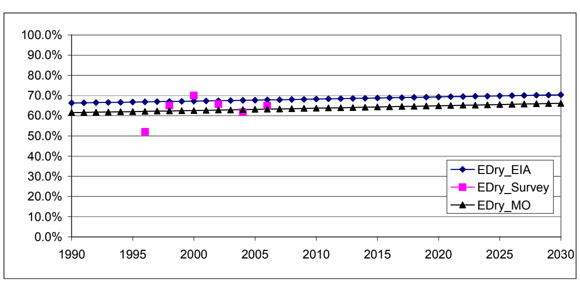


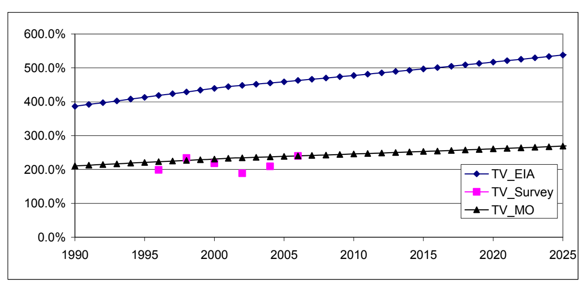












2.5 RESIDENTIAL SAE MODEL SPECIFICATION

The SAE approach was used to develop models to forecast sales for the residential class. The SAE modeling framework defines energy use (kwh per customer) in the residential sector ($USE_{y,m}$) in year y and month m as the sum of energy used by heating equipment ($Heat_{y,m}$), cooling equipment ($Cool_{y,m}$) and other equipment ($Other_{y,m}$). Formally,

Equation 1

$$Use_{y,m} = Heat_{y,m} + Cool_{y,m} + Other_{y,m}$$

To increase the accuracy of this end-use forecast, the variables on the right-hand side of Equation 1 are calibrated to monthly billing data.

Equation 2

$$Use_{y,m} = b_1 \, xHeat_{y,m} + b_2 \, xCool_{y,m} + b_3 \, xOther_{y,m} + \varepsilon_{y,m}$$

where $xHeat_{y,m}$, $xCool_{y,m}$, and $xOther_{y,m}$ are explanatory variables constructed from

end-use information, weather data, and market data. The constructed end-use variables are engineering-based estimates of end-use consumption. The variables are regressed on observed average usage. The estimated model can then be thought of as a statistically adjusted end-use model, where the estimated coefficients for the end-use variables are calibration factors.

2.5.1 HEATING END-USE VARIABLE

Electricity use for space heating depends on heating degree days, the percentage of heaters using electricity, heating equipment operating efficiencies, dwelling thermal integrity and floor space, average household size, household income, and energy prices. The heating variable is represented as the product of an annual equipment index and a monthly usage multiplier. That is,

Equation 3

$$\text{XHeat}_{y,m} = \text{HeatIndex}_y \times \text{HeatUse}_{y,m}$$

where $XHeat_{y,m}$ is estimated heating energy use in year y and month m, $HeatIndex_y$ is the annual index of heating equipment, and $HeatUse_{y,m}$ is the monthly usage multiplier. Separate Heat Indices were estimated for both residential models:

- Kansas Residential Urban (RU)
- Missouri Residential Urban (RU)

The $HeatIndex_y$ reflects changes in equipment saturation and efficiency trends relative to a base year, which was defined as 2001. The index is defined at the equipment level and then weighted to reflect end-use intensity in the base year. Given a set of fixed weights, the index will change over time with changes in equipment saturations (*Sat*), operating efficiencies (*Eff*), and building structural index (*StructuralIndex*). The ratio is equal to 1.0 in the base year, 2001. In other years, it will be greater than one if equipment saturation levels are above their 2001 level. This will be offset by higher efficiency levels, which will drive the index downward.

Historical and projected heating saturation trends are derived from EIA's Residential Energy Consumption Survey (RECS) for the West North Central region. Heating efficiencies are in terms of a *Heating Seasonal Performance Factor* and are developed by EIA. Formally, the heating index is defined as:

Equation 4

$$HeatIndex_y = StructuralIndex_y \times \sum_{Type} Weight^{Type} \times \frac{\left(Sat_y^{Type} \big/ Eff_y^{Type} \right)}{\left(Sat_{01}^{Type} \big/ Eff_{01}^{Type} \right)}$$

The *StructuralIndex* is constructed by combining the building shell efficiency index trends from Energy Information Agency (EIA) with surface area estimates, and then it is indexed to the 2001 value:

Equation 5

$$StructuralIndex_y = \frac{BuildingShellEfficiencyIndex_y \times SurfaceArea_y}{BuildingShellEfficiencyIndex_{01} \times SurfaceArea_{01}}$$

Surface area is derived to account for roof and wall area of a standard dwelling based on the regional average square footage data obtained from EIA. The relationship between the square footage and surface area is constructed assuming an aspect ratio of 0.75 and an average of 25% two-story and 75% single-story. Given these assumptions, the approximate linear relationship for surface area is:

Equation 6

$$\mathrm{SurfaceArea}_y = 892 + 1.44 \times \mathrm{Footage}_y$$

The saturation and efficiency trends are provided at the equipment level for heating and cooling. An overall end-use intensity is derived by calculating equipment intensity in the base year and summing the equipment intensities. Equation 7 shows the equipment intensity calculation.

Equation 7

$$Weight^{Type} = \frac{Energy_{01}^{Type}}{HH_{01}} xHeatShare_{01}^{Type}$$

With these weights, the 2001 *HeatIndex* is equal to estimated annual heating intensity per household. This intensity estimate changes over time as saturation, efficiency, and the structural index change from their base year value. The weights are input into the calculation spreadsheet as base year i*ntensities* on the "*Efficiencies*" tab. A separate spreadsheet is constructed for each model.

The utilization of the end-use stock is captured by the heating utilization variable *HeatUse*. Heating system usage levels are impacted by several factors, including weather, household size, income levels, and price.

Equation 8

$$HeatUse_{y,m} = \left(\frac{Price_{y,m}}{Price_{01}}\right)^{E_P} \times \left(\frac{Income_{y,m}}{Income_{01}}\right)^{E_I} \times \left(\frac{HHSize_{y,m}}{HHSize_{01}}\right)^{E_{HH}} \times \left(\frac{HDD_{y,m}}{HDD_{01}}\right)$$

where $Price_{y,m}$ is the average residential real price of electricity in year y and month m, $Price_{01}$ is the average residential real price of electricity in 2001, E_P is the price elasticity, $Income_{y,m}$ is the average real income per household in a year y and month m, $Income_{01}$ is the real income per household in 2001, E_I is elasticity of income, $HHSize_{y,m}$ is the average household size in a year y and month m, $HHSize_{01}$ is the household size in 2001, E_{HH} is the elasticity of householdsize, $HDD_{y,m}$ is the revenue-month heating degree days in year y and month m, and HDD_{01} is the annual heating degree days for 2001.

By construction, the $HeatUse_{y,m}$ variable has an annual sum that is close to one in the base year, 2001. The *HDD* term serves to allocate annual values to months of the year. The remaining terms average to one in the base year. In other years, the values will reflect changes in the economic driver changes, as transformed through the end-use elasticity parameters. For example, the price elasticity for heating is -0.15, which indicates that if the real price of electricity increases 10% the *HeatUse* variable will decrease 1.5%.

2.5.2 COOLING END-USE VARIABLE

The cooling end-use variable is constructed in a manner similar to that for heating. Cooling requirements depend on cooling degree days, cooling equipment saturation levels, cooling equipment operating efficiencies, dwelling thermal integrity, dwelling size, household size, household income, and the real price of electricity. The cooling variable is represented as the product of an equipment-based index and monthly usage multiplier. That is,

Equation 9

$$\mathrm{XCool}_{y,m} = \mathrm{CoolIndex}_{y} \times \mathrm{CoolUse}_{y,m}$$

where $XCool_{y,m}$ is estimated cooling energy use in year y and month m, $CoolIndex_y$ is the annual index of cooling equipment, and $CoolUse_{y,m}$ is the monthly usage multiplier.

The *CoolIndex* represents an initial estimate of annual cooling intensity (in kWh). It is a weighted average across several cooling end-use technologies including central air conditioning, heat pumps, and room air conditioning. The index changes over time as in response to changes in equipment saturation, efficiency, housing size, and thermal integrity. Formally, the equipment index is defined as:

Equation 10

$$CoolIndex_y = StructuralIndex_y \times \sum_{Type} Weight^{Type} \times \frac{\left(Sat_y^{Type} \big/ Eff_y^{Type} \right)}{\left(Sat_{01}^{Type} \big/ Eff_{01}^{Type} \right)}$$

The annual saturation estimates are derived from KCP&L's survey data and EIA's study for the West North Central region. The efficiency for space cooling heating pumps and central air-conditioning (A/C) units are given in terms of *Seasonal Energy Efficiency Ratio*, and for room A/C units efficiencies are given in terms of EER (energy efficiency ratio). Historical and projected efficiency trends are developed by the EIA.

In the above expression, 2001 is used as a base year for normalizing the index. The ratio on the right is equal to 1.0 in 2001. In other years, it will be greater than one if equipment saturation levels are above their 2001 level. This will be offset by higher efficiency levels, which will drive the index downward. The weights are defined as follows.

Equation 11

$$\text{Weight}^{\text{Type}} = \frac{\text{Energy}_{01}^{\text{Type}}}{\text{HH}_{01}} \times \text{CoolShare}_{01}^{\text{Type}}$$

As with heating, the sum of the end-use weights represents the annual cooling requirement in the base year. Separate indices are calculated for each revenue class. Variations from this value in other years will be proportional to saturation, efficiency, and structural index variations around their base values.

Cooling system usage levels are impacted by changes in weather, household size, income, and prices.

Equation 12

$$CoolUse_{y,m} = \left(\frac{Price_{y,m}}{Price_{01}}\right)^{E_P} \times \left(\frac{Income_{y,m}}{Income_{01}}\right)^{E_I} \times \left(\frac{HHSize_{y,m}}{HHSize_{01}}\right)^{E_{HH}} \times \left(\frac{CDD_{y,m}}{CDD_{01}}\right)$$

where $CDD_{y,m}$ is the revenue month cooling degree days in year y and month m, and CDD_{01} is the annual cooling degree days for 2001.

By construction, the $CoolUse_{y,m}$ variable has an annual sum that is close to one in the base year, 2001. The *CDD* term serves to allocate annual values to months of the year. The remaining terms average to one in the base year. In other years, the values will reflect changes in the economic driver changes.

2.5.3 OTHER END-USES

Monthly estimates of non-weather sensitive sales can be derived in a similar fashion to space heating and cooling. Based on an end-use framework, other sales are driven by appliance saturation levels and efficiency levels, average household size, real income, real prices, and billing days. The explanatory variable for other uses is defined as follows:

Equation 13

$$\mathrm{XOther}_{y,m} = \mathrm{OtherEqpIndex}_{y,m} \times \mathrm{OtherUse}_{y,m}$$

The first term on the right hand side of this expression ($OtherEqpIndex_{y,m}$) embodies information about appliance saturation and efficiency levels and monthly usage multipliers. The second term (*OtherUse*) captures the impact of changes in price, income, and number of billing-days on appliance utilization.

End-use indices are constructed in the residential indices spreadsheets. The end-use indices are combined into an aggregate stock index (*OtherEqpIndex*) in the forecast project files. *OtherEqpIndex* and *XOther* are constructed in the transformation tables “*RUStrucVars*”.

The equipment index for water heaters (*EWHeat*) and appliances are given in Equation 14 and 15, respectively.

Equation 14

$$EWHeatIndex_{y,m} = Weight \times \frac{\left(Sat_y / Eff_y \right)}{\left(Sat_{01} / Eff_{01} \right)} \times MoMult_m$$

Equation 15

$$ApplianceIndex_{y,m} = Weight^{Type} \times \frac{\left(Sat_y^{Type} \Big/ \frac{1}{UEC_y^{Type}} \right)}{\left(Sat_{01}^{Type} \Big/ \frac{1}{UEC_{01}^{Type}} \right)} \times MoMult_m^{Type}$$

where *Weight* is the intensity for each appliance type, Sat_y represents the fraction of households who have an appliance type, Eff_y is the average operating efficiency, UEC_y is the unit energy consumption, and *MoMult* is the monthly usage multiplier for each appliance. The index for non-HVAC equipment is derived by summing the above equations:

Equation 16

$$\text{OtherEqpIndex}_{y,m} = \text{EWHeatIndex}_{y,m} + \text{ApplianceIndex}_{y,m}$$

The annual saturation levels for water heating units and appliances are derived from KCP&L's residential saturation survey data and EIA's study for the West North Central region. The efficiency for water heating units is given in terms of *Seasonal Energy Efficiency Ratio*, UECs are used as a proxy for efficiency change in the other appliances and are given in terms of kWh/year. UEC estimates are provided by EIA.

The weights reflect estimated end-use intensity in the base year. Estimates are based on EIA values for the West North Central census region. The end-use intensities are summed in constructing *OtherEqpIndex*. The end-use index reflects changes in saturation and efficiency and UEC levels for the main appliance categories. As with heating and cooling, the weights are defined as follows:

Equation 17

$$\text{Weight}^{\text{Type}} = \frac{\text{Energy}_{01}^{\text{Type}}}{\text{HH}_{01}} \times \text{Share}_{01}^{\text{Type}}$$

With these weights, the *OtherEqpIndex* value in 2001 will be equal to estimated annual water heating, appliance, and lighting intensity per household in that year. Changes in the index are driven by changes in saturation, efficiency assumptions.

Water heating and appliance usage levels are impacted on a monthly basis by several factors, including household size, income levels, prices, and billing days (*BDays*). The other use variable is computed as:

Equation 18

$$OtherUse_{y,m} = \left(\frac{Price_{y,m}}{Price_{01}}\right)^{E_P} \times \left(\frac{Income_{y,m}}{Income_{01}}\right)^{E_I} \times \left(\frac{HSize_{y,m}}{HSize_{01}}\right)^{E_{HH}} \times \left(\frac{BDays_{y,m}}{NormalBDays}\right)$$

Multiplying the equipment index variable with the utilization variable then generates xOther.

2.6 ESTIMATED RESIDENTIAL MODEL

Once the end-use variables are constructed, they are regressed on average residential use per customer. Binary variables for specific months were added to the list of explanatory variables and error correction terms were used when statistically significant. The estimated model coefficients are all highly significant. Residential model R^2 are similar at .99 with in sample MAPE of 2.3% to 2.5%. Tables 13 through 15 show the resulting model coefficients by state.

Table 13: Average Use Residential Model Results

	MO Residential	KS Residential
Estimation Period	1/2000-5/2007	1/1995-5/2005
MAPE	2.46%	2.33%
R^2	0.987	0.989

Table 14: Coefficients for Kansas Average Residential Use

Variable	Coefficient	T-Stat
xOther	0.908	49.0
xHeat55	0.857	29.2
xCool65	1.421	34.3
xCool65shoulder	-0.238	-4.3
xCool75	-0.036	-1.5
prior2006	31.1	2.8
Apr	-28.1	-2.9
Feb	-28.1	-2.8
Mar	-22.3	-2.1
Dec	15.7	1.7
AR(1)	0.372	4.5

Table 15: Coefficients for Missouri Average Residential Use

Variable	Coefficient	T-Stat
xOther	0.701	39.6
xHeat55	0.582	23.1
xCool65	0.972	9.8
xCool70	0.115	1.5
year<2006	20.7	1.8
Dec	24.2	2.4
AR(1)	0.420	3.9

Charts 11 and 12 show resulting actual and predicted values for the residential class by state.

Chart 11: Missouri Residential Urban Average Use Model Results

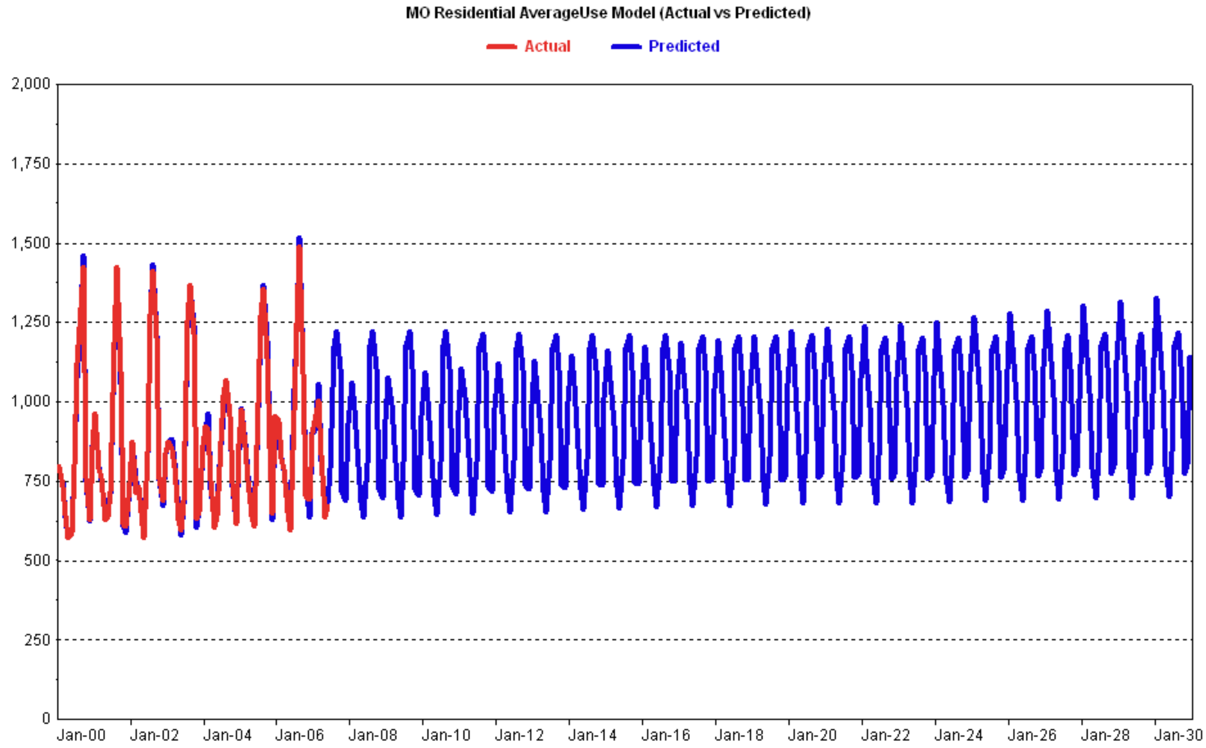
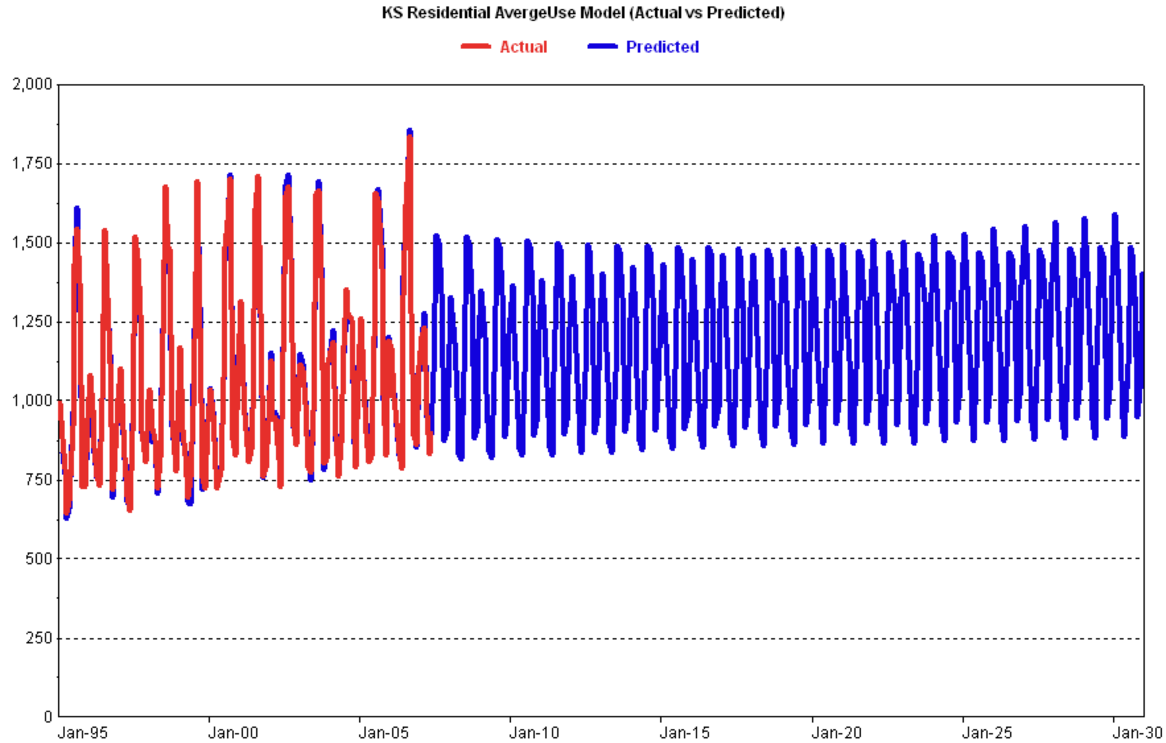


Chart 12: Kansas Residential Urban Average Use Model Results



2.7 AVERAGE USE BASE CASE FORECAST

Table 16 shows the annual average use forecast and historical actual average use for the MO and KS residential classes. The forecast shows a slowdown in the growth of average use. This is primarily due to a slowdown in the growth of population and households in the Kansas City Metropolitan area since new customers tend to have larger homes and thus higher usage than existing customers.

Table 16: Missouri and Kansas Average Use

Weather Normalized Historical and Forecasted AverageUse Residential (KWh/Customer)			
Year	Missouri	Kansas	Total Residential
1990	8,173	10,806	9,212
1995	9,206	11,845	10,300
2000	9,897	12,636	11,107
2005	10,568	13,380	11,866
2006	10,673	13,442	11,956
2007	10,717	13,499	12,013
2010	11,038	13,762	12,325
2015	11,358	14,062	12,665
2020	11,664	14,340	12,983
2025	11,840	14,491	13,170
2030	12,156	14,807	13,504

Annual Growth Rates			
1990-1995	2.4%	1.9%	2.3%
1995-2000	1.5%	1.3%	1.5%
2000-2005	0.9%	0.8%	0.9%
2006-2007	0.4%	0.4%	0.5%
2007-2010	1.0%	0.6%	0.9%
2010-2015	0.6%	0.4%	0.5%
2015-2020	0.5%	0.4%	0.5%
2020-2025	0.3%	0.2%	0.3%
2025-2030	0.5%	0.4%	0.5%
2007-2030	0.5%	0.4%	0.5%

2.8 DAILY LOAD PROFILES

Annual end-use class sales for residential are combined with hourly end-use and class load profiles. The residential class daytype profiles are based on 2006 hourly residential load research data with simulated shapes for 2008-2030, and the end-use profiles are based on previous KCP&L analysis. Refer to Section 6, Energy and Demand for information about residential class and end-use daily load profiles and the use of these profiles in forecasting energy and demand.

SECTION 3: COMMERCIAL

3.1 SUMMARY

Commercial class billed electricity consumption is expected to increase at a compounded annual rate of 1.5% percent between 2007 and 2030. During the same time, the Missouri commercial class is expected to grow at 1.3% and the Kansas commercial class is expected to grow at 1.8%. A further break out by class shows commercial secondary growing at 1.5% and commercial primary at 1.6%. The slow down in growth in the commercial class is being driven by a slow down in Kansas. The Kansas commercial secondary customers are slowing down due to a slower residential household growth, while commercial primary is forecasted to have no growth with average use declining compared to the late 1990's and early 2000's. Table 17 summarizes the commercial energy forecast by state.

Table 17: Commercial Actual Billed GWh Sales

Historical and Forecasted Billed GWh Sales Commercial			
Year	**Missouri**	**Kansas**	**Total Commercial**
1990	3,267	1,574	4,841
1995	3,576	1,887	5,463
2000	4,022	2,536	6,558
2005	4,216	3,007	7,223
2006	4,302	3,071	7,374
2007	4,368	3,171	7,539
2010	4,624	3,391	8,014
2015	5,049	3,802	8,850
2020	5,391	4,171	9,562
2025	5,631	4,464	10,095
2030	5,901	4,773	10,674

Annual Growth Rates			
1990-1995	1.8%	3.7%	2.4%
1995-2000	2.4%	6.1%	3.7%
2000-2005	0.9%	3.5%	2.0%
2006-2007	1.5%	3.2%	2.2%
2007-2010	1.9%	2.3%	2.1%
2010-2015	1.8%	2.3%	2.0%
2015-2020	1.3%	1.9%	1.6%
2020-2025	0.9%	1.4%	1.1%
2025-2030	0.9%	1.3%	1.1%
2007-2030	1.3%	1.8%	1.5%

3.2 METHODOLOGY

The SAE approach was used to develop commercial models to forecast energy for the commercial classes of Missouri and Kansas. The models were developed by Itron as successors to EPRI's COMMEND models by the same staff that formerly supported the COMMEND models for EPRI.

3.3 CUSTOMERS

Separate customer forecasting models are estimated for each revenue class by state. Simple monthly regression models are estimated that relate residential customer projections for KCP&L's service territory to historical monthly commercial customer data. Model adjusted R^2 varies from .375 to .954 with in sample MAPE of .40% to 4.26%. Tables 18 and 19 shows the model results by state and revenue class. Exponential smoothing was used to forecast Primary Other customers in Kansas.

Table 18: Missouri Commercial Customers Model Results

	MO Commercial Secondary	MO Primary Other
Estimation Period	1/2000-12/2006	1/1991-5/2007
MAPE	0.40%	2.37%
R^2	0.954	0.734

MO Commercial Secondary		
Variable	Coefficient	T-Stat
Constant	-7,397	-4.2
RU_Cust	0.076	4.8
LagDep(1)	0.656	9.4
Jul2003	670	4.3
AR(1)	-0.252	-2.1

MO Primary Other		
Variable	Coefficient	T-Stat
Constant	73.789	2.3
Emp_NonMan	0.081	2.2
Jan93	-11.308	-3.0
May2001	-10.487	-2.8
Feb2002	11.942	3.2
Jun2002	-16.19	-4.4
Dec03	7.998	2.1
year:mo>=2006:09	-5.14	-1.4
AR(1)	0.487	7.0
AR(2)	0.348	5.0

Table 19: Kansas Commercial Customers Model Results

	KS Commercial Secondary	KS Commercial Primary Other
Estimation Period	1/2003-5/2007	1/1990-5/2007
MAPE	0.40%	4.26%
R^2	0.954	0.375

KS Commercial Secondary		
Variable	Coefficient	T-Stat
Constant	-3,141	-2.8
RU_Cust	0.105	5.1
LagDep(1)	0.279	2.0

Kansas Primary Other		
Variable	Coefficient	T-Stat
Constant	9.795	4.0
Emp_NonMan	0.018	4.7
LagDep(1)	0.358	3.1
AR(1)	-0.257	-2.1

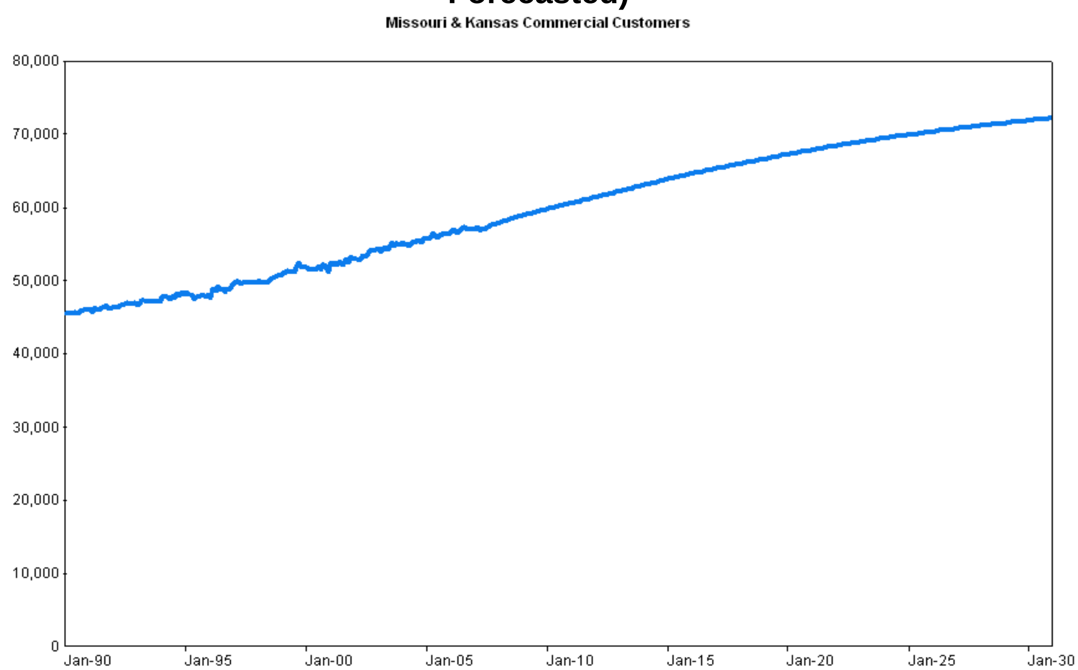
After the completion of each class model projection, each revenue class is summed to create a state total and a commercial system total. Table 20 shows historical and predicted average commercial customers by state. Chart 13 shows historical and predicted values for the commercial class as a whole (MO & KS).

Table 20: Commercial Customers

Historical and Forecasted Annual Average Commercial Customers			
Year	Missouri	Kansas	Total Sys Commercial
1990	28,594	17,134	45,728
1995	28,964	18,985	47,949
2000	29,195	22,496	51,691
2005	30,958	25,207	56,166
2006	31,196	25,738	56,934
2007	31,264	26,084	57,348
2010	32,551	27,640	60,191
2015	34,201	30,036	64,237
2020	35,391	32,169	67,559
2025	36,182	33,963	70,145
2030	36,667	35,386	72,053

Annual Growth Rates			
1990-1995	0.3%	2.1%	1.0%
1995-2000	0.2%	3.5%	1.5%
2000-2005	1.2%	2.3%	1.7%
2006-2007	0.2%	1.3%	0.7%
2007-2010	1.4%	1.9%	1.6%
2010-2015	1.0%	1.7%	1.3%
2015-2020	0.7%	1.4%	1.0%
2020-2025	0.4%	1.1%	0.8%
2025-2030	0.3%	0.8%	0.5%
2007-2030	0.7%	1.3%	1.0%

Chart 13: Total Missouri and Kansas Commercial Customers (Historical & Forecasted)



3.4 COMMERCIAL END-USE INDICES

The commercial indices are constructed using EIA's efficiency and end-use saturation series for the West North Central Census region. EIA analyzes 10 commercial building types and 10 different energy end-uses as part of their forecasting process. Table 21 details the end-uses and building types analyzed.

Table 21: Building Types and End-Uses

Building Type	End-uses
Office	Electric Space Heating
Restaurant	Electric Air Conditioning
Grocery	Ventilation
Retail	Electric Water Heating
Warehouse	Electric Cooking
Education	Refrigeration
Health	Exterior lighting
Lodging	Interior Lighting
Miscellaneous	Office Equipment
Other	Miscellaneous Electric Appliances

3.5 COMMERCIAL SAE MODEL SPECIFICATION

The SAE modeling framework used for the commercial class is similar to the residential SAE modeling in that commercial energy use is defined as commercial sector ($USE_{y,m}$) in year y and month m as the sum of energy used by heating equipment ($Heat_{y,m}$), cooling equipment ($Cool_{y,m}$) and other equipment ($Other_{y,m}$). Formally,

Equation 19

$$\text{Use}_{y,m} = \text{Heat}_{y,m} + \text{Cool}_{y,m} + \text{Other}_{y,m}$$

To increase the accuracy of this end-use forecast, the variables on the right-hand side of Equation 19 are calibrated to monthly billing data.

Equation 20

$$Use_{y,m} = b_1\, xHeat_{y,m} + b_2\, xCool_{y,m} + b_3\, xOther_{y,m} + \varepsilon_{y,m}$$

where $xHeat_{y,m}$, $xCool_{y,m}$, and $xOther_{y,m}$ are explanatory variables constructed from end-use information, weather data, and market data. The constructed end-use variables are engineering-based estimates of end-use consumption. The variables are regressed on observed average monthly usage. The estimated model can then be thought of as a statistically adjusted end-use model, where the estimated coefficients for the end-use variables are calibration factors. Examples of calculating xHeat, xCool, xOther, for Commercial Secondary (CS) and Primary Other (PO) are shown in Table 22.

Table 22: Calculations for xHeat, xCool, and xOther

XHeat55_CS	EconTrans.CS_Prc_Ind ^ Elas.Price_CS * EconTrans.GPNonMan_Ind ^ Elas.Output_CS * CS_WthrIndex.HDD55 * Convstock (Indices.Heating_CS)
XCool55_CS	EconTrans.CS_Prc_Ind ^ Elas.Price_CS * EconTrans.GPNonMan_Ind ^ Elas.Output_CS * CS_WthrIndex.CDD55* Convstock (Indices.Cooling_CS)
XOther_CS	EconTrans.CS_Prc_Ind ^ Elas.Price_CS * EconTrans.GPNonMan_Ind ^ Elas.Output_CS * WthrTrans.CSBDays_Index* Convstock (Indices.NonHVAC_CS) * Value (MoMults.Multipliers, 2001, month)
Xheat55_PO	EconTrans.PO_Prc_Ind ^ Elas.Price_PO * EconTrans.GPNonMan_Ind^ Elas.Output_PO * PO_WthrIndex.HDD55* Convstock (Indices.Heating_PO)
Xcool55_PO	EconTrans.PO_Prc_Ind ^ Elas.Price_PO * EconTrans.GPNonMan_Ind ^ Elas.Output_PO * PO_WthrIndex.CDD55 * Convstock (Indices.Cooling_PO)
XOther_PO	EconTrans.PO_Prc_Ind ^ Elas.Price_PO * EconTrans.GPNonMan_Ind ^ Elas.Output_PO * WthrTrans.POBDays_Index * Convstock (Indices.NonHVAC_PO) * Value (MoMults.Multipliers, 2001, month)
GMP_Index GPNonMan_Ind GPMan_ind	Economics.GMP / IndexValues.GMP Economics.GP_Non_Man / IndexValues.GP_Non_Man Economics.GP_Man / IndexValues.GP_Man

3.5.1 HEATING END-USE VARIABLE

As in the residential model, energy use by space heating systems depends on heating degree days, heating equipment share levels, heating equipment operating efficiencies, commercial output, and the real price of electricity. The heating variable is represented as the product of an annual equipment index and a monthly usage multiplier. That is,

Equation 21

$$XHeat_{y,m} = HeatIndex_y \times HeatUse_{y,m}$$

where $xHeat_{y,m}$ is estimated heating energy use in year y and month m, $HeatIndex_y$ is the annual index of heating equipment, and $HeatUse_{y,m}$ is the monthly usage multiplier. Separate Heat Indices are estimated for two commercial models for each state:

- Commercial Secondary (CS)
- Primary Other (PO)

The *HeatIndex* is composed of electric space heating saturation levels normalized by operating efficiency levels. The index will change over time with changes in equipment saturations (*Sat*) and operating efficiencies (*Eff*). Formally, the equipment index is defined as:

Equation 22

$$HeatIndex_y = \left(\frac{kWh}{Sqft}\right)_{heating} \times \frac{\left(Sat_y / Eff_y\right)}{\left(Sat_{98} / Eff_{01}\right)}$$

The $HeatIndex_y$ reflects changes in equipment saturation and efficiency trends relative to a base year, 2001. The index is defined at the equipment level and then weighted to reflect the end-use intensity in the base year. Given a set of fixed weights, the index will change over time with changes in equipment saturations (*Sat*) and operating efficiencies (*Eff*). The ratio is equal to 1.0 in 2001. In other years, it will be greater than one if equipment saturation levels are above their 2001 level. This will be offset by higher efficiency levels, which will drive the index down. The average space heating intensity is energy sales for space heating per square feet of floor space.

Historical and projected heating equipment saturation trends are derived from EIA's Commercial Buildings Energy Consumption Survey (CBECS) for the North West Central region. Heating equipment efficiency trends are obtained from EIA's study for the North West Central region.

The utilization of the end-use stock is captured by the heating utilization variable *HeatUse*. Heating system usage levels are impacted on a monthly basis by several factors, including weather, commercial level economic activity, and prices.

Equation 23

$$HeatUse_{y,m} = \left(\frac{Price_{y,m}}{Price_{01}}\right)^{E_P} \times \left(\frac{Output_{y,m}}{Output_{01}}\right)^{E_O} \times \left(\frac{HDD_{y,m}}{HDD_{01}}\right)$$

where $Price_{y,m}$ is the average commercial real price of electricity in year y and month m, $Price_{01}$ is the average commercial real price of electricity in 2001, E_P is the price elasticity, $Output_{y,m}$ is the economic output in year y and month m, $Output_{01}$ is the economic output in 2001, E_O is the output elasticity, $HDD_{y,m}$ is the revenue-month heating degree days, and HDD_{01} is the annual heating degree days for 2001.

By construction, the $HeatUse_{y,m}$ variable has an annual sum that is close to one in the base year, 2001. The *HDD* term serves to allocate annual values to months of the year. The remaining terms average to one in the base year. In other years, the values will reflect changes in the economic driver changes, as transformed through the end-use elasticity parameters.

3.5.2 COOLING END-USE VARIABLE

The explanatory variable for cooling loads is constructed in a similar manner as space heating. The amount of energy used by cooling systems depends on cooling degree days, cooling equipment saturations, cooling equipment operating efficiencies, commercial output, and energy prices. The cooling variable is represented as the product of an equipment-based index and monthly usage multiplier. That is,

Equation 24

$$\mathrm{XCool}_{y,m} = \mathrm{CoolIndex}_{y} \times \mathrm{CoolUse}_{y,m}$$

where $xCool_{y,m}$ is estimated cooling energy use in year y and month m, $CoolIndex_y$ is an index of cooling equipment, and $CoolUse_{y,m}$ is the monthly usage multiplier. As with heating, the *CoolIndex* depends on equipment saturation levels normalized by operating efficiency levels. Formally, the cooling equipment index is defined as:

Equation 25

$$CoolIndex_y = \left(\frac{kWh}{Sqft}\right)_{cooling} \times \frac{\left(Sat_y / Eff_y\right)}{\left(Sat_{01} / Eff_{01}\right)}$$

Historical and projected cooling equipment saturation trends are derived from EIA's CBECS for the North West Central region. Cooling equipment efficiency trends are obtained from EIA's study for the North West Central region.

Data values in 2001 are used as a base year for normalizing the index, and the ratio on the right is equal to 1.0 in 2001. In other years, it will be greater than one if equipment saturation levels are above their 2001 level. This will be offset by higher efficiency levels, which will drive the index downward. The average space cooling intensity is computed as energy sales for space cooling per square feet of floor space.

Cooling system usage levels are impacted on a monthly basis by several factors, including weather, economic activity levels, and prices. Using elasticity parameters, the estimates for cooling equipment usage levels are computed as follows:

Equation 26

$$CoolUse_{y,m} = \left(\frac{Price_{y,m}}{Price_{01}}\right)^{E_P} \times \left(\frac{Output_{y,m}}{Output_{01}}\right)^{E_O} \times \left(\frac{CDD_{y,m}}{CDD_{01}}\right)$$

where $CDD_{y,m}$ is the revenue month cooling degree days in year y and month m, and CDD_{01} is the annual cooling degree days for 2001.

By construction, the $CoolUse_{y,m}$ variable has an annual sum that is close to one in the base year, 2001. The *CDD* term serves to allocate annual values to months of the year. The remaining terms average to one in the base year. In other years, the values will reflect changes in the economic driver changes.

3.5.3 OTHER END-USES

Monthly estimates of non-weather sensitive sales can be derived in a similar fashion to space heating and cooling. Based on end-use concepts, other sales are driven by equipment saturation levels, efficiency levels, commercial output, prices, and billing days. The explanatory variable for other uses is defined as follows:

Equation 27

$$\mathrm{XOther}_{y,m} = \mathrm{OtherIndex}_{y} \times \mathrm{OtherUse}_{y,m}$$

The first term on the right-hand side of this expression (*OtherIndex*$_y$) embodies information about equipment saturation levels and efficiency levels. The second term (*OtherUse*) captures the impact of changes in price, income, and number of billing-days on appliance utilization. The equipment index for other uses is defined as follows:

Equation 28

$$OtherIndex_y = \sum_{Type} Weight^{Type} \times \left(\frac{Sat_y^{Type} \big/ Eff_y^{Type}}{Sat_{01}^{Type} \big/ Eff_{01}^{Type}} \right)$$

where, *Weight* is the weight for each equipment type (measured in kWh/sqft), *Sat*$_y$ represents the fraction of floor stock with an equipment type, and *Eff*$_y$ is the average operating efficiency. This index combines information about trends in saturation levels and efficiency levels for the main equipment categories. The average equipment intensity is computed as energy sales for equipment per square feet of floor space. The annual saturation and efficiency levels for non-HVAC equipment are taken from the spreadsheet developed by EIA's study for the West North Central region.

Monthly variation is introduced by multiplying by usage factors and a monthly multiplier ($Mult_m$), and constructed as follows:

Equation 29

$$OtherUse_{y,m} = \left(\frac{\text{Price}_{y,m}}{\text{Price}_{01}}\right)^{E_P} \times \left(\frac{Output_{y,m}}{Output_{01}}\right)^{E_O} \times Mult_m$$

Where E_p and E_o are elasticity parameters. The *OtherUse* and *XOther* variables are constructed at the "*StrucVars*" transformation table in the project files.

3.6 ESTIMATED COMMERCIAL MODEL

The Commercial Secondary (CS) revenue class is estimated using an average use per customer models. Commercial Primary Other (PO) models are estimated using total monthly billed sales. The SAE models explain historical sales well with adjusted R^2 from .904 to .964 and in sample MAPE of 2.5% to 5.4%. CS models had the best fit with in sample MAPE's of 1.6% for Kansas and 1.9% for Missouri. The PO MAPE is 1.1% for Kansas and 2.4% for Missouri. Tables 23 and 24 show the coefficients for the commercial models.

Table 23: Missouri Commercial Model Results

	MO Commercial Secondary	MO Commercial Primary Other
Estimation Period	1/2000-5/2007	1/2004-5/2007
MAPE	1.88%	2.41%
R^2	0.941	0.904

Missouri Commercial Secondary Average Use		
Variable	Coefficient	T-Stat
xOther_CS	1.014	63.9
xHeat55_CS	0.745	11.6
xCool55_CS	1.305	45.7
year<2007	-146	-1.5

Missouri Primary Other Sales		
Variable	Coefficient	T-Stat
XCool55_PO	988	20.4
XHeat55_PO	196	2.0
XOther_PO	824	54.4
Year<2006	3,200,406	4.4

Table 24: Kansas Commercial Model Results

	KS Commercial Secondary	KS Commercial Primary Other
Estimation Period	1/2000-5/2007	1/2005-5/2007
MAPE	1.64%	1.10%
R^2	0.957	0.964

Kansas CS_AvgUse		
Variable	Coefficient	T-Stat
xHeat55_CS	0.518	6.9
xCool55_CS	1.295	41.8
xOther_CS	1.001	52.0
CS_AvgUse.feb	182	2.8
year<2007	-84.1	-0.7
AR(1)	0.408	3.4

Kansas Primary Other Sales		
Variable	Coefficient	T-Stat
xOther_PO	0.957	101.2
xHeat50_PO	0.320	5.4
xCool55_PO	0.941	21.6
Mar07	1,348,636	2.8
Sept	-360,827	-0.9
July	-368,651	-0.8
Aug06	-1,680,440	-2.8
year:mo<=2005:07	1,291,047	6.2

Charts 14 through 17 show resulting actual and predicted values for each of the commercial revenue classes.

Chart 14: Missouri Commercial Secondary Average Use Model

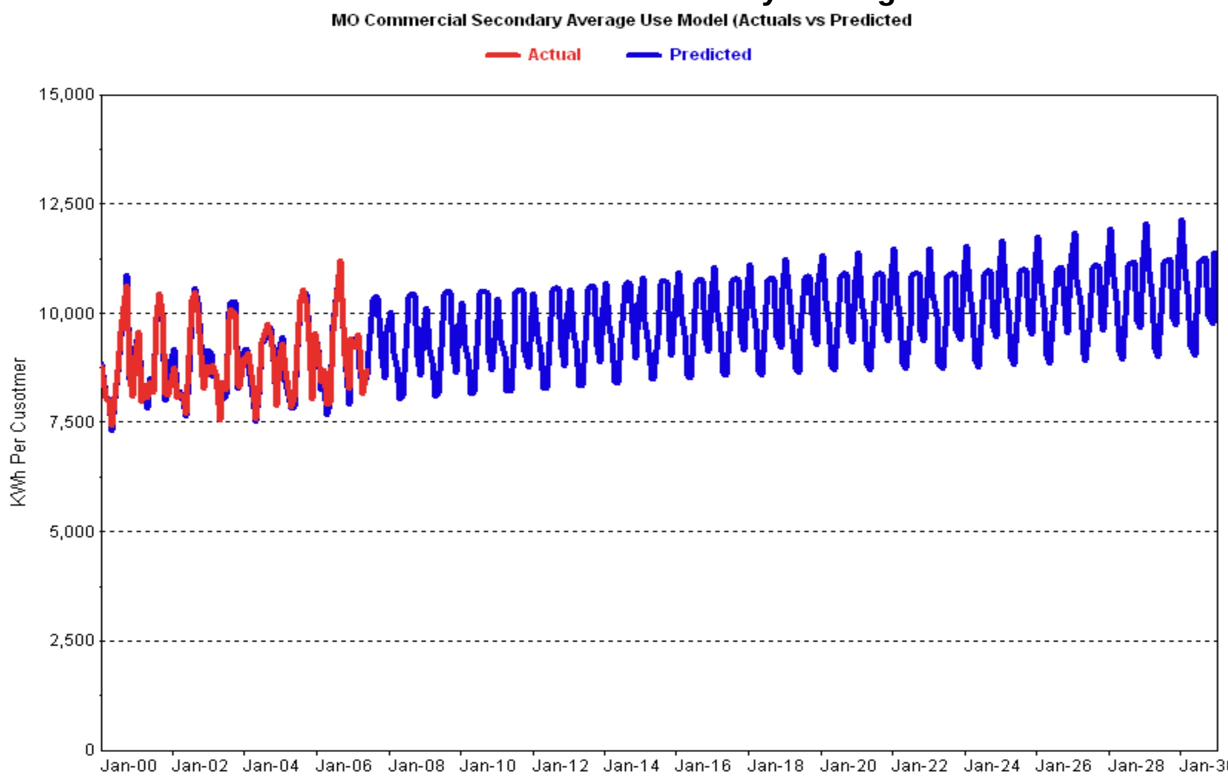


Chart 15: Missouri Primary Other Total kWh Sales Model

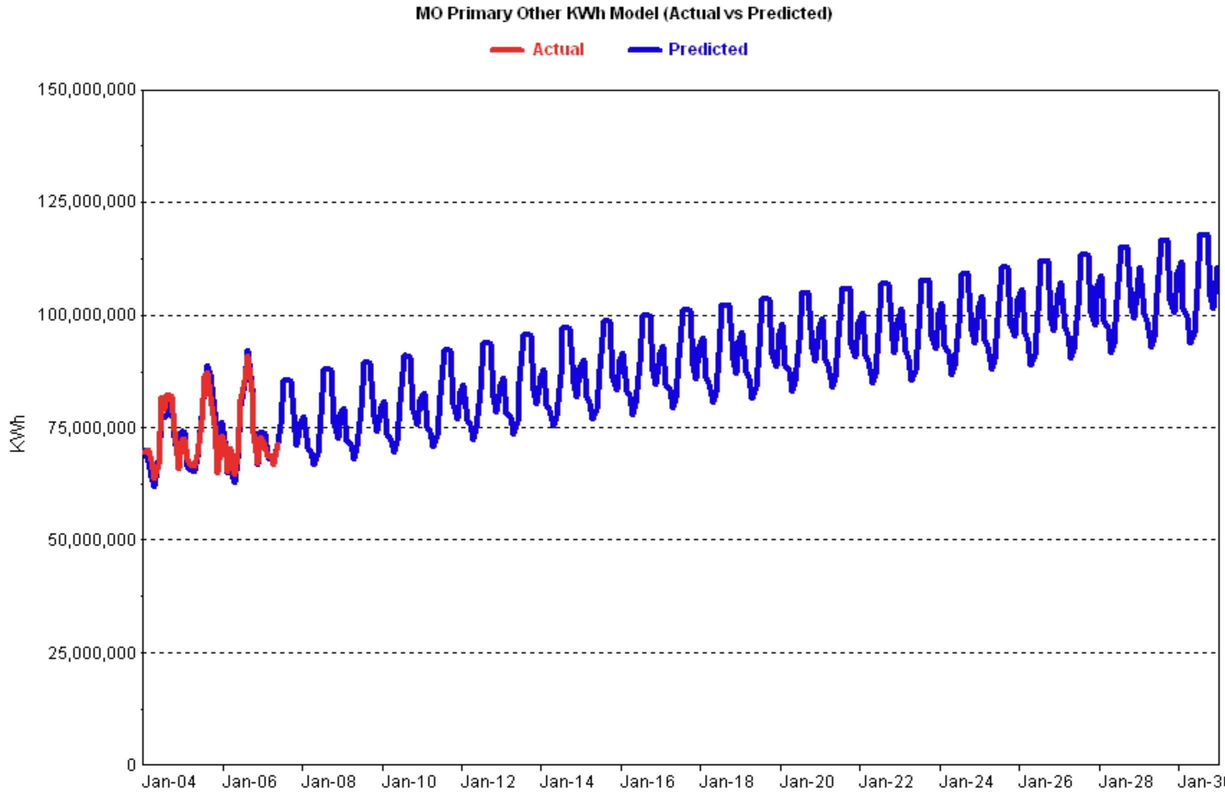


Chart 16: Kansas Commercial Secondary Average Use Model

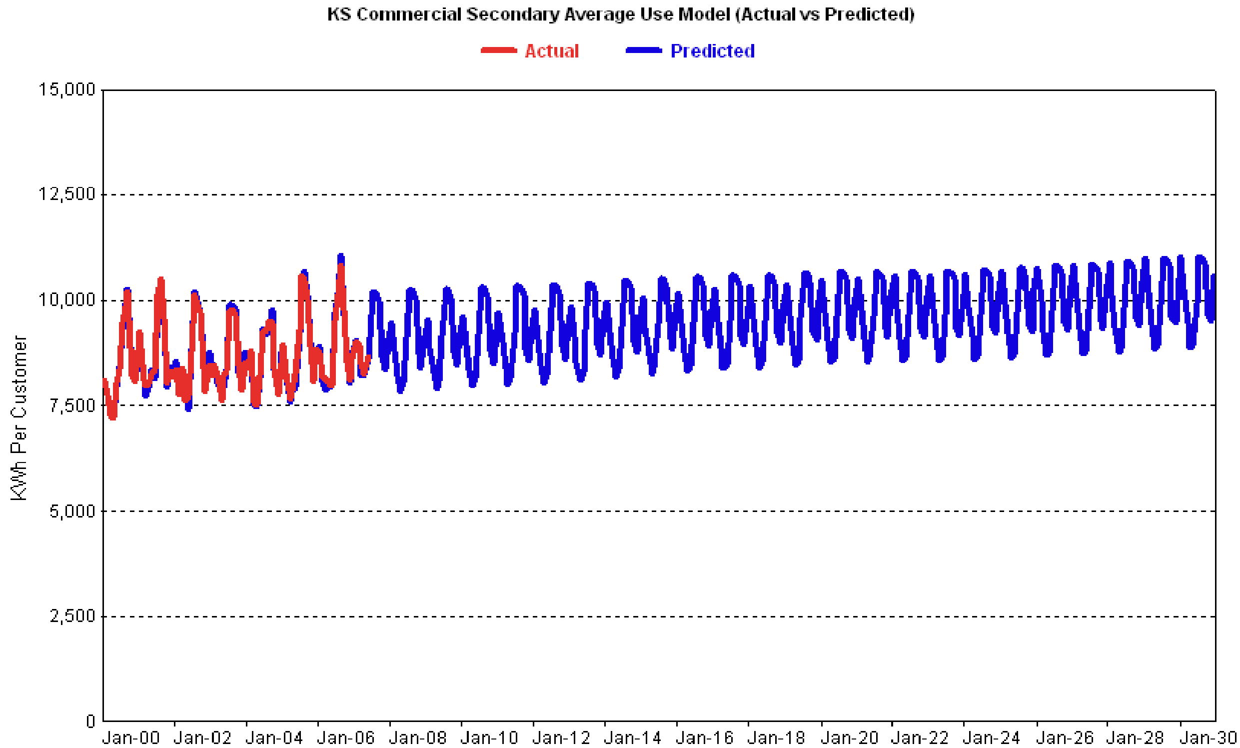
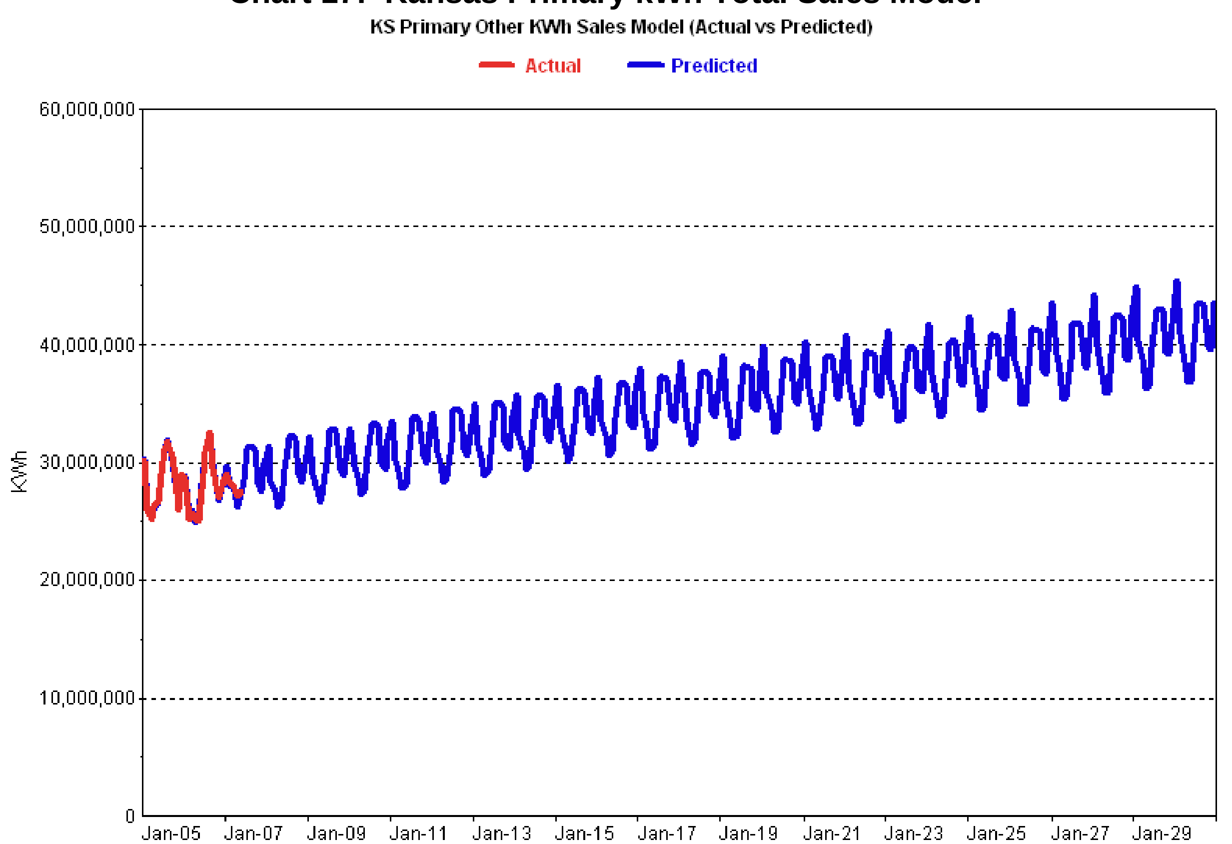


Chart 17: Kansas Primary kWh Total Sales Model



3.7 AVERAGE USE BASE CASE FORECAST

The Commercial Secondary sales forecasts are generated as a product of the customer forecast and monthly average use. Summing over the monthly model results yields the annual sales forecast.

Charts 18 through 21 show the electric forecasts for Missouri and Kansas by voltage level. The jump in Kansas commercial primary (Chart 21) is due to the Sprint Campus.

Chart 18: Missouri Commercial Secondary

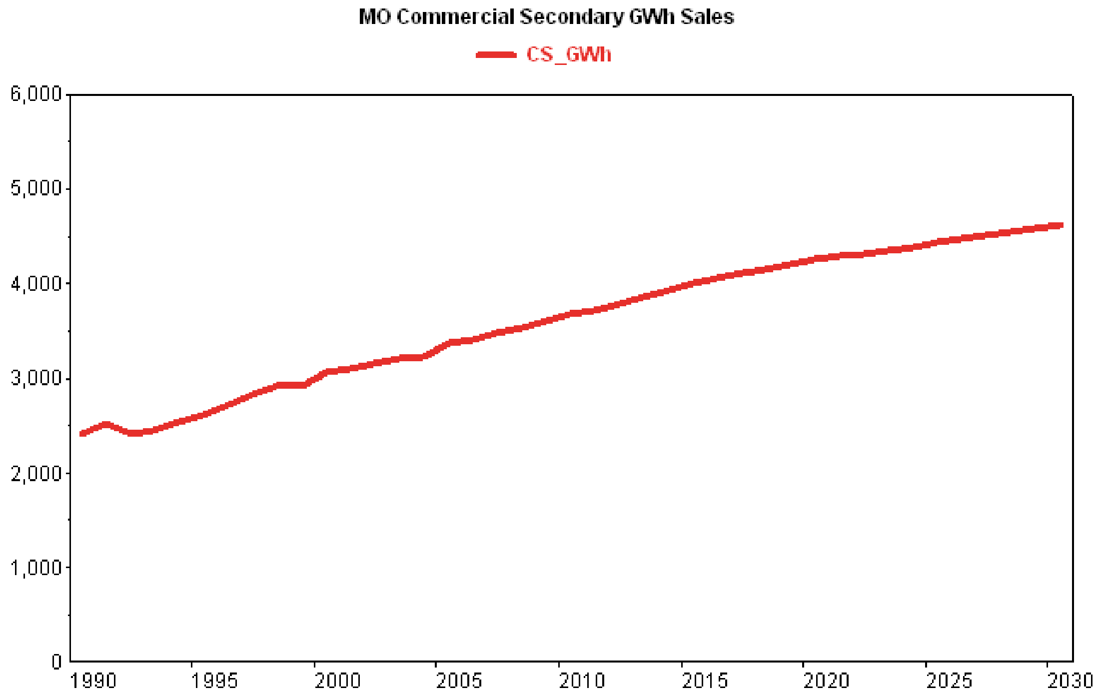


Chart 19: Missouri Commercial Primary Other

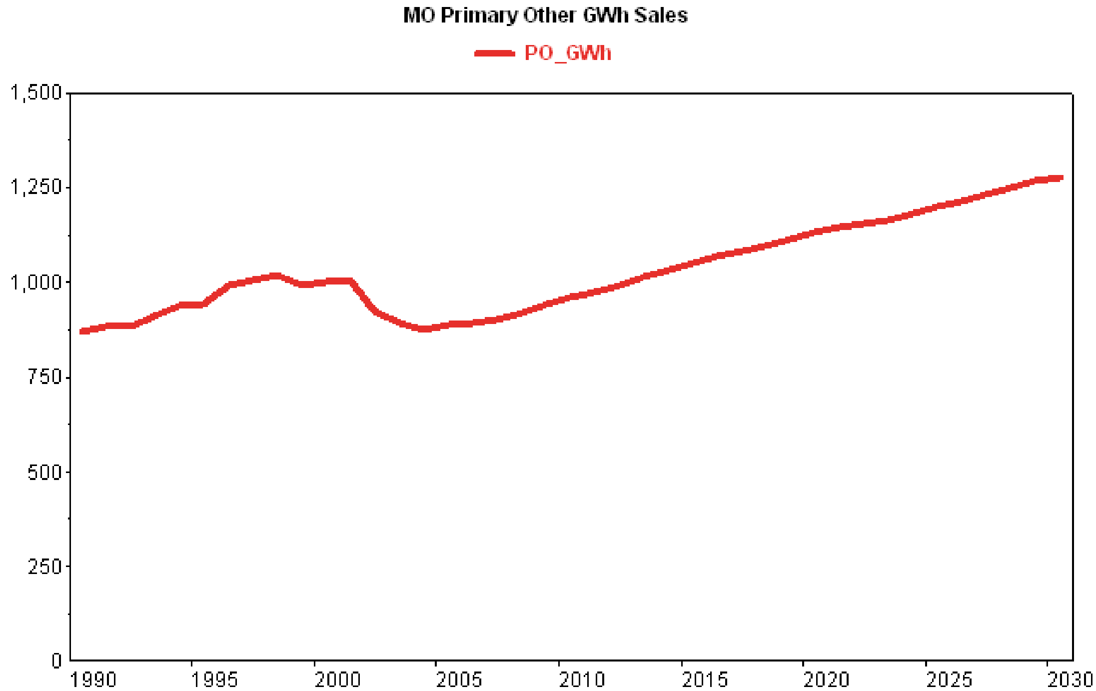


Chart 20: Kansas Commercial Secondary

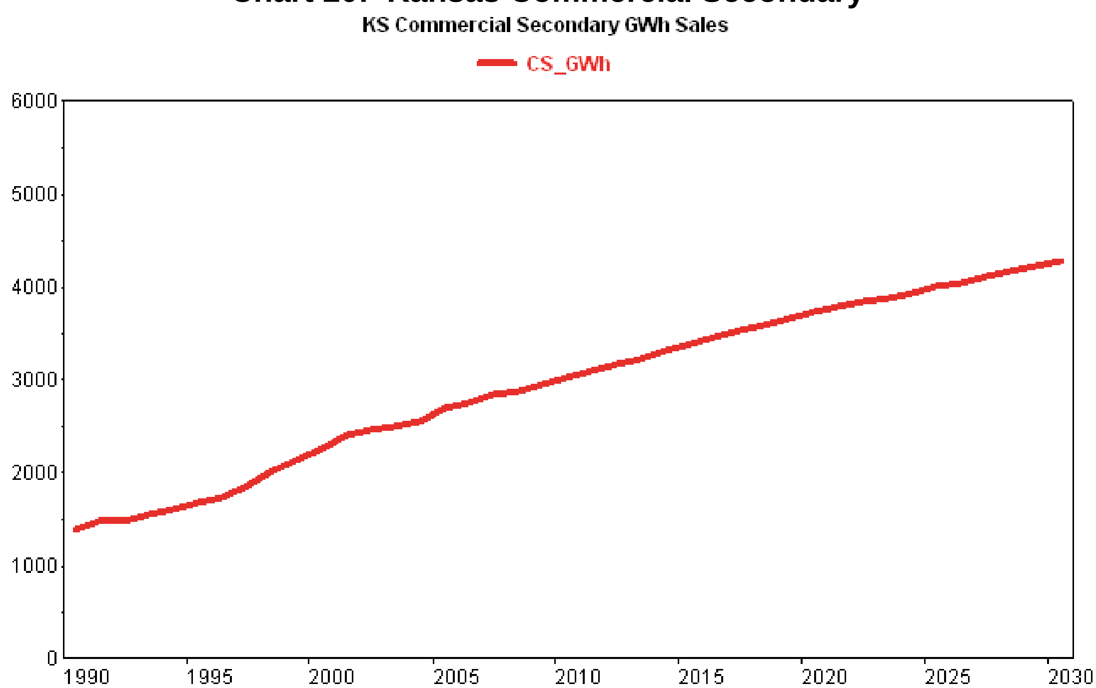
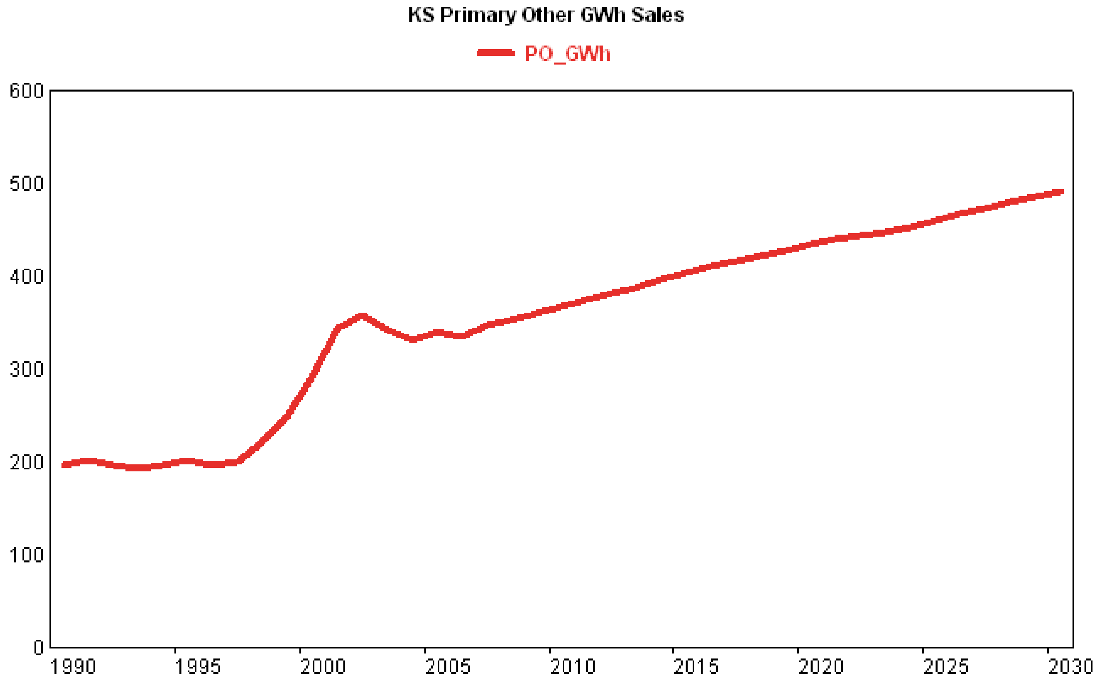


Chart 21: Kansas Commercial Primary



In the Kansas Commercial Secondary (CS) revenue class, electric heating accounts for roughly 1% of total sales, air conditioning comprises roughly 10% of total CS sales and base use accounts for 89% of estimated commercial sales. Lighting accounts for the largest share of commercial non-HVAC usage. For the West North Central region, the EIA estimates that lighting is approximately 37% of total commercial electric sales. Office and miscellaneous equipment use represents the next largest use accounting for roughly 27% of energy use.

3.8 LOAD SHAPES

Monthly end-use sales forecasted for commercial customers are combined with hourly end-use load profiles. The commercial end-use profiles are based on load research data. Refer to Section 6, Energy and Demand for information about commercial class and end-use daily load profiles and the use of these profiles in forecasting energy and demand.

SECTION 4: INDUSTRIAL

4.1 SUMMARY

Sales to manufacturing customers accounted for 14.3% of KCP&L's total retail sales in 2006. KCP&L has a relatively small manufacturing sector, and most of these customers are in the category of light manufacturing. Thus their end-use profile is more like that of commercial customers, particularly warehouses and offices, than heavy manufacturing. For this reason, ITRON adapted their SAE model for the commercial sector to KCP&L's smaller manufacturing customers served at a secondary voltage.

The industrial class billed electricity consumption is expected to increase at a 0.9% annual rate between 2007-2030. A higher rate of growth is expected on the Kansas side of KCP&L's service territory. Table 25 summarizes the industrial energy forecast.

Table 25: Industrial Historical and Forecasted Billed GWh Sales

Historical and Forecasted Billed GWh Sales Industrial			
Year	Missouri*	Kansas	Total Industrial
1990	1,363	340	1,702
1995	1,568	444	2,012
2000	1,662	409	2,071
2005	1,678	429	2,107
2006	1,701	431	2,132
2007	1,711	419	2,129
2010	1,767	454	2,221
2015	1,869	478	2,347
2020	1,949	500	2,449
2025	1,998	521	2,519
2030	2,057	539	2,596

**Excludes GST Steel*

Annual Growth Rates			
1990-1995	2.8%	5.5%	3.4%
1995-2000	1.2%	-1.6%	0.6%
2000-2005	0.2%	0.9%	0.3%
2006-2007	0.6%	-2.9%	-0.1%
2007-2010	1.1%	2.7%	1.4%
2010-2015	1.1%	1.0%	1.1%
2015-2020	0.8%	0.9%	0.9%
2020-2025	0.5%	0.8%	0.6%
2025-2030	0.6%	0.7%	0.6%
2007-2030	0.8%	1.1%	0.9%

4.2 METHODOLOGY

The SAE approach was used to develop models to forecast the sales of the manufacturing classes in Missouri and Kansas. The techniques used are similar to those used in the residential and commercial modeling. The industrial class forecast is separated at two voltage levels, Manufacturing Primary (MP) and Manufacturing Other (MO). Monthly kwh sales per customer is modeled in the MO classes and total kwh sales is modeled in the MP classes.

4.3 CUSTOMER ANALYSIS

Separate customer forecast models were constructed for each revenue class by state. Simple monthly regression models were estimated that relate manufacturing employment or gross product in manufacturing, for the Kansas City MSA to historical monthly customer data. Model adjusted R^2 varies from .04 to .94 with in-sample

MAPE of 0.9% to 8.4%. The Manufacturing Primary class has few customers with frequent monthly changes in the number of customers resulting in a higher error. Table 26 shows the model results by state and revenue class.

Table 26: Industrial Customer Model Results

	MO Manufacturing Primary	MO Manufacturing Other	KS Manufacturing Primary	KS Manufacturing Other
Estimation Period	1/1990-5/2007	12/2000-5/2007	1/1995-5/2007	1/1996-5/2007
MAPE	5.39%	0.90%	8.41%	1.59%
R^2	0.543	0.874	0.043	0.942

Kansas MO Customers		
Variable	Coefficient	T-Stat
Constant	307	0.8
Emp_Man	8.91	2.0
calibrate	7.31	0.3
Dec02	69.64	3.8
Jun99	-87.14	-4.7
AR(1)	0.917	26.1

Missouri MO Customers		
Variable	Coefficient	T-Stat
Constant	11.707	0.3
Emp_Man	0.580	1.1
LagDep(1)	0.945	24.5
AR(1)	-0.533	-5.4

Kansas MP Customers		
Variable	Coefficient	T-Stat
Constant	5.215	2.7
Gross Product, Manf	0	0.8
Customers, previous month	0.434	3.9
AR(1)	-0.329	-2.8

Missouri MP Customers		
Variable	Coefficient	T-Stat
Constant	5.864	1.2
Emp_Man	0.119	2.1
Customers, previous month	0.69	13.5

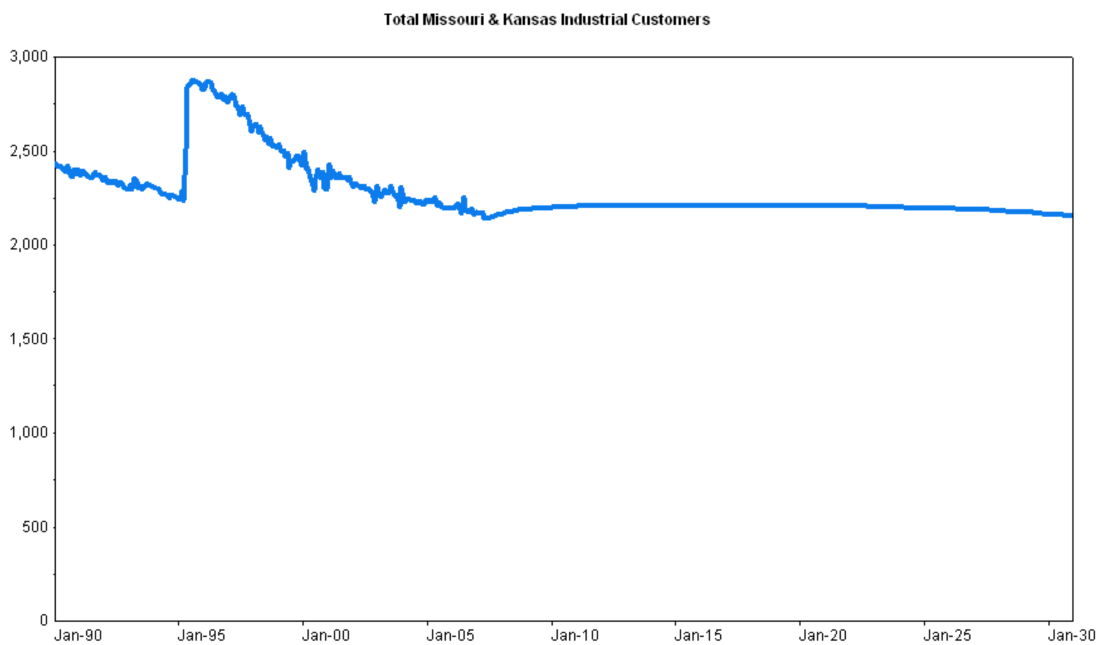
Table 27 shows historical and predicted manufacturing customers by state. Chart 22 shows historical and predicted values for the manufacturing class as a whole (MO and KS). In both Missouri and Kansas, industrial customer numbers are expected to remain steady over the forecast period 2007-2030. On a system basis, customers growth will be 0.0% per year over the 2007-2030 forecast period.

Table 27: Annual Average Industrial Customers

Historical and Forecasted Annual Average Industrial Customers			
Year	Missouri	Kansas	Total Sys Industrial
1990	1,263	1,137	2,400
1995	1,396	1,281	2,677
2000	1,259	1,106	2,365
2005	1,162	1,052	2,214
2006	1,146	1,043	2,190
2007	1,129	1,029	2,157
2010	1,144	1,058	2,202
2015	1,149	1,060	2,208
2020	1,149	1,059	2,208
2025	1,142	1,052	2,195
2030	1,124	1,034	2,158

Annual Growth Rates			
1990-1995	2.0%	2.4%	2.2%
1995-2000	-2.0%	-2.9%	-2.5%
2000-2005	-1.5%	-1.0%	-1.3%
2006-2007	-0.7%	-1.4%	-1.5%
2007-2010	0.5%	0.9%	0.7%
2010-2015	0.1%	0.0%	0.1%
2015-2020	0.0%	0.0%	0.0%
2020-2025	-0.1%	-0.1%	-0.1%
2025-2030	-0.3%	-0.3%	-0.3%
2007-2030	-0.1%	0.0%	0.0%

Chart 22: Missouri and Kansas Industrial Customers



4.4 INDUSTRIAL END-USE INDICES

Industrial end-use indicies are similar to commercial indices in that it is constructed solely using EIA's efficiency and end-use saturation series for the West North Central Census region. EIA analyzes ten different energy end-uses as part of their forecasting process.

4.5 MANUFACTURING OTHER SAE MODEL SPECIFICATIONS

The SAE modeling used for the Manufacturing Other class is similar to the commercial SAE modeling in that energy use per customer is defined in year y and month m as the sum of energy used by cooling equipment ($Cool_{y,m}$) and other equipment ($Other_{y,m}$). Formally,

Equation 30

$$Use_{y,m} = Cool_{y,m} + Other_{y,m}$$

To increase the accuracy of this end-use forecast, the variables on the right-hand side of Equation 30 are calibrated to monthly billing data.

Equation 31

$$Use_{y,m} = b_1 \, xCool_{y,m} + b_2 \, xOther_{y,m} + \varepsilon_{y,m}$$

where $XCool_{y,m}$, and $XOther_{y,m}$ are explanatory variables constructed from end-use information, weather data, and market data. The constructed end-use variables are engineering-based estimates of end-use consumption. The variables are regressed on observed average usage. The estimated model can then be thought of as a statistically adjusted end-use model, where the estimated coefficients for the end-use variables are adjustment factors. Examples for calculating XCool, and XOther for Manufacturing Primary and Manufacturing Other are shown in Table 28.

Table 28: Calculation of XCool, and XOther

XCool55_MP	EconTrans.MP_Prc_Ind ^ Elas.Price_MP * EconTrans.GPMan_Ind ^ Elas.Output_MP * MP_WthrIndex.CDD55 * Convstock (Indices.Cooling_MP)
Xother_MP	EconTrans.MP_Prc_Ind ^ Elas.Price_MP * EconTrans.GPMan_Ind ^ Elas.Output_MP * WthrTrans.MPBDays_Index * Convstock (Indices.NonHVAC_MP)
XCool55_MO	EconTrans.MO_Prc_Ind ^ Elas.Price_MO * EconTrans.GPMan_Ind ^ Elas.Output_MO * MO_WthrIndex.CDD55 * Convstock (Indices.Cooling_MO)
Xother_MO	EconTrans.MO_Prc_Ind ^ Elas.Price_MO * EconTrans.GPMan_Ind ^ Elas.Output_MO * WthrTrans.MOBDays_Index * Convstock (Indices.NonHVAC_MO) * Value (MoMults.Multipliers, 2001, month)
GMP_Index GPNonMan_Ind GP_Man Ind	Economics.GMP / IndexValues.GMP Economics.GP_Non_Man / IndexValues.GP_Non_Man Economics.GP_Man / IndexValues.GP_Man
MP_Prc_Ind MO_Pr_Ind	Price.MP / IndexValues.MP_Price Price.MO / IndexValues.MO_Price

4.6 ESTIMATED INDUSTRIAL MODEL

Manufacturing Primary (MP) models are estimated using total monthly billed sales. Manufacturing Other (MO) is estimated using SAE based average use per customer models. These models include binary indicator variables for certain months and error correction terms. The SAE and econometric models explain historical sales well with adjusted R^2 from .64 to .95 and in sample MAPE of 1.5% to 5.1%. Table 29 shows the results from the models.

Table 29: Missouri and Kansas Industrial Model Results

	MO Industrial Primary	MO Industrial Other	KS Industrial Primary	KS Industrial Other
Estimation Period	1/2001-5/2007	1/2005-5/2007	1/1995-5/2007	1/1990-5/2007
MAPE	2.99%	1.47%	5.06%	4.52%
R^2	0.636	0.951	0.887	0.893

Kansas Manufacturing Secondary Average Use

Variable	Coefficient	T-Stat
xCool60_MO	0.560	12.5
xOther_MO	0.184	2.1
july1999sep	2,859	8.9
year<2007	1,461	1.4
AR(1)	0.663	9.8
AR(2)	0.339	5.0

Missouri Manufacturing Secondary Average Use

Variable	Coefficient	T-Stat
xCool55_MO	0.878	15.0
xOther_MO	1.282	103.7
Jan	-3,308	-8.1
Jul	355	0.8
Aug	1,394	2.9
Dec	-1,771	-4.2
year<2006	-598	-1.9
AR(1)	0.304	1.4

Kansas Manufacturing Primary Sales

Variable	Coefficient	T-Stat
Constant	7,622,590	3.4
xOther_MP	43.8	3.2
xCool55_mp	648	6.4
Mar	570,249	2.7
Oct	823,522	3.7
year<2007	-442,206	-0.4
AR(1)	0.933	32.6

Missouri Manufacturing Primary Sales

Variable	Coefficient	T-Stat
xCool55_MP	471	10.1
xOther_MP	90.8	88.3
Aug2005	-30,633,448	-6.5
Jun01	11,754,061	2.6
Oct01	15,322,558	3.4
Mar02	-15,872,262	-3.3
Sep04	-15,707,158	-3.4
year<2006	-342,905	-0.3
Mar	9,335,140	4.5
Feb	-4,613,248	-2.2
Nov	-7,225,299	-3.3
Jul	-5,739,994	-2.3
AR(1)	-0.263	-2.0

Charts 23 through 26 shows resulting actual and predicted values for each of the Industrial revenue classes.

Chart 23: Missouri Manufacturing Primary

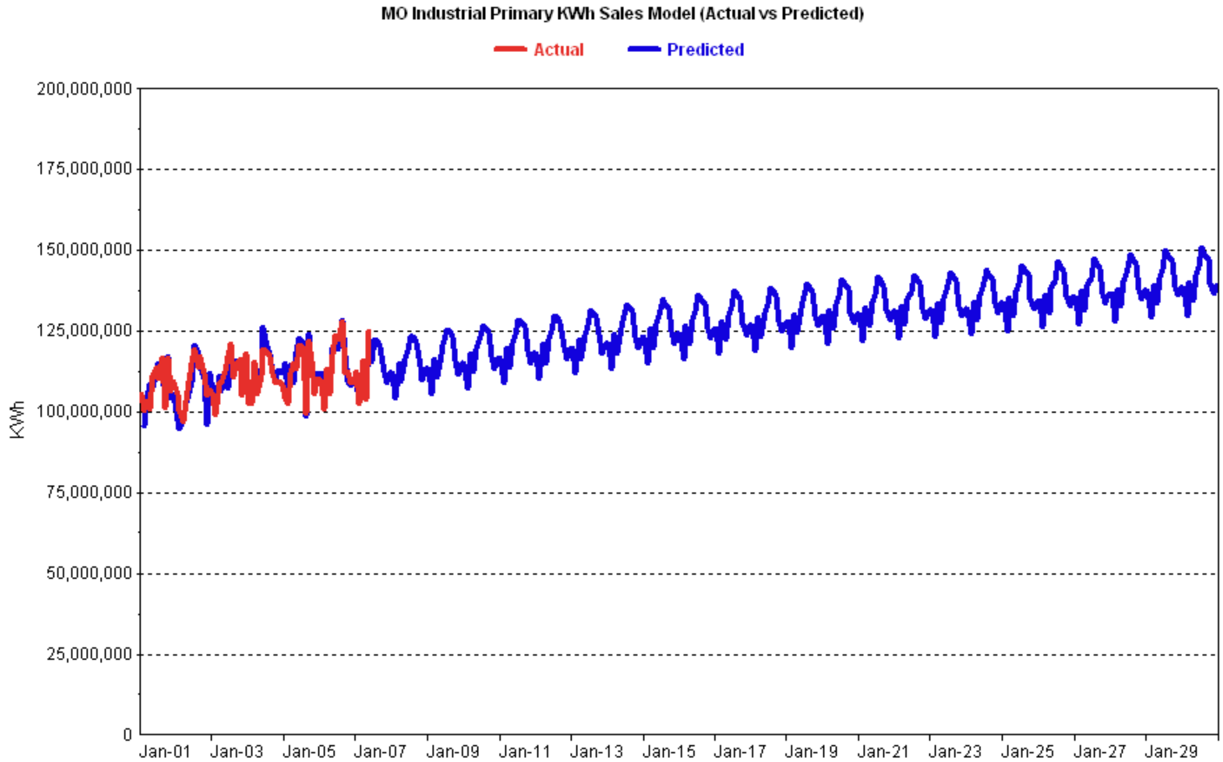


Chart 24: Missouri Manufacturing Other

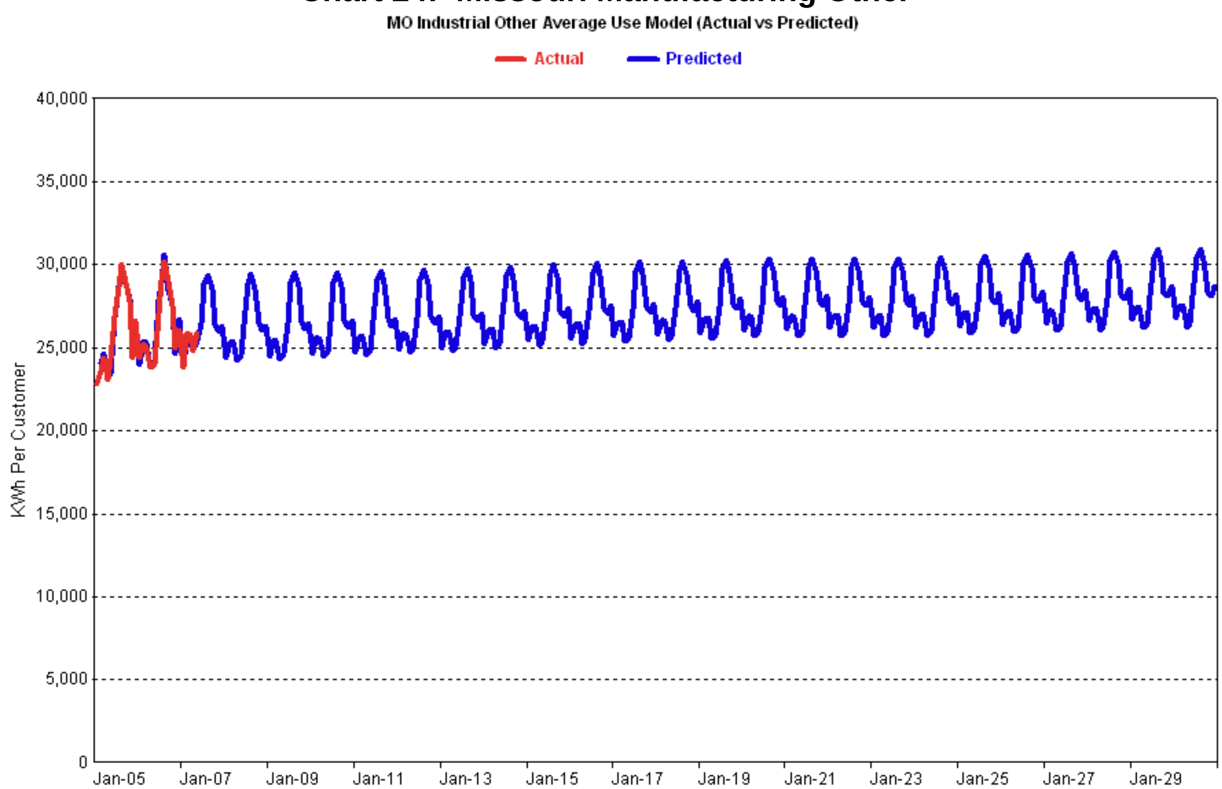


Chart 25: Kansas Manufacturing Primary

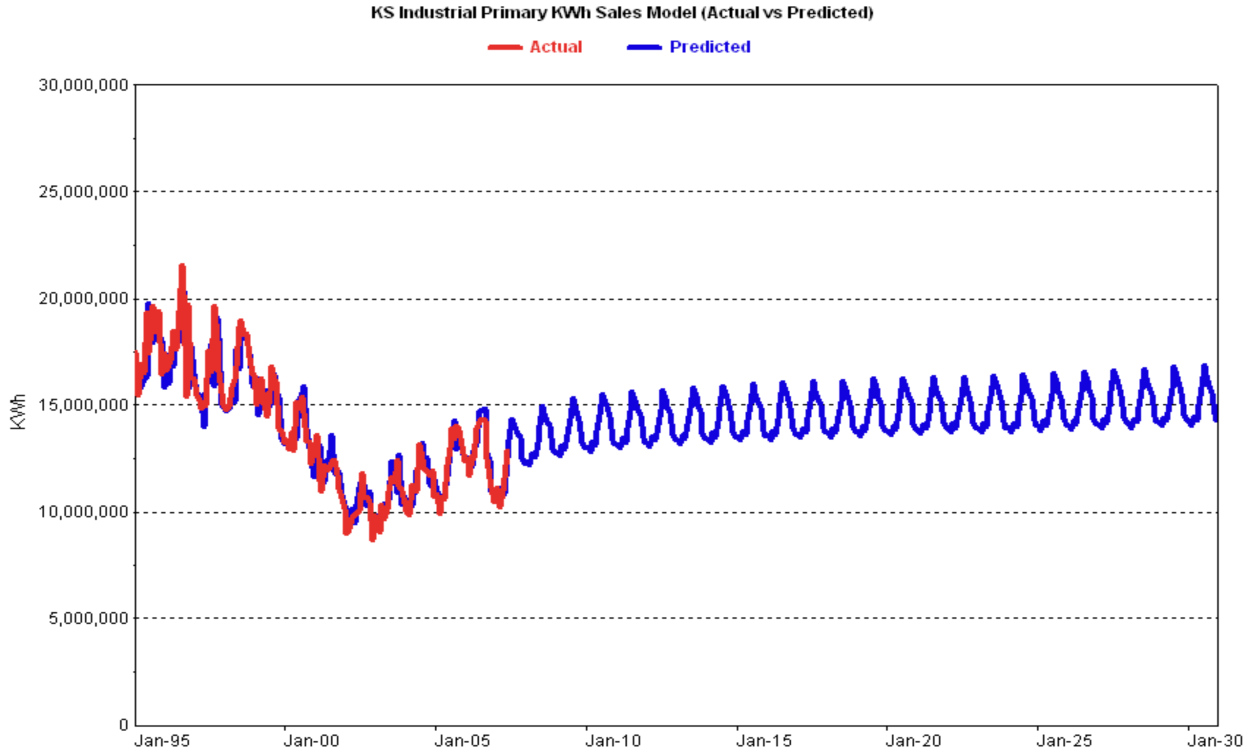
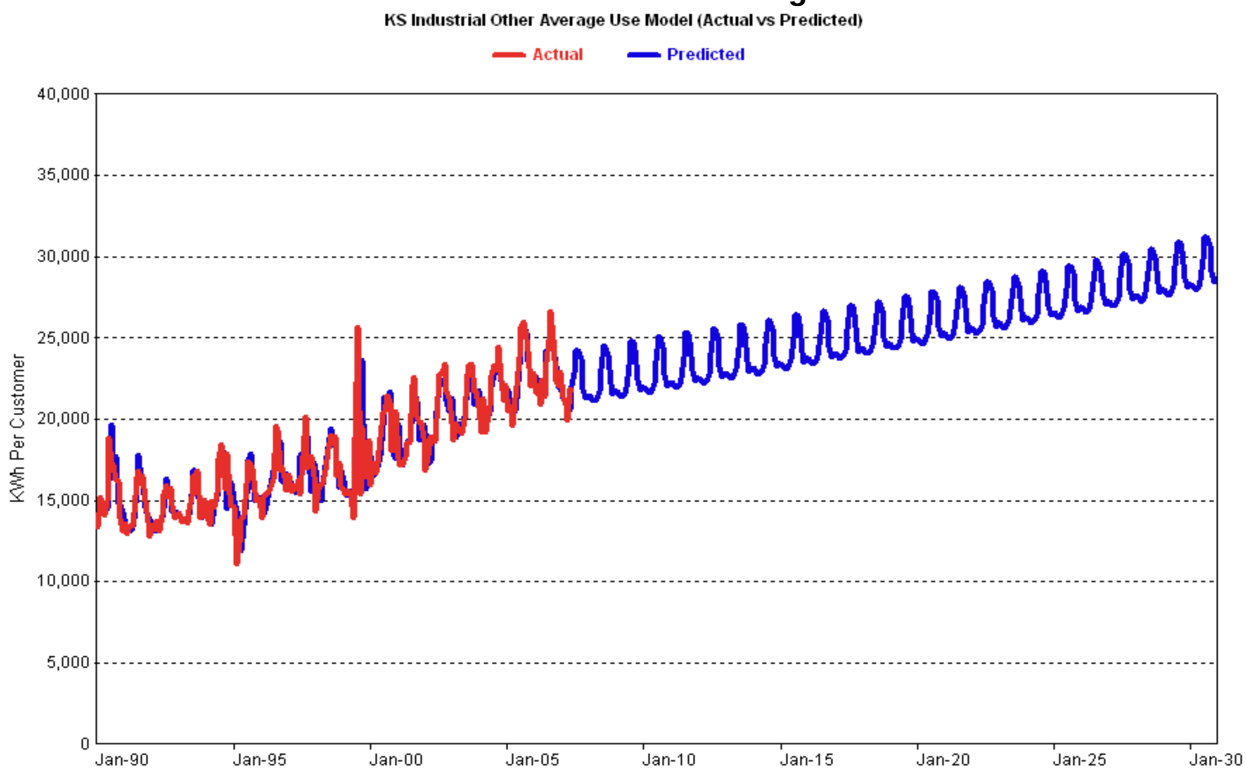


Chart 26: Kansas Manufacturing Other



4.7 BASE CASE FORECAST

Total industrial sales forecast are generated as a product of the monthly sales (Manufacturing Primary) and monthly average use (Manufacturing Other). Charts 27 through 30 show the annual energy forecast for Missouri and Kansas industrial revenue classes.

Chart 27: Missouri Manufacturing Primary Base Annual Forecast

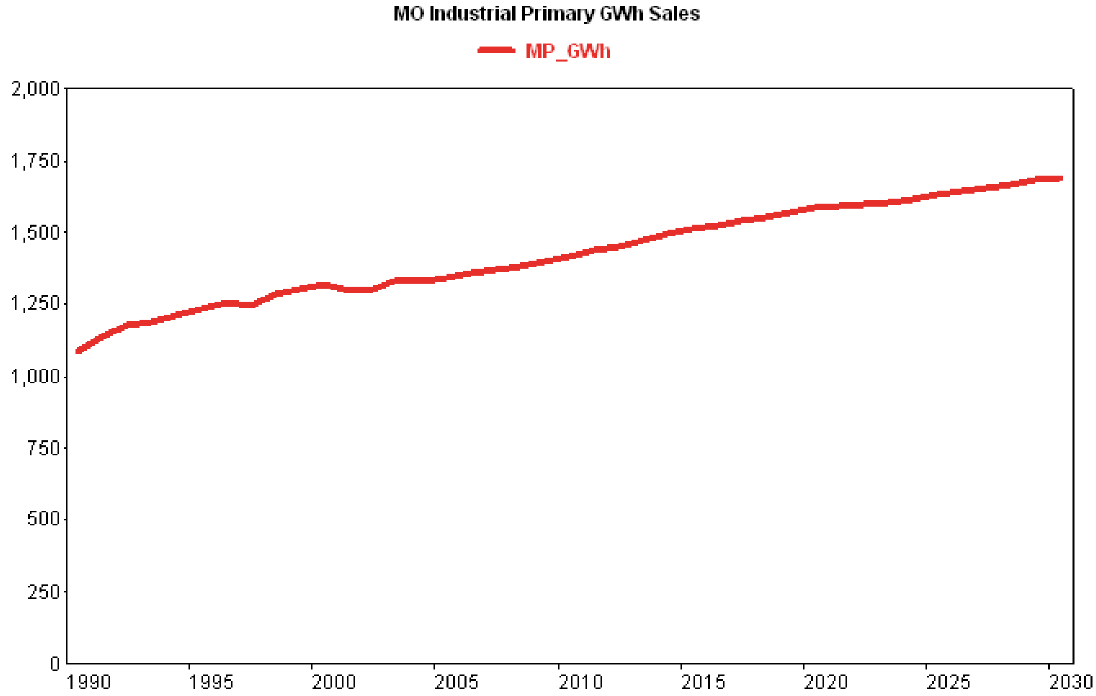


Chart 28: Missouri Manufacturing Other Base Annual Forecast

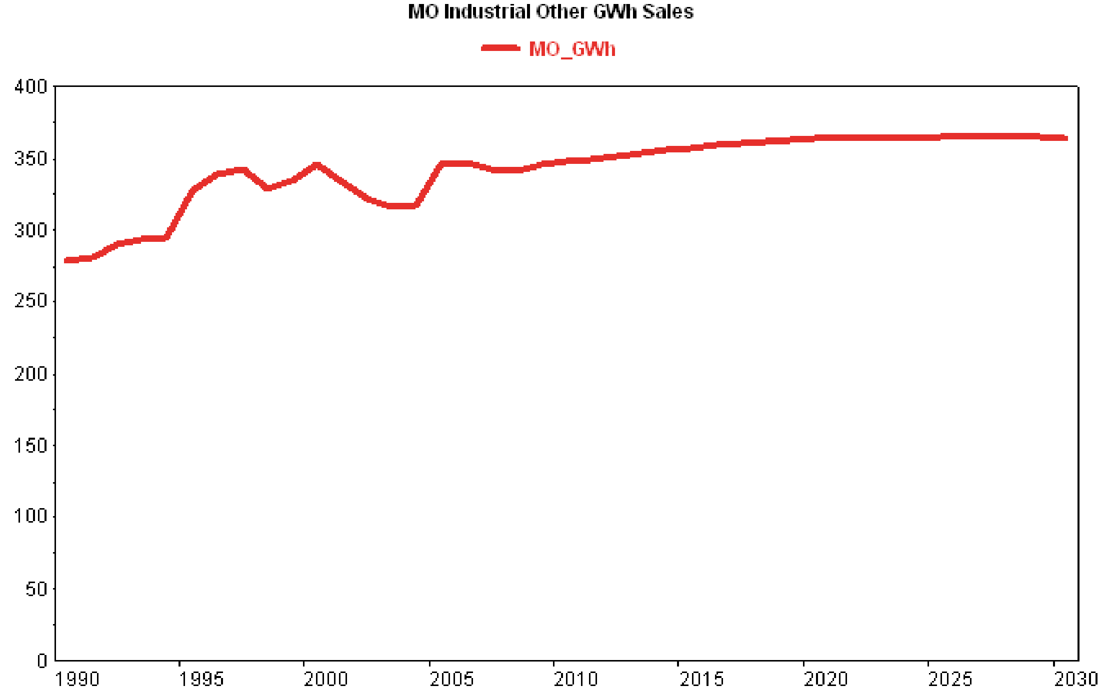


Chart 29: Kansas Industrial Primary Base Annual Forecast

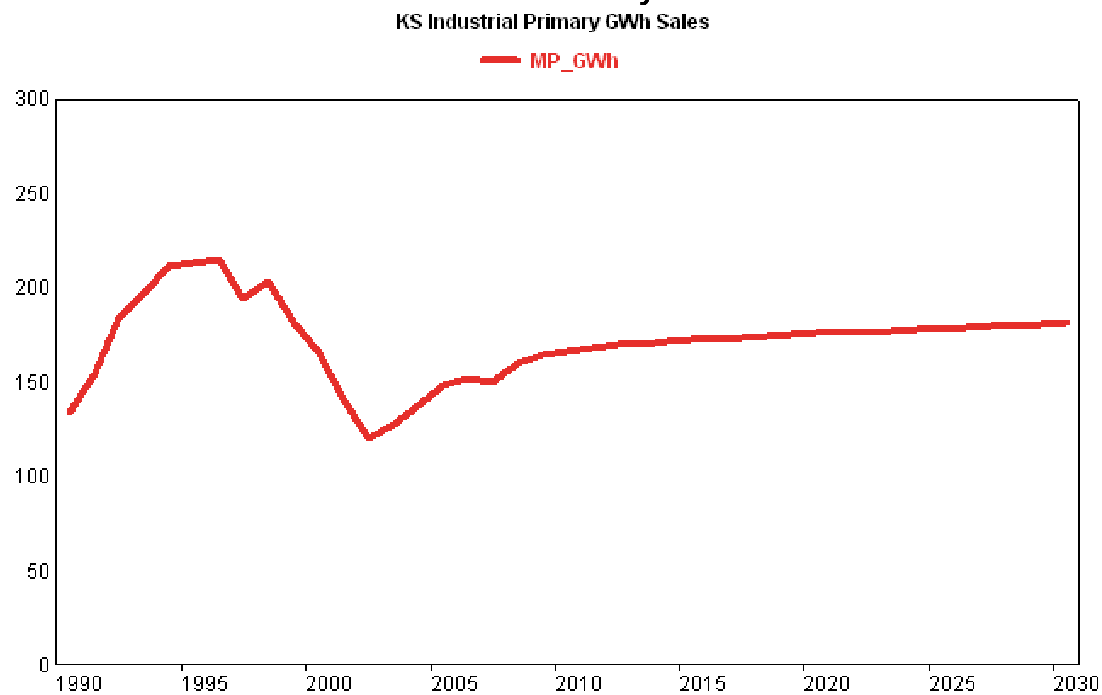
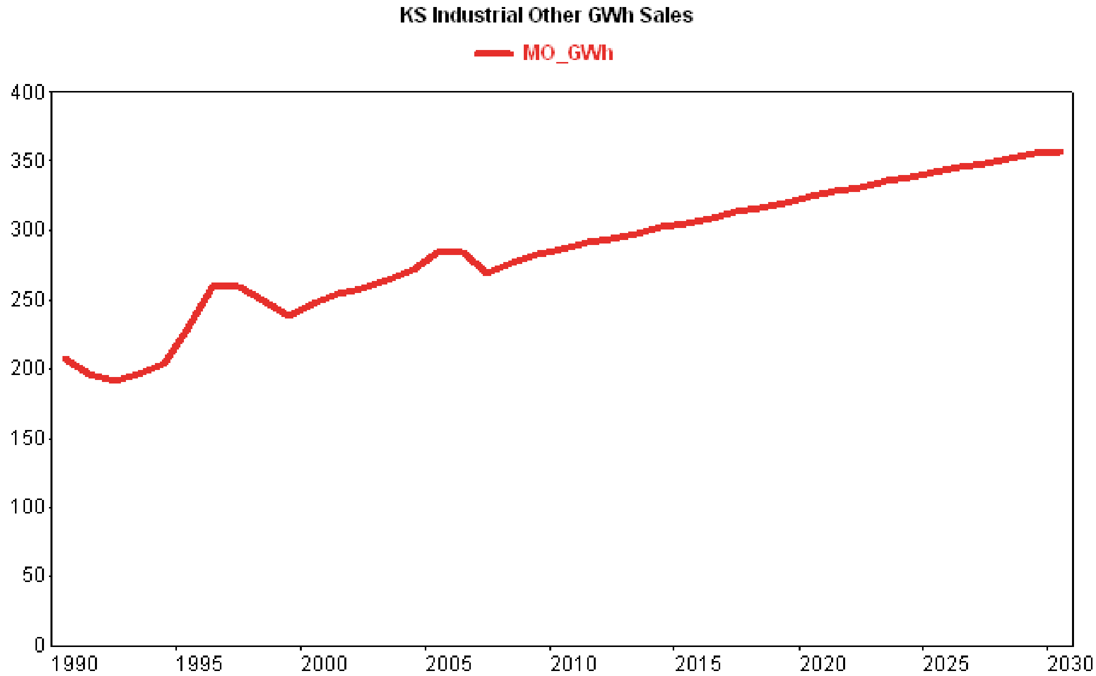


Chart 30: Kansas Industrial Other Base Annual Forecast



4.8 LOAD SHAPES

The industrial end-use profiles are based on load research data. Refer to Section 6, Energy and Demand for information about Industrial class and end-use daily load profiles and the use of these profiles in forecasting energy and demand.

SECTION 5: OTHER RETAIL SALES

5.1 SUMMARY

The Public Street Light and Traffic Signals classes account for less than one percent of total system sales. Sales for this group are expected to grow at 1.4% percent over the 2007-2030 forecast.

Table 30: Other Retail GWh Sales

Historical and Forecasted Billed GWh Sales Other			
Year	**Street Lights**	**Traffic Signals**	**Total Other**
1990	68.8	1.2	70.1
1995	64.1	1.4	65.5
2000	74.4	1.6	76.0
2005	80.3	1.8	82.1
2006	82.8	3.0	85.8
2007	91.7	3.0	94.7
2010	99.0	3.0	102.1
2015	110.7	3.1	113.8
2020	118.7	3.1	121.8
2025	123.9	3.1	127.0
2030	127.2	3.1	130.3

Annual Growth Rates			
1990-1995	-1.4%	2.9%	-1.3%
1995-2000	3.0%	1.9%	3.0%
2000-2005	1.5%	3.1%	1.6%
2006-2007	10.7%	-0.5%	10.3%
2007-2010	2.6%	0.4%	2.5%
2010-2015	2.2%	0.2%	2.2%
2015-2020	1.4%	0.2%	1.4%
2020-2025	0.9%	0.2%	0.8%
2025-2030	0.5%	0.1%	0.5%
2007-2030	1.4%	0.2%	1.4%

5.2 STREET LIGHTING

Street lighting contributes less than one percent of total KCP&L sales. The forecast models are built from historical usage and driven by population. Table 31 shows the model coefficients for street lighting.

Table 31: Model Coefficients for Street Lighting

Kansas Street Lighting		
Variable	Coefficient	T-Stat
Constant	1,881,078	15.8
June1999	199,159	11.2
Jan	-25,387	-3.5
Feb	-337,741	-35.4
Mar	-340,173	-30.9
Apr	-581,007	-48.4
May	-703,367	-55.8
Jun	-894,874	-68.9
Jul	-810,860	-63.6
Aug	-666,927	-54.5
Sep	-545,062	-48.4
Oct	-320,721	-33.0
Nov	-132,050	-18.3
AR(1)	0.977	51.8

Missouri Street Lighting		
Variable	Coefficient	T-Stat
Constant	-9,703,159	-2.3
LagDep(1)	0	1.5
Total_Households	18,511	3.1
june2006july	382,175	5.1
year<2007	-417,259	-4.4
AR(1)	0	0.8

5.3 TRAFFIC SIGNALS

Traffic signals contribute only a small fraction to total system sales. Simple regression and ARIMA models are used.

5.4 SALES FOR RESALE

Individual class regression models were created for each state. The Missouri Sales for Resale (SFR) class consists of SFR Muni and SFR Private customer classifications and in Kansas SFR Muni and SFR COOP. SFR is expected to grow 1.4 percent per year during the 2007-2030 forecast period. Generally the drivers are weather, usage, price, and the number of households in the KC metro area. SFR customer growth is expected to remain constant during the forecast period, three customers in Missouri and five in Kansas. Table 32 shows the GWh sales for the Sales for Resale classifications.

Table 32: Sales for Resale GWh Sales

Historical and Forecasted Billed GWh Sales SFR				
Year	SFR Muni	SFR Priv	SFR COOP	Total SFR
1990	76.8	2.9	34.1	113.8
1995	36.0	3.4	39.0	78.4
2000	79.7	4.9	43.5	128.1
2005	75.8	4.9	57.4	138.2
2006	51.9	4.9	57.9	114.8
2007	32.6	5.2	60.5	98.2
2010	34.9	5.5	64.1	104.4
2015	39.1	6.0	71.8	117.0
2020	42.1	6.4	77.2	125.7
2025	44.0	6.6	80.7	131.3
2030	45.2	6.8	82.8	134.8

Annual Growth Rates				
1990-1995	-14.1%	2.9%	2.7%	-7.2%
1995-2000	17.3%	7.5%	2.2%	10.3%
2000-2005	-1.0%	0.3%	5.7%	1.5%
2006-2007	-37.3%	5.2%	4.4%	-14.4%
2007-2010	2.3%	2.1%	2.0%	2.1%
2010-2015	2.3%	1.8%	2.3%	2.3%
2015-2020	1.5%	1.2%	1.5%	1.4%
2020-2025	0.9%	0.7%	0.9%	0.9%
2025-2030	0.5%	0.4%	0.5%	0.5%
2007-2030	1.4%	1.2%	1.4%	1.4%

The model coefficients for SFR are shown in Table 33.

Table 33: Sales for Resale Model Coefficients

Kansas SFR Cooperatives		
Variable	Coefficient	T-Stat
Constant	-8,494,255	-10.3
CDD65	3,061,491	6.8
HDD55	2,893,580	6.4
Households, KC Metro	16,223	14.2
July03	-1,730,258	-6.5
Aug03	-1,645,423	-6.2
Jan07	1,079,868	3.5
Aug00	1,135,937	4.3
Sept03	-1,154,881	-4.3
Sept06	-941,842	-3.1
Oct98	1,124,350	4.3
Sept99	-802,092	-3.0
Jan03	544,474	2.0
Oct03	-805,663	-3.1
Jan	621,590	3.3
Dec	830,746	4.7
Jul	1,095,901	5.6
Aug	517,602	2.5
SAR(1)	1	8.4

Missouri SFR Private		
Variable	Coefficient	T-Stat
Constant	-467,065	-3.9
CDD65	327,659	6.8
HDD55	48,576	0.6
Households, KC Metro	1,099	6.7
Mar07	-69,732	-1.8
Feb07	111,563	2.7
Jan	90,033	5.4
Feb	77,891	5.6
Apr	-47,789	-3.8
May	-63,488	-4.3
Jun	-24,139	-1.7
Jul	50,749	4.2
Sep	-46,899	-3.8
Oct	-57,000	-4.7
Dec	111,844	8.7
AR(1)	0	4.8

Kansas SFR Municipals		
Variable	Coefficient	T-Stat
Constant	-8,494,255	-10.3
CDD65	3,061,491	6.8
HDD55	2,893,580	6.4
Households, KC Metro	16,223	14.2
July03	-1,730,258	-6.5
Aug03	-1,645,423	-6.2
Jan07	1,079,868	3.5
Aug00	1,135,937	4.3
Sept03	-1,154,881	-4.3
Sept06	-941,842	-3.1

Missouri SFR Municipals		
Variable	Coefficient	T-Stat
Constant	-467,065	-3.9
CDD65	327,659	6.8
HDD55	48,576	0.6
Households, KC Metro	1,099	6.7
Mar07	-69,732	-1.8
Feb07	111,563	2.7
Jan	90,033	5.4
Feb	77,891	5.6
Apr	-47,789	-3.8
May	-63,488	-4.3

SECTION 6: ENERGY AND DEMAND FORECAST

6.1 OVERVIEW

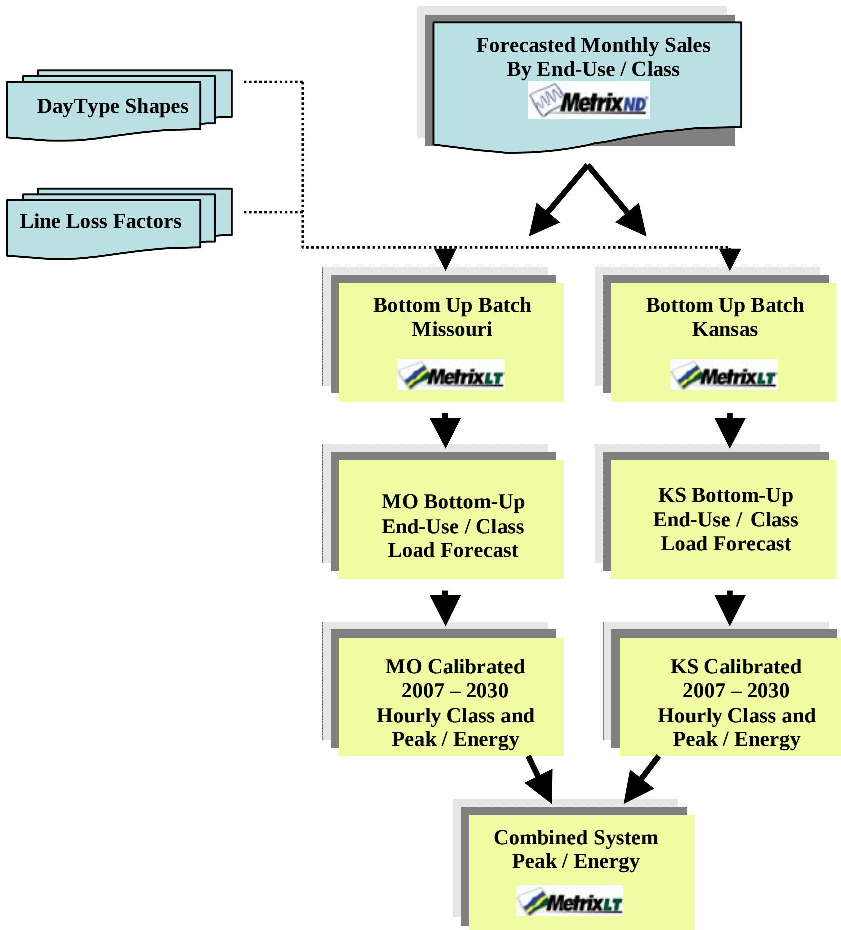
This section provides an overview of the models used to construct an hourly load and peak demand forecast, which was developed using *MetrixLT* software.

MetrixLT is designed to generate an hourly load peak forecast by combining end-use and class energy with hourly load profiles. This “bottom-up” approach entails integrating end-use sales forecasts with end-use and class hourly load forecasts, aggregating the class and revenue class load forecasts.

Monthly end-use sales for residential, commercial, industrial, and monthly sales forecast for street lighting are combined with hourly end-use and class hourly day-type profiles, which were constructed from 2006 load research data.

An initial hourly load forecast is then generated by summing across the end-use and class hourly load forecasts and adjusting the resulting hourly load forecast for system losses. The system load model is then used to generate monthly class and system peak forecasts for 2008 to 2030. Figure 1 depicts the forecast process.

Figure 1: Flow Chart for the Hourly Load and Peak Forecast Process



6.2 FORECAST METHODOLOGY

The following steps are used to develop the energy and peak forecast:

Step 1: Construct residential, commercial, and industrial end-use profiles by state

The residential, commercial, and industrial end-use profiles are generated using 2006 load research data and imported into *MetrixLT* as "daytype" profiles. KCP&L developed daytype profiles for heating, cooling, and other use by class and state. The daytype profiles represent typical usage patterns for a weekday, weekend, and peak day. A separate set of profiles was provided for each month. The result is an hourly end-use profile. A Street lighting profile is constructed as a *daytype* model. The profiles are then imported into the *MetrixLT* project file as *Daytype Data*. Hourly daytype profiles generated for Missouri residential, commercial, and industrial can be found in Appendix 3.D. Examples of Kansas daytype profiles can be found in Appendix 3.E.

6.2.1 HOURLY END-USE CLASS LOAD FORECASTS

Step 2: Develop Missouri and Kansas hourly end-use class load forecasts

Hourly load profiles for Missouri and Kansas are developed for residential, commercial, industrial, street lighting, and resale. Class profiles are generated through the forecast period based on a calendar and normal weather conditions.

Residential, Commercial, & Industrial Hourly Load Forecasts. The residential, commercial and industrial end-use hourly load forecasts are generated by combining the monthly end-use sales forecasts with the end-use *Day-type* profiles. *MetrixLT* allocates the monthly end-use sales forecasts to each hour in the year based on the end-use profile. The end-use hourly load forecasts are then summed and adjusted for line losses to generate a hourly load forecast.

Street Lights & Resale Hourly Load Forecasts. Combining the class sales forecasts with the class hourly load profiles generates hourly load forecasts for street lighting and resale sectors. The monthly hourly load forecasts are allocated to each hour of the year based on the class profiles. Profiles are adjusted for line losses.

Charts 31 and 32 show the resulting seasonal Missouri residential and commercial hourly end-use class load forecast.. Hourly end-end-use class load forecast for Missouri can be found in Appendix 3.F **Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.**and Kansas in Appendix 3.G.

Chart 31: MO Residential End-Use Forecast

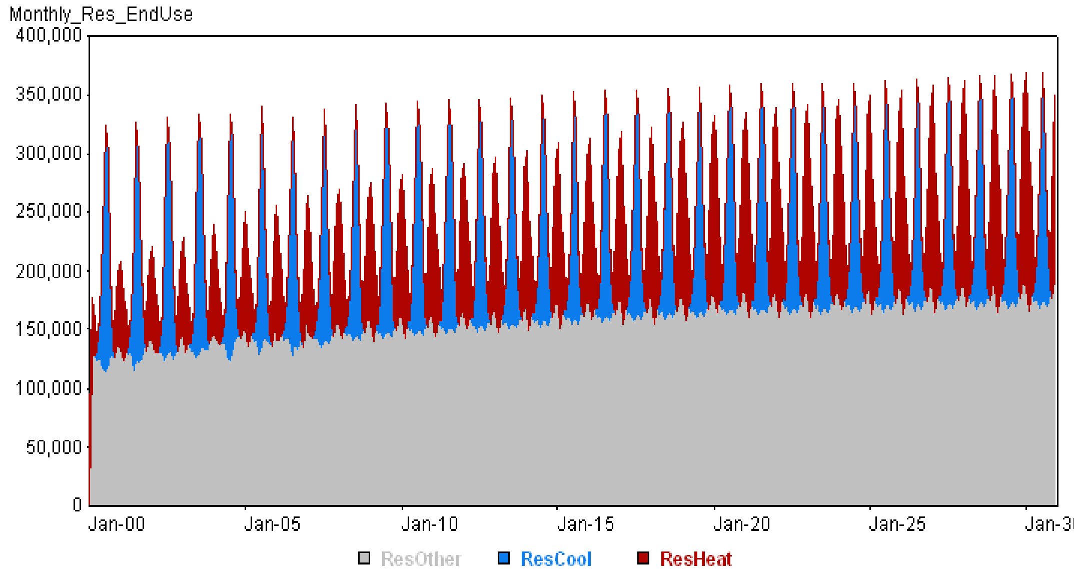
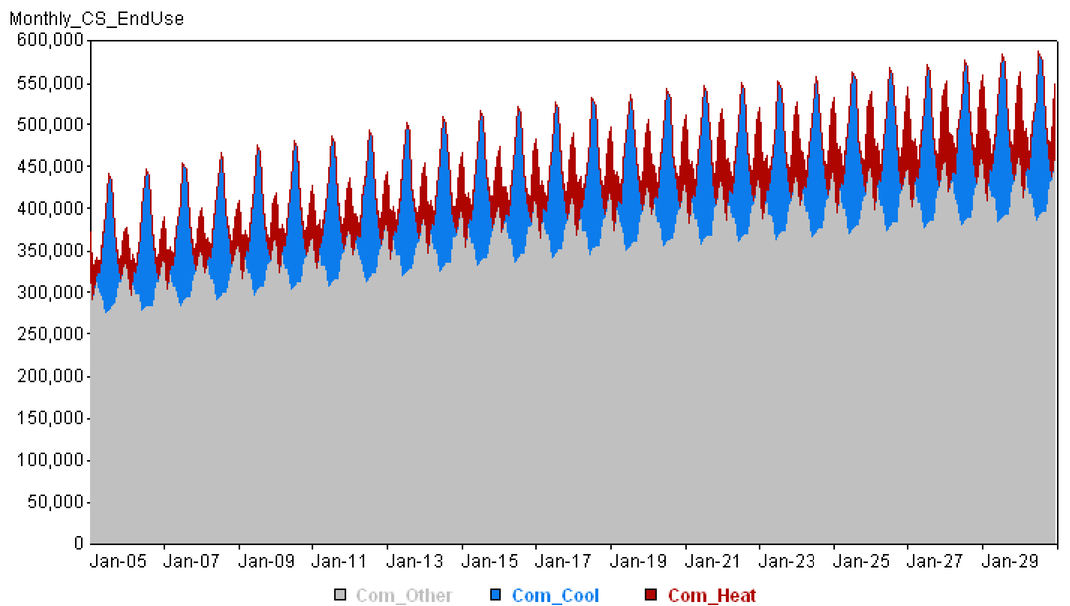


Chart 32: MO Commercial Load Profile



Step 3: Construct Missouri and Kansas system hourly load forecast

The hourly load forecast is constructed by combining the end-use and class monthly sales forecast with the end-use and class hourly load profiles generated in Steps 1 and 2. The bottom-up forecast is built using a *Batch Transform* object.

Initial State Level Hourly Load Forecast. Separate state files are created in *MetrixLT* for both Missouri and Kansas. The initial state level system hourly load forecasts are calculated by summing the class hourly load forecasts. Charts 33 and 34 shows the resulting Missouri and Kansas system load.

Chart 33: Missouri System Hourly Load

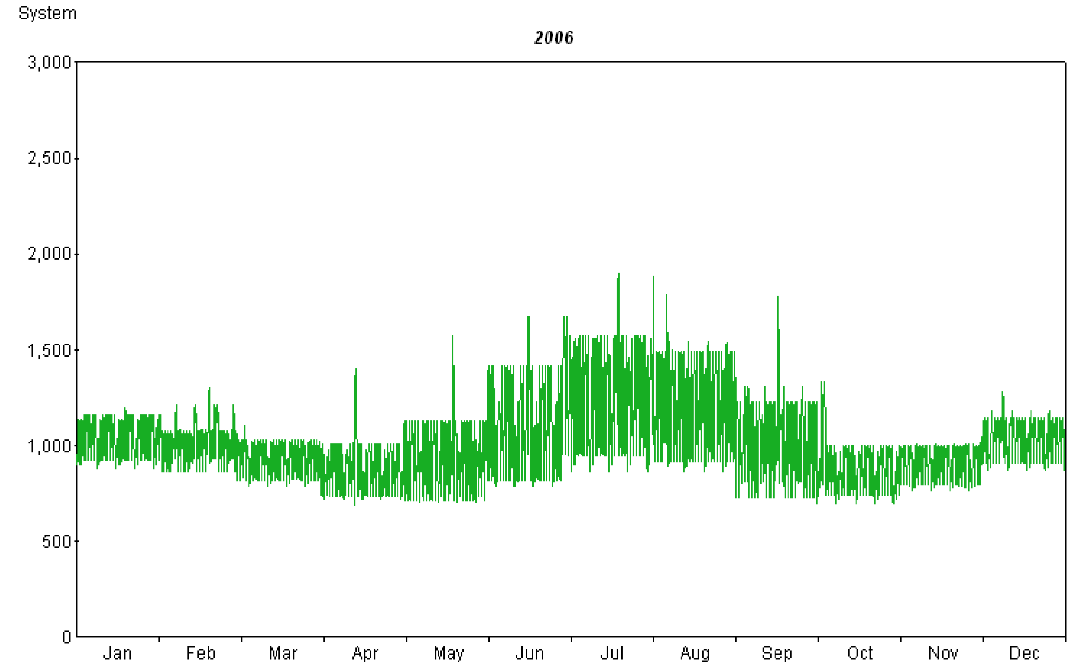
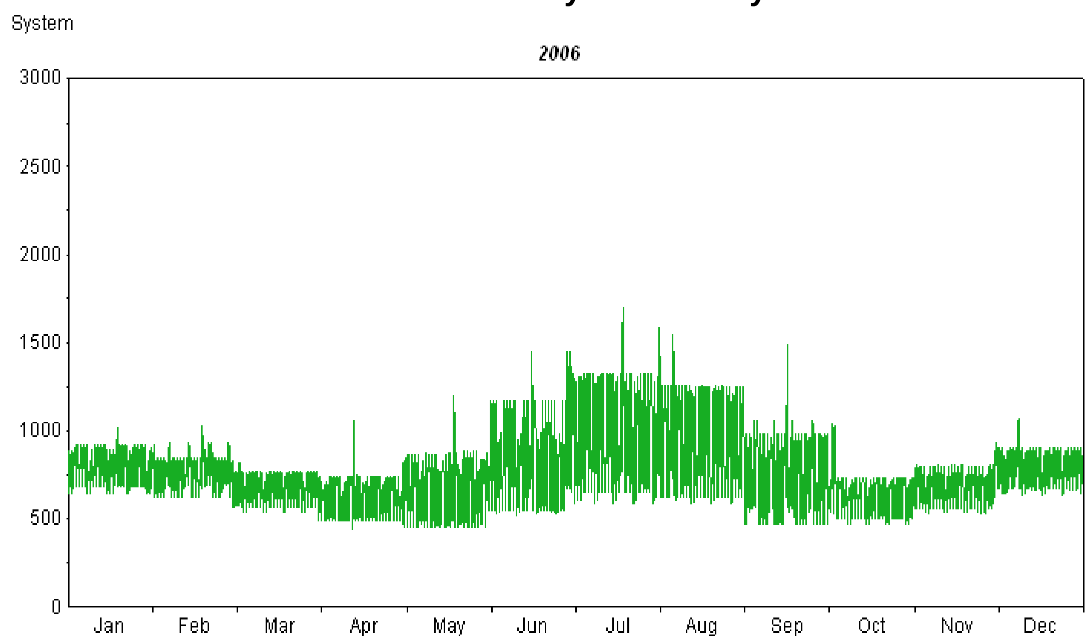


Chart 34: Kansas System Hourly Load



Step 4. Combine Missouri and Kansas Bottom-Up Forecast to System Hourly Load

The Missouri and Kansas "bottom-up" hourly load forecast is combined in *System MetrixLT* file*.* Each forecast is imported in to MetrixLT as an *Interval Data* table. Then comibined in a *Batch Transform* table to create the hourly system load. Monthly and annual system forecasts are created through the use of a *Frequency Transform* table. Chart 35 shows the combined monthly system hourly load for KCP&L and Chart 36 shows the resulting monthly peak shape.

Chart 35: KCP&L System Hourly Load

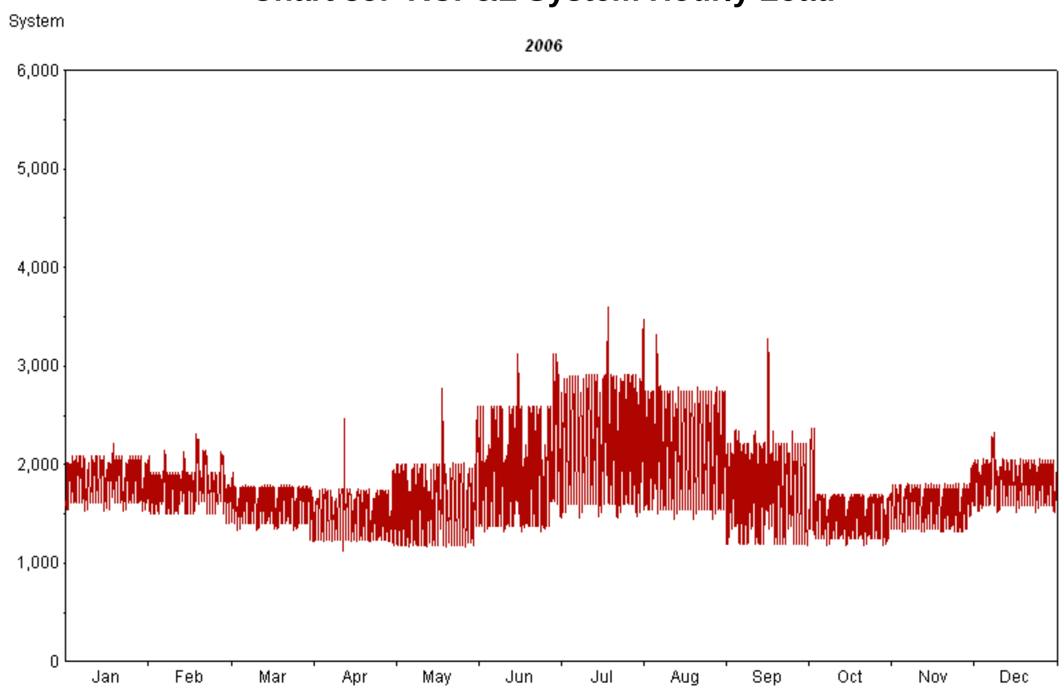
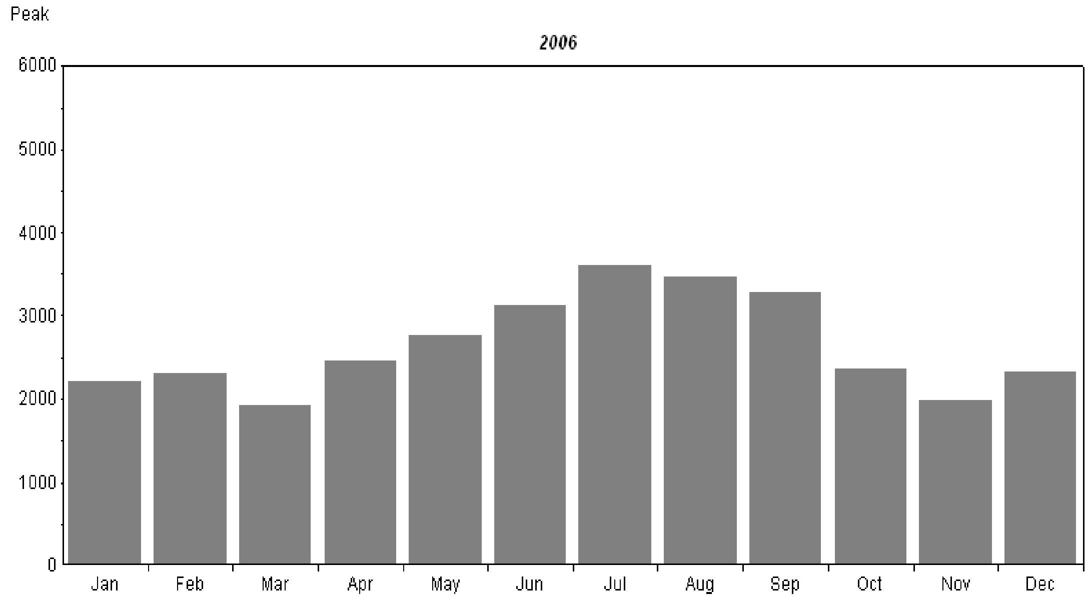


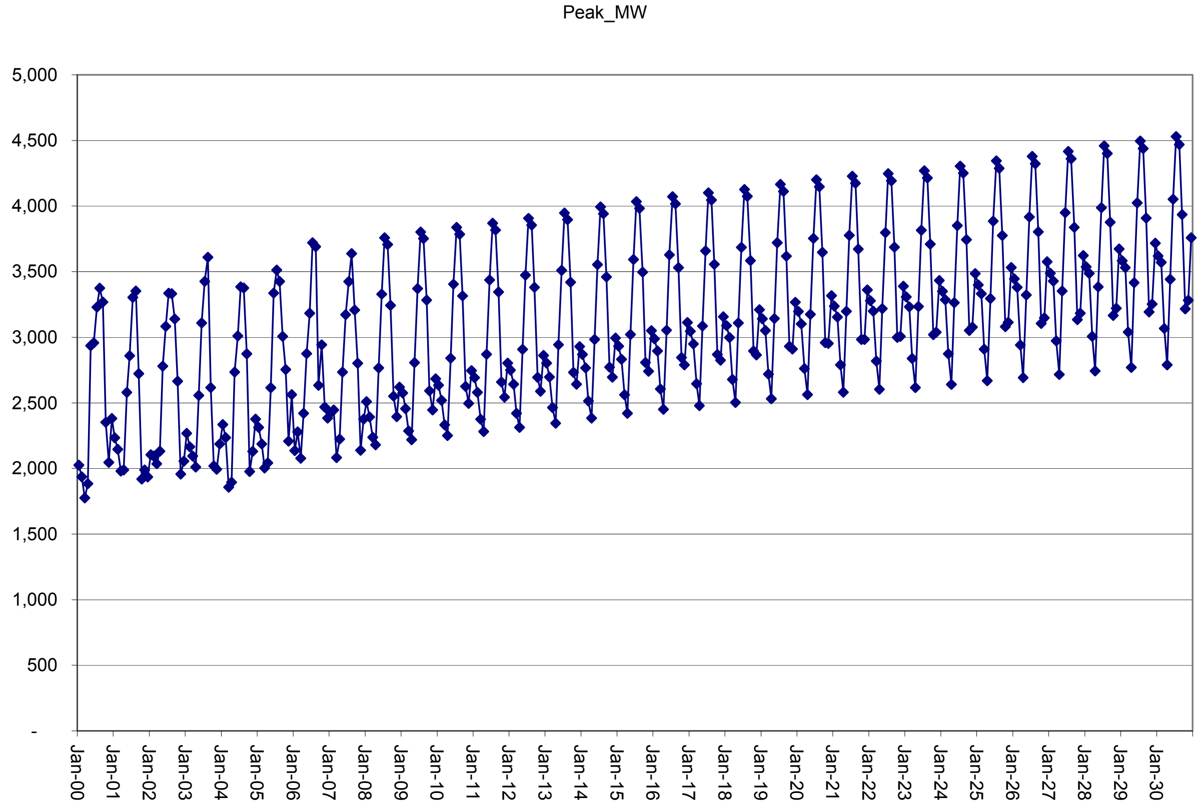
Chart 36: KCP&L System Peak



6.3 <u>RESULTS</u>

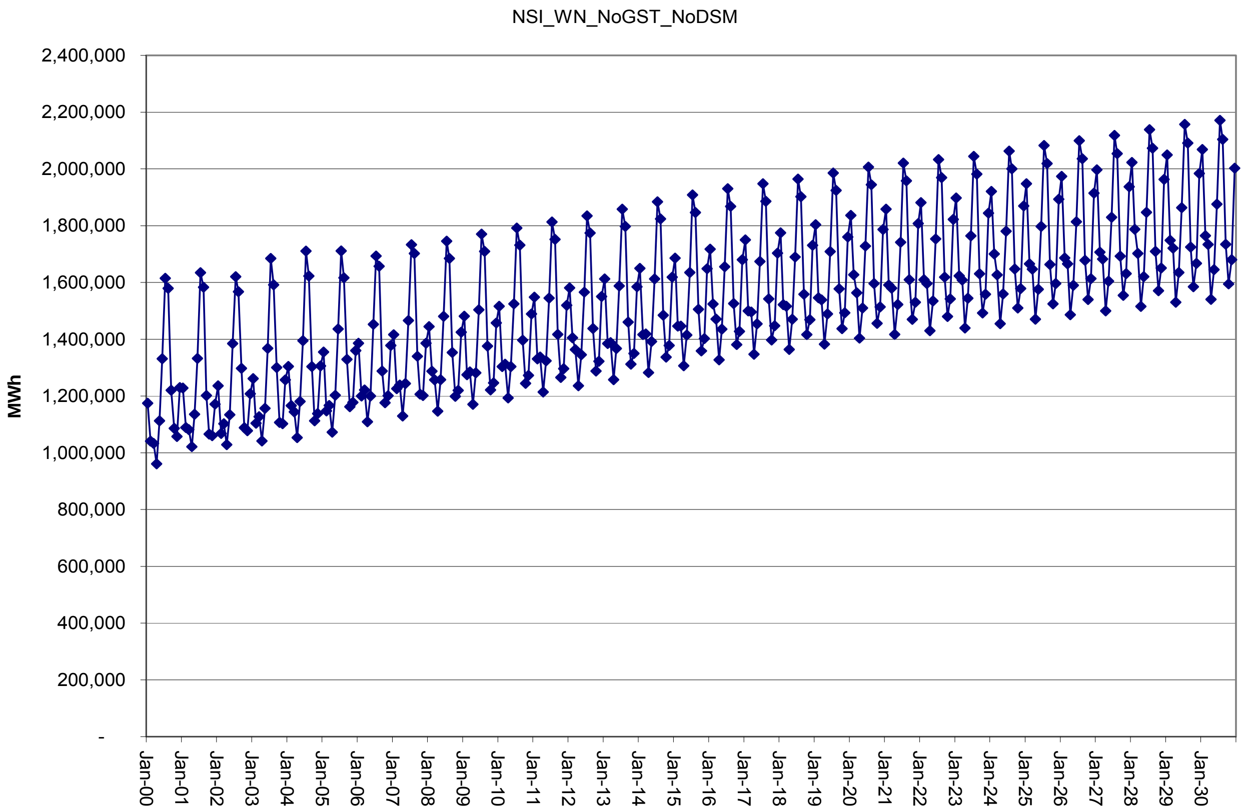
Charts 37 and 38 show forecasted monthly peaks and system energy through 2030. The figure shows actual system peaks and energy from January 2000 to May 2007 and peak and energy forecasts based on normal weather conditions less DSM from existing programs from June 2007 to December 2030. The system peak occurs in July with the system peak growing at an average annual growth rate of 0.9%. This compares with system energy growth rate forecast of 1.3%. DSM impacts for energy were accounted for after completing the hourly load and peak forecast process.

Chart 37: Monthly System Weather Normalized Peak Forecast (MW) Excludes DSM



GST Steel historical data has been removed

Chart 38: Monthly Weather Normalized NSI Forecast (MWH) Excludes DSM



GST Steel historical data has been removed.

SECTION 7: IRP RULES COMPLIANCE

Pursuant to Rule 22.030 (1) (A): KCP&L maintains data bases with customer class detail. The data bases are stored in Metrix ND project files with the following file names:

MOResSales.ndm
MOComSales.ndm
MOIndSales.ndm
KSResSales.ndm
KSComSales.ndm
KSIndSales.ndm

The data bases contain customer monthly kwh usage for each customer class starting in 1990.

Pursuant to Rule 22.030 (1) (A) 1: The data bases are maintained for each of the following customer classes:

Major Class	Subclasses
Residential	none
Commercial	Commercial Secondary (CS)
	Primary Other (PO)
Manufacturing	Manufacturing Other (MO)
	Manufacturing Primary (MP)
Lighting	Traffic Signals
	Street Lights
Sales for Resale	Cooperative, Municipal and Private

Pursuant to Rule 22.030 (1) (A) 2: KCP&L does not use subclasses for the residential sector. KCP&L's billing statistics do not track customers by dwelling type. However, and end-use forecast is constructed with data from the US DOE and KCP&L's customer surveys that incorporates trends in energy use by dwelling type and this forecast is incorporated into the explanatory variables used in KCP&L's residential models for Kansas and Missouri.

Subclasses for the commercial and industrial sector distinguish customers by voltage, primary or secondary. KCP&L's models are fit to monthly billing statistics and these do not distinguish customers by building or product type. However, these models include explanatory variables, constructed with DOE data and forecasts, that are based on business type. The explanatory variables for the industrial sector were based on business rather than product type because most of the manufacturing in KCP&L's service area is light rather than heavy. Thus most of the energy use is considered to be end-use related rather than process related.

Pursuant to Rule 22.030 (1) (B) 1: For each customer class, the data bases listed in 1.A include monthly kwh, number of customers, revenue and weather-normalized kwh if weather sensitive. The data is maintained separately for Kansas and Missouri.

Pursuant to Rule 22.030 (1) (B) 2: Actual and weather normalized demands at the time of the system peak are maintained for each major class in the following Metrix ND project files:

Residential.ndm
Commercial.ndm
Industrial.ndm
ReSale.ndm

Pursuant to Rule 22.030 (1) (B) 3: Actual and weather normalized net system input is maintained in System.ndm.

Pursuant to Rule 22.030 (1) (C) 1: KCP&L forecasts energy use for the following units:

Subclass	Units
Residential:	Customer
Commercial Secondary:	Customer
Commercial Primary:	none
Manufacturing Secondary:	Customer
Manufacturing Primary:	none

For the manufacturing and commercial classes, KCP&L uses a two-step process in modeling kwh sales. The first step relies on an estimate of energy use per square foot.

For both CS and MO, KCP&L uses US Department of Energy (DOE) data to forecast energy use per square foot and then multiplies that by a calibration coefficient to compute energy use per customer and then uses this result to forecast sales per customer.
For both PO and MP, KCP&L uses US Department of Energy (DOE) data to forecast energy use per square foot and then multiplies that by a calibration coefficient to compute energy use and then uses this result to forecast total sales for the class.

This Statistically Adjusted End-use (SAE) approach was adopted because it incorporates end-use and efficiency trends that can be calibrated to monthly billing data.

Documentation for the DOE models can be found at:

http://tonto.eia.doe.gov/reports/reports_kindD.asp?type=model%20documentation

Pursuant to Rule 22.030 (1) (C) 2: KCP&L updates the models described in this filing once a year. The Metrix ND model files were listed in section 22.030 (1) (A) above. First, actual heating and cooling degree days are uploaded into models along with recent billing data, including the number of customers and kwh sales. Then the models compute weather normalized monthly sales and the monthly weather impacts. This is done routinely during the summer of each year.

Pursuant to Rule 22.030 (1) (C) 2. A: The models used in the current KCP&L filing include multiple cooling degree day variables, if statistically significant, to create a piecewise linear temperature response function.

Pursuant to Rule 22.030 (1) (C) 2. B: In each model that is weather sensitive, KCP&L forecasts the heating, cooling and non-weather sensitive components of sales for each year in the forecast period, 2008-2020. These are summed to forecast total sales. The forecast is computed in the regression models in each Metrix ND project file. The project files are

MOResSales.ndm
MOComSales.ndm
MOIndSales.ndm
KSResSales.ndm
KSComSales.ndm
KSIndSales.ndm

Pursuant to Rule 22.030 (1) (C) 2. C: KCP&L fully documented its load forecasting method[1]s and results in its IRP filing.

Pursuant to Rule 22.030 (1) (D): The data base files listed in Section 1.A begin in 1990 and thus contain more than 15 years of data.

Pursuant to Rule 22.030 (1) (D) 1: The Commission granted KCP&L a waiver under "Order Granting Kansas City Power and Light Company's Request for Waivers", Case No. EE-2008-0034, dated October 5, 2007, (Order) Attachment A, Item 1, which allowed for the starting date of January 1990 for this filing. Actual and weather normalized sales are stored in Metrix ND project files with the following file names:

MOResSales.ndm
MOComSales.ndm
MOIndSales.ndm
KSResSales.ndm
KSComSales.ndm
KSIndSales.ndm

Pursuant to Rule 22.030 (1) (D) 2: The Commission granted KCP&L a waiver under the Order, Attachment A, Item 2, which allowed for the start date for this rule to January 2005 for this filing.

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[1] LOAD FORECAST DOCUMENTATION, 2007-2030 Load Forecast, Released: July 2008

The coincident peaks for each class and the system can be found in Excel files stored in two file folders, 8BIRP and 8DIRP.

The weather normalized hourly system loads can be found in system.ltm. These are also provided by state in KS_Fcst07.ltm and MO_Fcst07.ltm.

Pursuant to Rule 22.030 (2) (A): The driver variables and assumptions for these are described in Section 1.3 of KCP&L's documentation for the load forecast.

Pursuant to Rule 22.030 (2) (B): Documentation of statistical models can be located as follows in KCP&L's report on the load forecast:

Residential	Section 2
Commercial	Section 3
Industrial	Section 4
Street Lights	Section 5.2
Traffic Lights	Section 5.3
Sales for Resale	Section 5.4

Pursuant to Rule 22.030 (2) (C): KCP&L separately modeled the number of units (customers) for each subclass.

Pursuant to Rule 22030 (3): The Commission granted KCP&L a waiver under the Order, Attachment A, Item 3, for each major class, KCP&L will analyze historical use per unit for heating, cooling and other end-uses. For the residential class, other end-uses will be appliance specific.

Pursuant to Rule 22.030 (3) (A): The three end-uses and the residential appliance data specified above are the only data available. This data is used in the SAE model to evaluate energy demands by end-use. KCP&L conducts an appliance saturation survey for its residential customers, which allows analysis of use per unit for that class. For commercial and industrial classes, KCP&L relies on regional end-use data collected by the US Department of Energy (DOE), which does not include an accurate means of disaggregation by end-use. KCP&L believes that the DOE provides the best available end-use data for forecasting its loads because it maintains the best available models for incorporating appliance efficiency standards and trends in building design efficiencies, updates its models annually, and performs extensive research on energy utilization. In the future KCP&L will consider performing additional market studies to help calibrate the regional data.

Energy used for specific residential appliances is forecasted in a transformation table *End-useFcst* in the files *KSResSales.ndm* and *MOResSales.ndm.*

Pursuant to Rule 22.030 (3) (A) 1: Per waiver (3), for each major class, KCP&L modeled use per unit for heating, cooling and other end-uses. For the residential class, other end-uses were appliance specific.

Pursuant to Rule 22.030 (3) (A) 2: KCP&L used end-use information gathered from its residential appliance saturation surveys and by the US DOE.

Pursuant to Rule 22.030 (3) (A) 3: KCP&L disaggregated loads into heating, cooling and other components for all weather sensitive subclasses.

Pursuant to Rule 22.030 (3) (A) 4: Each weather sensitive major class has an other end-use.

Pursuant to Rule 22.030 (3) (B) 1: KCP&L acquires end-use information from two sources: first, from its biannual residential appliance surveys and secondly, from yearly updates from the DOE. DOE updates include historical and forecasted data for appliance stocks, efficiencies, utilization and standards.

The Commission granted KCP&L a waiver under the Order, Attachment A, Item 4, pertaining to this rule.

Pursuant to Rule 22.030 (3) (B) 2: The Commission granted KCP&L a waiver under the Order, Attachment A, Item 5, from this rule. KCP&L forecasts energy and demand for major end-uses, defined as heating cooling and other. KCP&L calibrates its end-use forecasts using the Statistically Adjusted End-use (SAE) technique. The end-use forecasts are summed into three components, heating, cooling and non-weather sensitive, and then calibrated to monthly sales using statistical regression analysis. The peak loads are calibrated to the weather normalized system peak.

Pursuant to Rule 22.030 (4): KCP&L developed load profiles for each customer class in each state, for heating cooling and other end-uses by month and day type. Day types include weekday, weekend and peak day. These profiles were used to allocate forecasted monthly energy use to each hour in the month. KCP&L's use of load profiles can be found on the following pages of this document:

Residential	Section 2.8
Commercial	Section 3.8
Industrial	Section 4.8
Other	Section 6

Pursuant to Rule 22.030 (4) (A): The commission granted KCP&L a waiver under the Order, Attachment A, Item 6, for this rule to specify the end-uses as heating, cooling and other.

Pursuant to Rule 22.030 (4) (B): The hourly class load research data was matched to daily temperatures. Statistical regression analysis was then used to model the hourly loads and extract the weather sensitive portions of the loads. Because statistical regression analysis was used, the profiles were calibrated to the class load research data, which in turn were calibrated to monthly accrued kwh sales.

The Commission granted KCP&L a waiver under the Order, Attachment A, Item 7, pertaining to this rule.

Pursuant to Rule 22.030 (5): KCP&L's load forecast was constructed to meet this rule.

Pursuant to Rule 22.030 (5) (A): KCP&L forecasts monthly peak and energy for both Kansas and Missouri separately.

Pursuant to Rule 22.030 (5) (B) 1: The methodology to forecast number of units can be found on the following sections of KCP&L's report:

Residential customers	Section 2.3
Commercial customers	Section 3.3
Industrial customers	Section 4.3

Pursuant to Rule 22.030 (5) (B) 1. A: The forecast of driver variables was obtained from Economy.com and is documented in Appendix 3.C.

Pursuant to Rule 22.030 (5) (B) 1. B: The forecast of the driver variables is compared to historical trends in Appendix 3.C.

Pursuant to Rule 22.030 (5) (B) 2. A: Natural gas and electric prices are used to forecast the saturations of space heating and water heating end-uses. Electric prices, household size and personal income are used to forecast usage.

KCP&L's use per unit forecast is documented in the following sections of KCP&L's report:

Residential kwh sales per customer	Section 2.6
Commercial kwh sales per customer	Section 3.6
Industrial kwh sales per customer	Section 4.6

Pursuant to Rule 22.030 (5) (B) 2. B: The Commission granted KCP&L a waiver under the Order, Attachment A, Item 8, on this section to specify the end-uses as heating, cooling and other. For these end-uses, KCP&L forecasting monthly use and hourly loads and monthly and seasonal peak demands.

Pursuant to Rule 22.030 (5) (B) 2. C: The methodology that KCP&L used to forecast energy-using capital goods and how its was used to forecast energy sales and peak demands is described in the following sections:

Residential	Sections 2.4 and 2.5
Commercial	Sections 3.4 and 3.5
Industrial	Sections 4.4 and 4.5

Pursuant to Rule 22.030 (5) (B) 2. D: Add appropriate references here.

Pursuant to Rule 22.030 (5) (C): Add appropriate references here.

Pursuant to Rule 22.030 (6): KCP&L uses constant elasticities for electric prices and other drivers in its sales models. These elasticities define the sensitivity of sales to these drivers. The elasticities are located in the Elas parameter table in each of the

Metrix ND project files. In addition, energy prices affect the saturations of electric space heating equipment.

The sensitivity of the forecast to energy prices is more complicated than for other driver variables because these prices affect both appliance utilization in the short-run and the saturations of electric space heating in the long-run. The stock of space heating equipment is fixed in the short run, but adjusts in the long run as new buildings are constructed or as space heating equipment breaks down and must be replaced.

To measure the sensitivity of the forecast to energy prices, KCP&L ran a scenario in which the price of electricity was raised by 10% in the base case scenario starting in 2010. The percentage change in the forecast divided by 10% approximates the price elasticity at different points in time.

In Appendix 3.J, plots J-1 to J-3 show the percentage changes in the forecast for gwh sales for Missouri, Kansas and the system. Plots J-4 to J-6 show the changes for peak demand. For example, plot J-1 shows that residential sales declined by 0.4% in the first year, by 1.1% in the second year, and by 1.8% in the last year. For this class, the short-run elasticity is approximately -0.04 and the long-run elasticity is approximately -0.18.

Pursuant to Rule 22.030 (7): KCP&L produces a high and low forecast scenario in addition to the base case forecast scenario. These scenarios are each based on a different economic scenario that we obtained from KCP&L's vendor, Economy.com. Economy.com assigns an 80% probability for the base case scenario, and 10% probabilities for the high and low scenarios. These scenarios are discussed in Section 1.4 of KCP&L's documentation.

Pursuant to Rule 22.030 (8) (A): See: Appendix 3.H.pdf

Pursuant to Rule 22.030 (8) (A) 1: See: Appendix 3.H.pdf

Pursuant to Rule 22.030 (8) (A) 2: See: Appendix 3.H.pdf

Pursuant to Rule 22.030 (8) (A) 2. A: See: Appendix 3.H.pdf

Pursuant to Rule 22.030 (8) (A) 2. A: See: Appendix 3.H.pdf

Pursuant to Rule 22.030 (8) (B): See: Appendix 3.I.pdf

Pursuant to Rule 22.030 (8) (B) 1: See: Appendix 3.I.pdf

Pursuant to Rule 22.030 (8) (B) 2: The commission granted KCP&L a waiver under the Order, Attachment A, Item 9, for this rule to specify the end-uses as heating, cooling and other. See: Appendix I.pdf

Pursuant to Rule 22.030 (8) (C): See: Appendix 3.J.pdf

Pursuant to Rule 22.030 (8) (D): See: Appendix 3.K.pdf

Pursuant to Rule 22.030 (8) (D) 1: See: Appendix 3.K.pdf

Pursuant to Rule 22.030 (8) (D) 2: See: Appendix 3.K.pdf

Pursuant to Rule 22.030 (8) (D) 3: See: Appendix 3.K.pdf

Pursuant to Rule 22.030 (8) (D) 4: See: Appendix 3.K.pdf

Pursuant to Rule 22.030 (8) (E): See: Appendix 3.L.pdf

Pursuant to Rule 22.030 (8) (E) 1: The commission granted KCP&L a waiver under the Order, Attachment A, Item 10, for this rule to specify the end-uses as heating, cooling and other. See: Appendix 3.L.pdf

Pursuant to Rule 22.030 (8) (E) 2: See: Appendix 3.L.pdf

Pursuant to Rule 22.030 (8) (F): See: Appendix 3.M.pdf

Pursuant to Rule 22.030 (8) (F) 1: See: Appendix 3.M.pdf

Pursuant to Rule 22.030 (8) (F) 2: See: Appendix 3.M.pdf

Pursuant to Rule 22.030 (8) (G): Each Appendix pertaining to Section 4 Rule 8 contains both tabular data and plots.

Pursuant to Rule 22.030 (8) (H) Section 1: through Section 7: of this document provide descriptions and methods used to develop the load forecast. Section 7: provides information on how these methods comply with the rules.