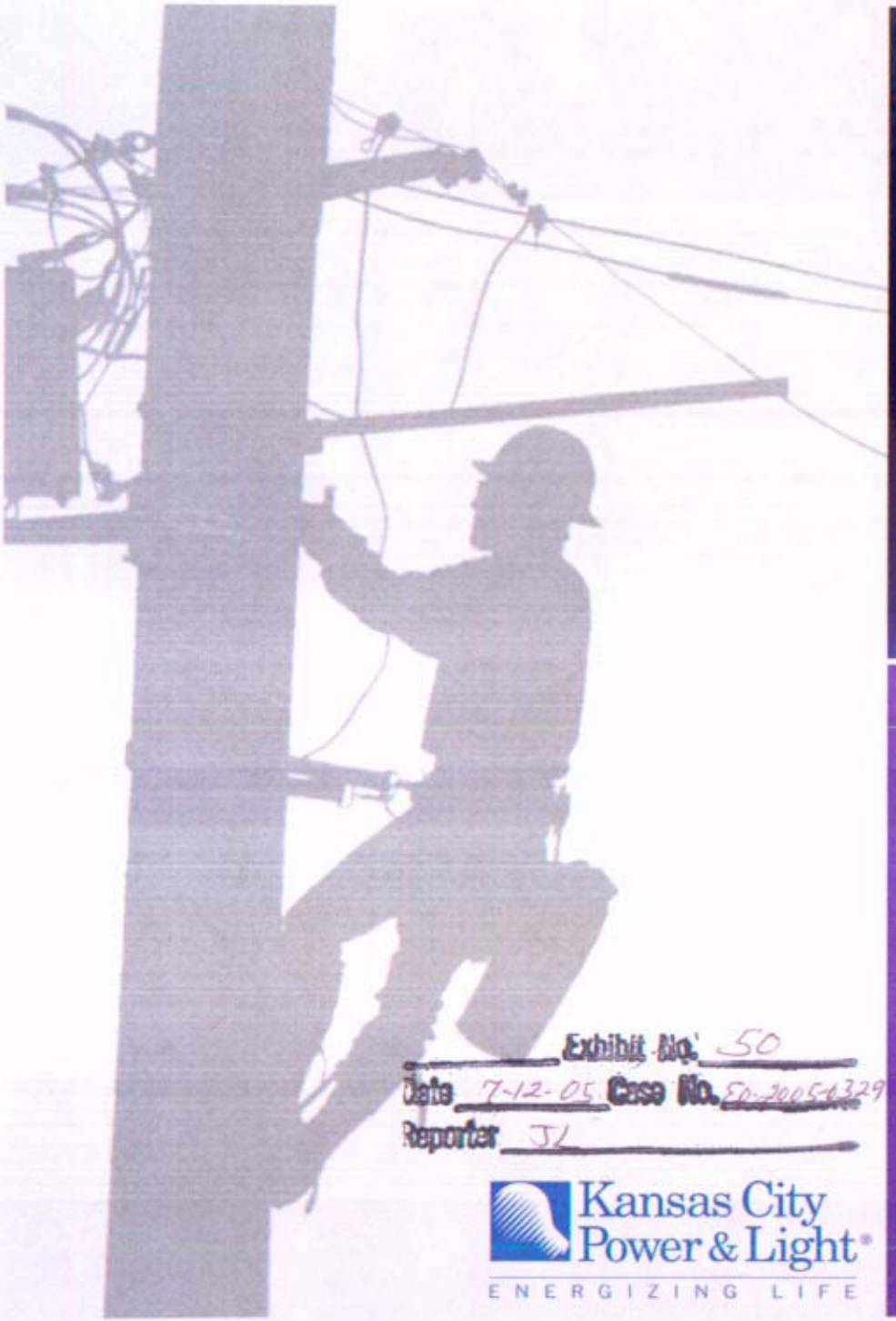


Kansas City Power & Light Company

Regulatory Workshop (Team A)

Load Forecasting

MPSC

August 11, 2004

Exhibit No. 50
Date 7-12-05 Case No. EO-2005-0329
Reporter JL

Kansas City Power & Light®
ENERGIZING LIFE

Outline

1. Overall Methodology
2. '04-'08 Budget Forecast
   - Drivers
3. 2002 Long-term Forecast
   - Drivers
4. '04-'24 Strategic Planning Forecast
   - Blended Results
5. Planning Scenarios
6. Current Situation
7. Models
8. Statistically Adjusted End-Use (SAE) Methodology

1) Overall Methodology

The Strategic Planning Forecast is a blend of several forecasts.

Kansas City Power & Light
ENERGIZING LIFE

Basic Method: Monthly Econometric Models

System Peak = f(Temperature, Economy, Customers)

System Energy = f(Degree Days, Economy, Customers)

Revenue Class = f(Degree Days, Economy, Customers)

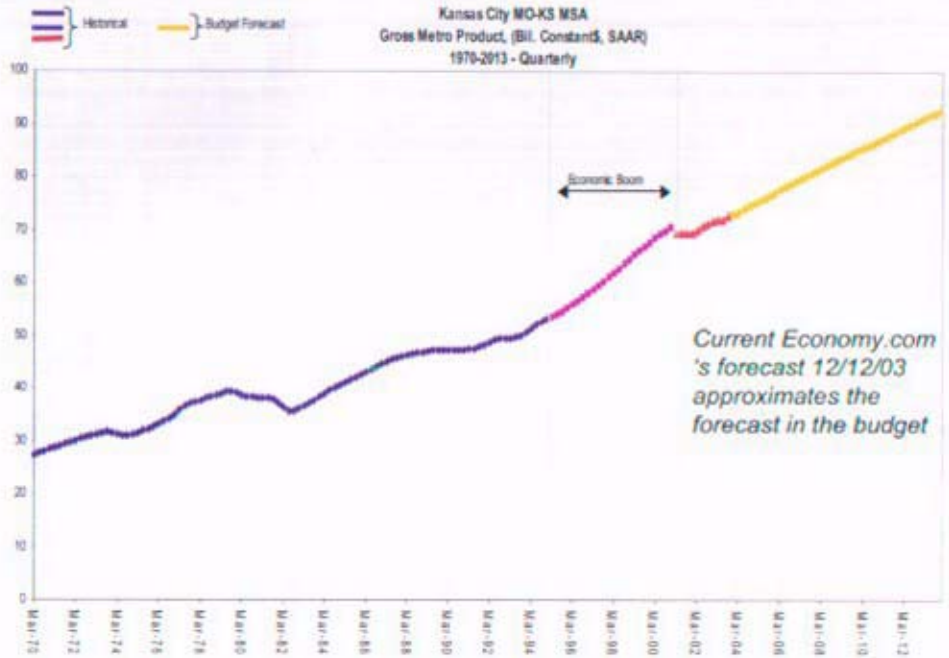
Customers = f(Population,Economy)

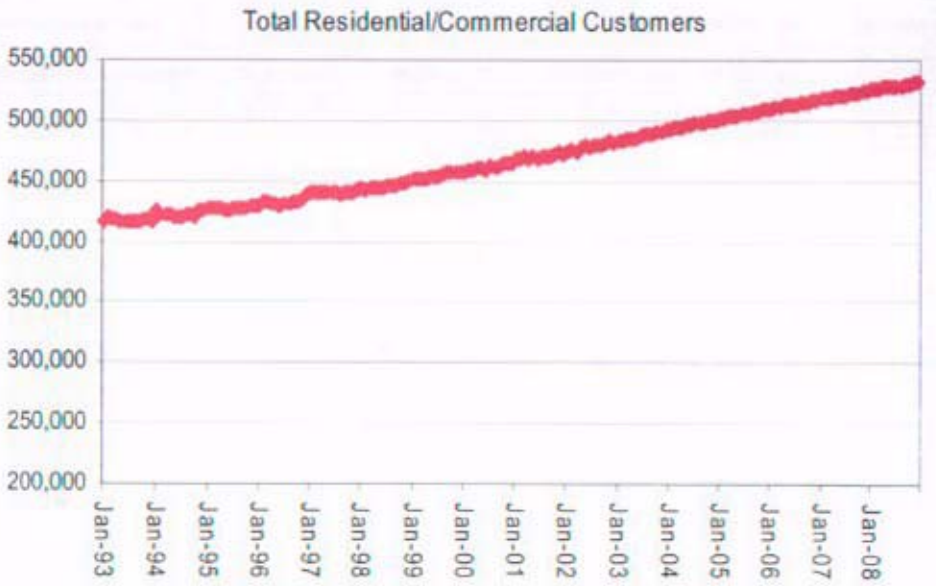
- All methods have some variation of Seasonal, Event, and/or Dummy Variables
- System Energy is also referred to as "Net System Input" or NSI

2) '04-'08 Budget Forecast

'04-'08 Budget Forecast – Drivers

Peak & NSI





GMP Growth Rates (KC MSA)

	Peak Model	NSI Model
'98-'03 =	2.79%	2.77%
'04-'08 =	2.55%	2.64%

Source: Economy.com

Customer Growth Rates

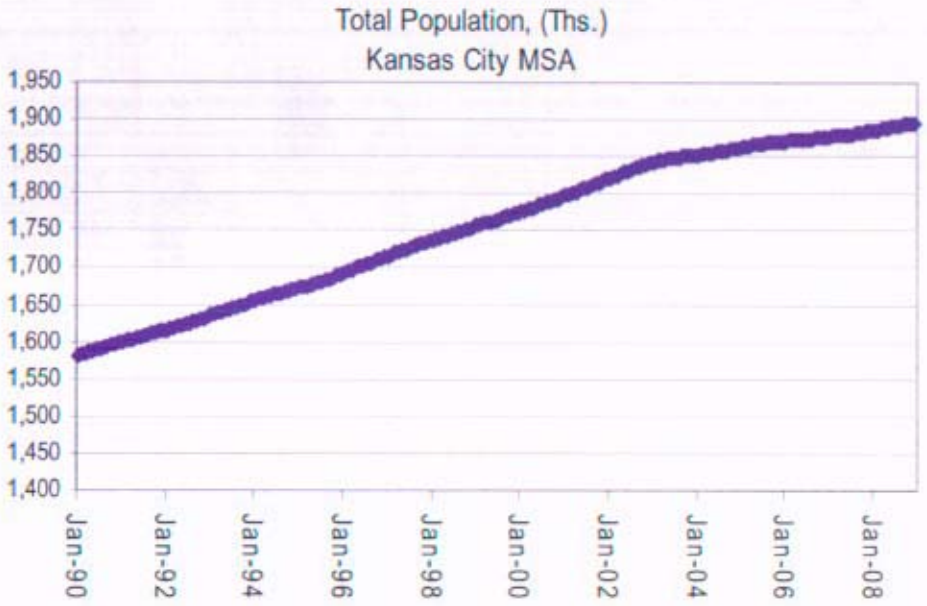
'98-'03 = 1.82%

'04-'08 = 1.54%

Kansas City Power & Light®
ENERGIZING LIFE

'04-'08 Budget Forecast – Drivers

Class Customers - Kansas Residential Urban



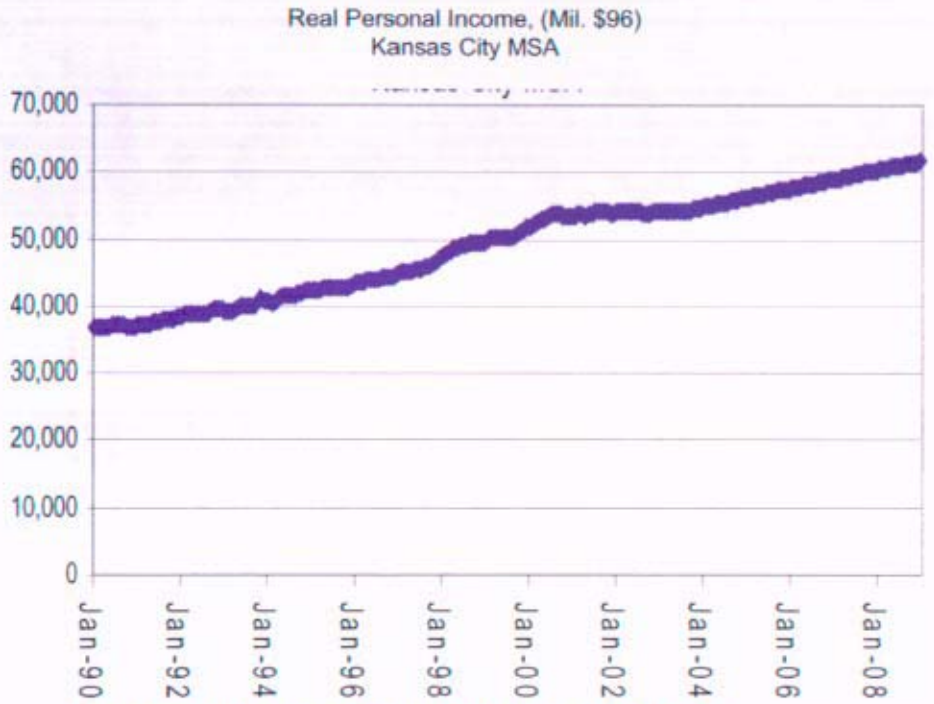
Population Growth Rates (KC MSA)
'98-'03 = 1.14%
'04-'08 = .45%

Source: Economy.com

Kansas City Power & Light
ENERGIZING LIFE

'04-'08 Budget Forecast – Drivers

Class kWh - Kansas Residential Urban

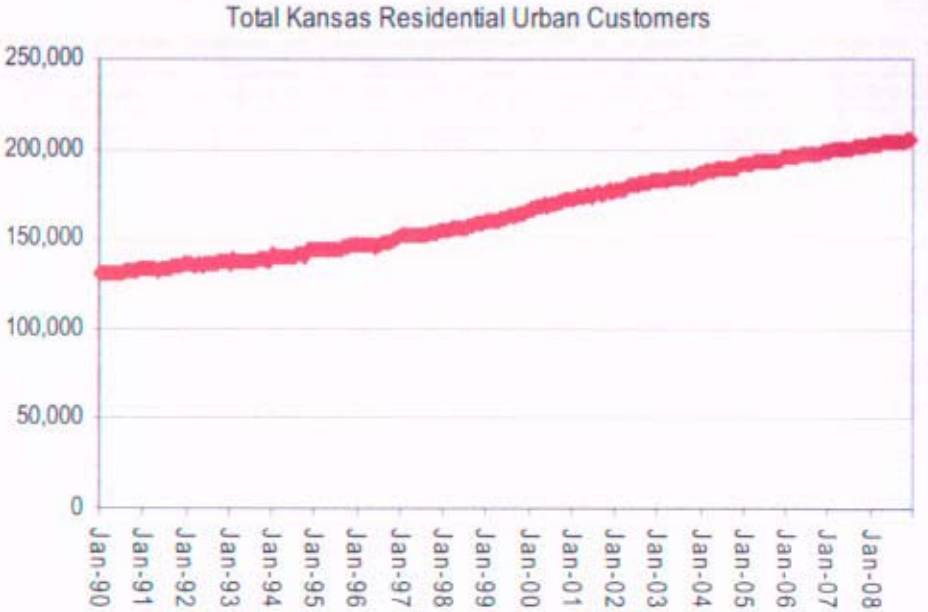


Personal Income Growth Rates (KC MSA)

'98-'03 = 1.99%

'04-'08 = 2.39%

Source: Economy.com



Kansas Customer Growth Rates

'98-'03 = 3.28%

'04-'08 = 1.94%

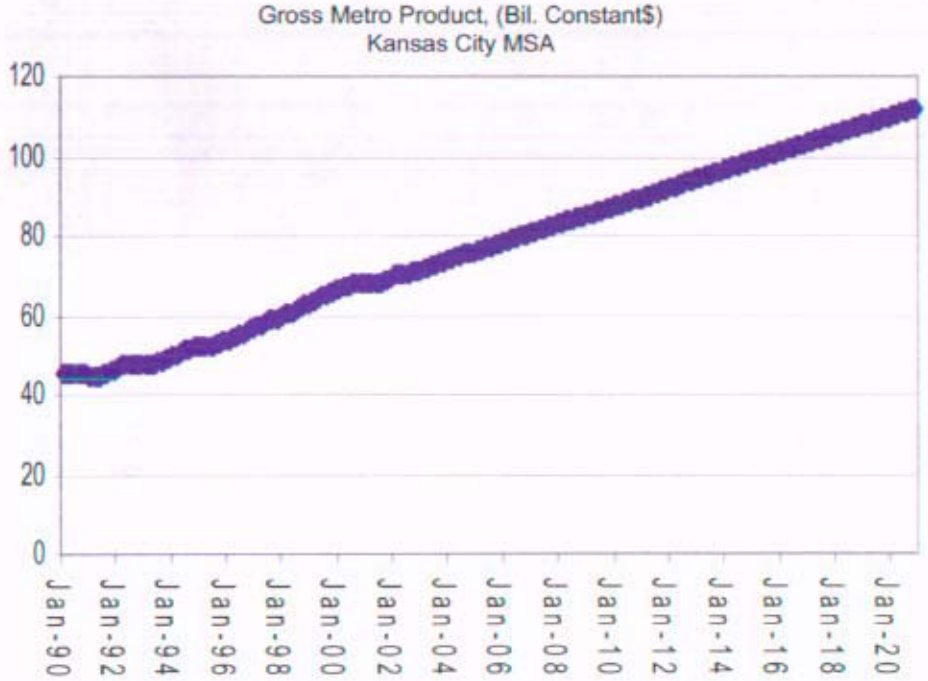
Kansas City Power & Light®
ENERGIZING LIFE

3) 2002 Long-Term Forecast

Kansas City Power & Light
ENERGIZING LIFE

'02-'20 Long-Term Forecast - Driver

Peak & NSI



GMP Growth Rates (KC MSA)
'98-'03 = 3.43%
'04-'08 = 2.84%
'04-'20 = 2.47%

Residential/Commercial Growth Rates
'98-'03 = 1.81%
'04-'08 = 1.38%
'04-'20 = .99%

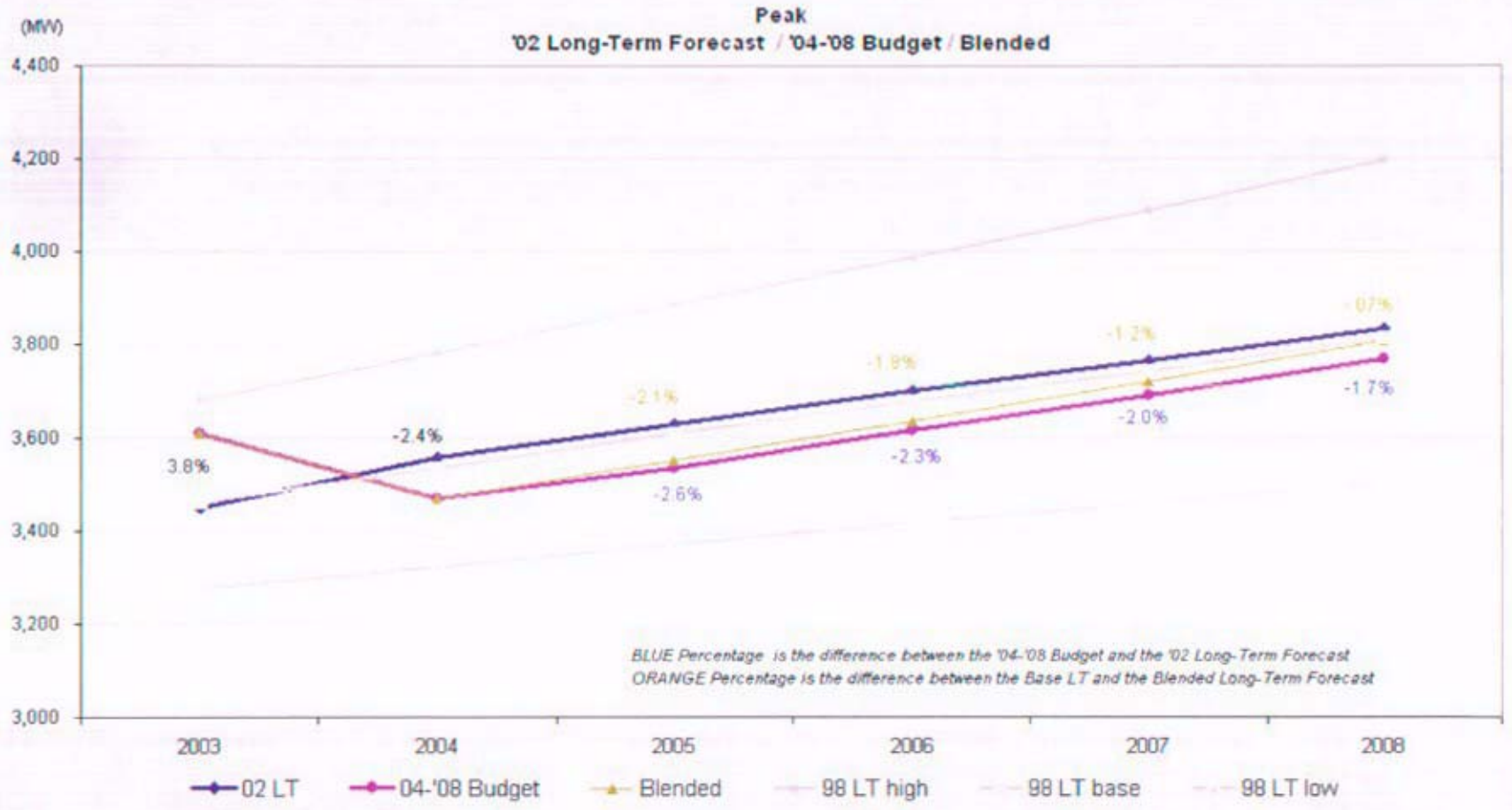
Source: Economy.com

Kansas City Power & Light®
ENERGIZING LIFE

4) '04-'24 Strategic Planning Forecast

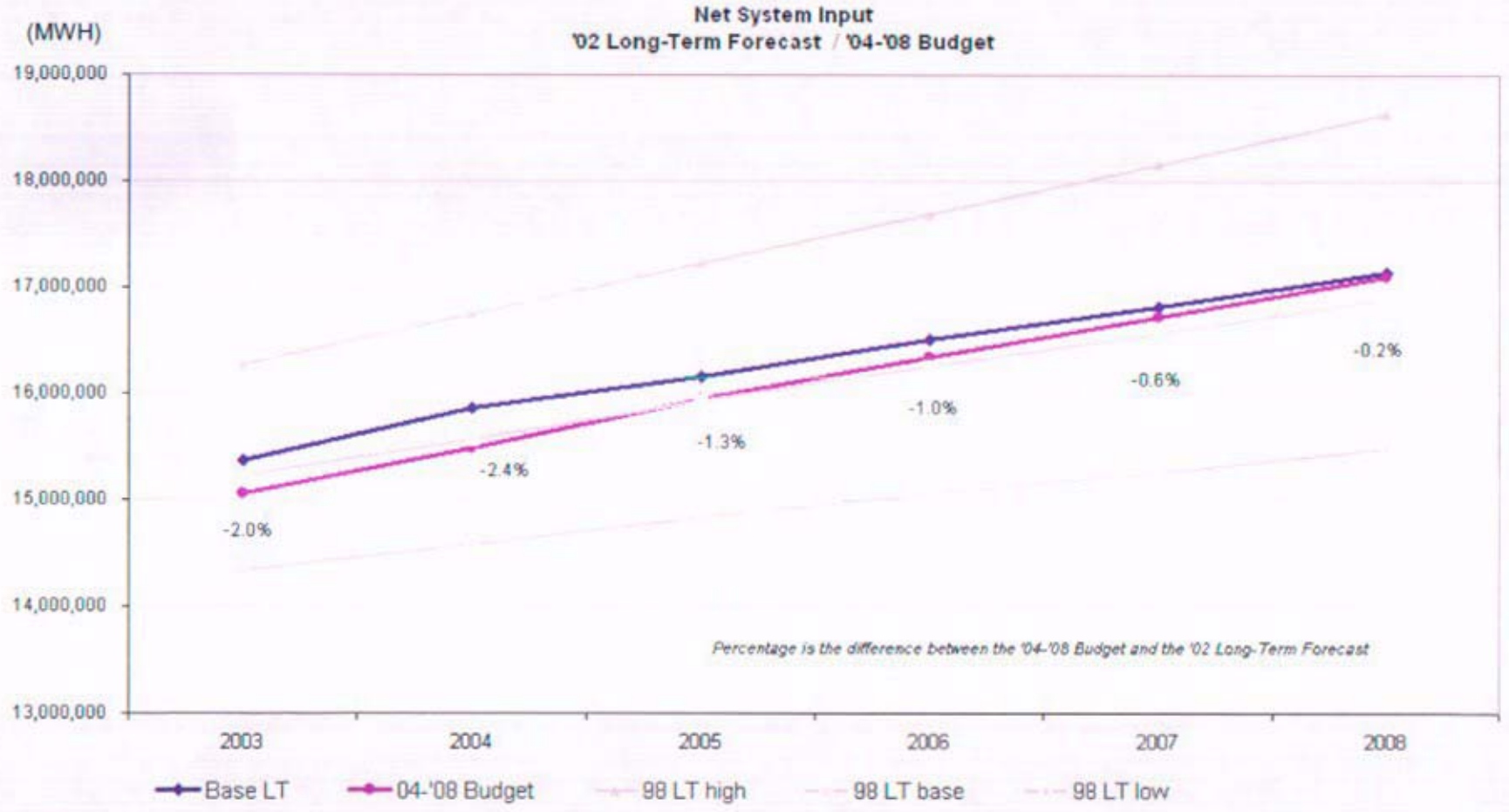
Kansas City Power & Light®
ENERGIZING LIFE

Summary of Forecasts – Peak Demand



Kansas City Power & Light®
ENERGIZING LIFE

Summary of Forecasts - Energy



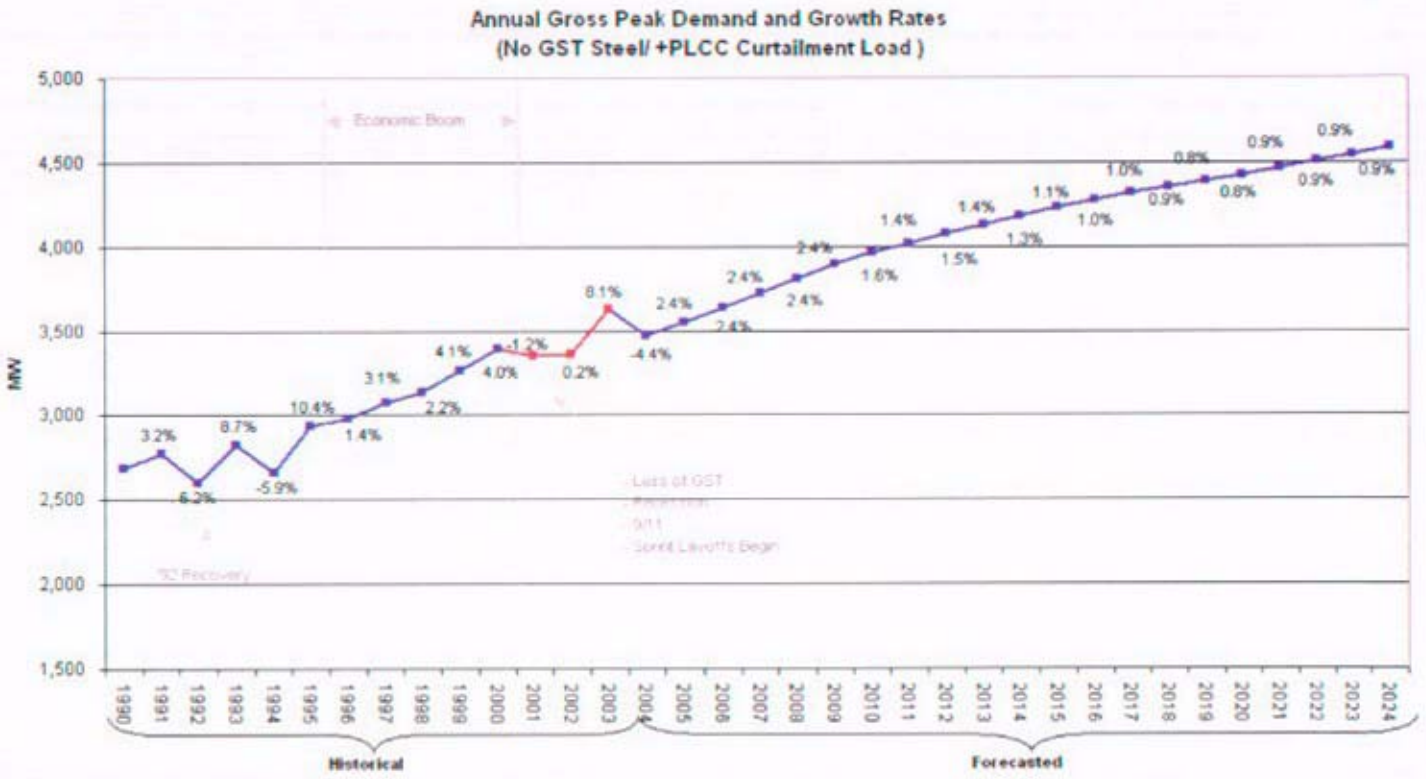
Note: GST Steel removed from 98 Long-Term Forecast

Kansas City Power & Light
ENERGIZING LIFE

Strategic Planning Forecast – Peak Demand

	Peak
2004	3,469
2005	3,551
2006	3,634
2007	3,720
2008	3,808
2009	3,898
2010	3,959
2011	4,015
2012	4,074
2013	4,130
2014	4,182
2015	4,230
2016	4,274
2017	4,315
2018	4,353
2019	4,389
2020	4,424
2021	4,463
2022	4,503
2023	4,544
2024	4,584

Growth Rate	
04-'14	1.9%
04-'20	1.5%
04-'24	1.4%



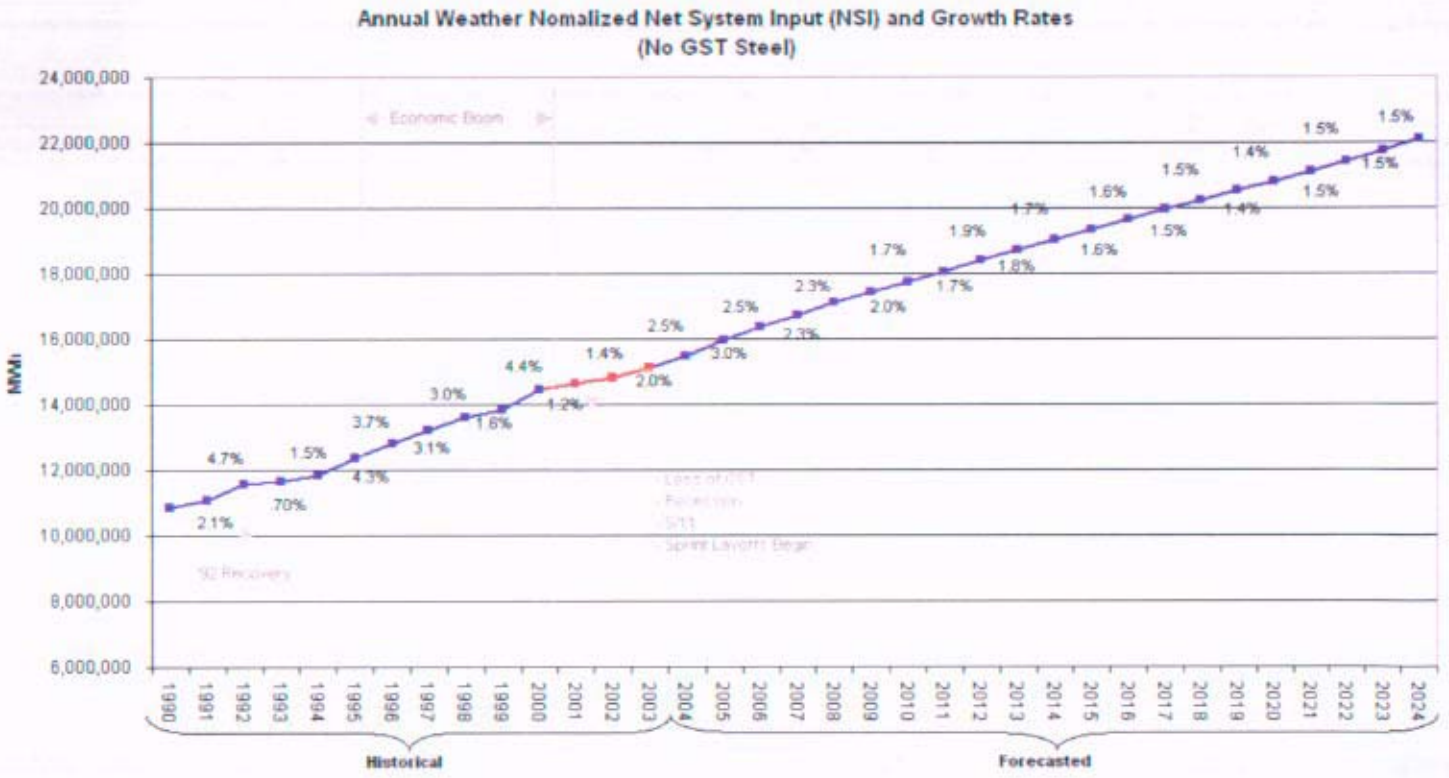
- *Historical data ('90-'03 not weather normalized)*

Kansas City Power & Light®
ENERGIZING LIFE

Strategic Planning Forecast – Energy

	NSI
2004	15,483,102
2005	15,941,224
2006	16,339,410
2007	16,713,960
2008	17,099,642
2009	17,439,807
2010	17,744,388
2011	18,053,810
2012	18,393,639
2013	18,720,480
2014	19,036,014
2015	19,343,862
2016	19,646,040
2017	19,945,380
2018	20,239,525
2019	20,530,339
2020	20,817,340
2021	21,125,240
2022	21,437,693
2023	21,754,768
2024	22,076,533

Growth Rate	
04-'14	2.1%
04-'20	1.9%
04-'24	1.8%



Kansas City Power & Light®
ENERGIZING LIFE

5) Planning Scenarios

Planning Scenarios

Driven by environmental, technical, and energy price/volatility

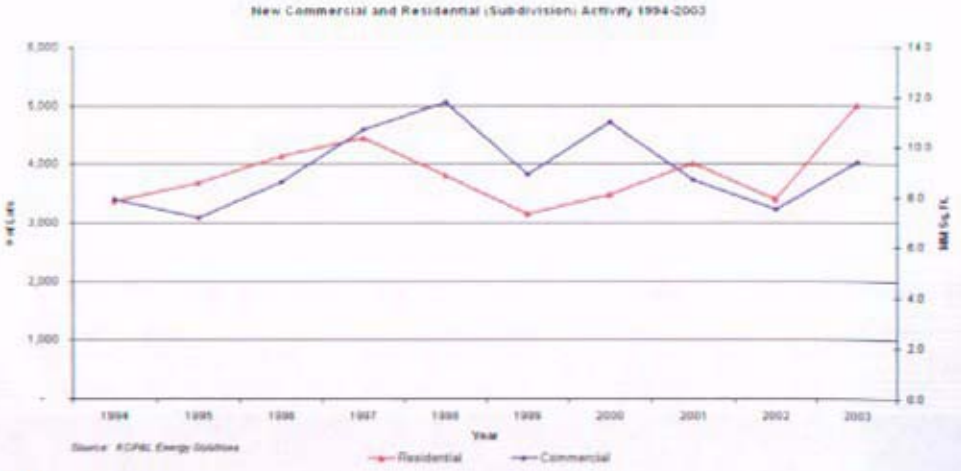
2004 – 2024 Average Annual Growth Rates			
	Low	Base	High
Peak	1.0%	1.4%	1.8%
Energy	1.3%	1.8%	2.2%

6) Current Situation

Kansas City Power & Light
ENERGIZING LIFE

Current Situation: Kansas City Economy

- Record Single-family Permits
- Office Vacancy Rates Top Out
- Year-Over-Year ('03/'02) Growth in Manufacturing Energy Use
- Issues:
  - Sprint
  - Employment growth
  - Downtown
    - Arena
    - H&R Block
    - KC Star
    - Other
      - Entertainment District
      - Lofts



7) Models

'04-'08 Budget Forecast – Peak Demand Model

Estimation Begin Date: **1997:5**
Estimation End Date: **2003:5**
Forecast Period End Date: **2008:12**

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	-230.121	334.555	-0.688	49.45%
DJAN	120.755	78.982	1.529	13.21%
DFEB	3.750	76.464	0.049	96.11%
DMAY	346.387	91.502	3.786	0.04%
DJUNE	569.878	109.692	5.195	0.00%
DAUG	760.496	126.775	5.999	0.00%
DSEPT	648.445	109.552	5.919	0.00%
DOCT	107.022	84.223	1.271	20.93%
DNOV	5.936	69.843	0.085	93.26%
DDEC	123.293	74.934	1.645	10.57%
DMAY97	-1159.452	2023.243	-0.573	56.90%
Cooling	29.707	4.742	6.265	0.00%
heating	6.479	1.665	3.892	0.03%
GMP	27.794	4.913	5.658	0.00%
DJulyMaxTemp	7.235	1.346	5.374	0.00%
AR(1)	0.084	0.136	0.616	54.03%

Regression Statistics

Iterations	6
Adjusted Observations	72
Deg. of Freedom for Error	56
R-Squared	0.955
Adjusted R-Squared	0.943
Durbin-Watson Statistic	1.989
Durbin-H Statistic	0.000
Std. Error of Regression	132.19
Mean Abs. Dev. (MAD)	83.48
Mean Abs. % Err. (MAPE)	3.58%

Variable Definitions

Dependent Variable = Gross Peak Demand (MW) minus GST Steel plus PLCC curtailable load.
CONST = Constant Term
DJAN = Seasonal dummy value for January; value of 0 for all months except January
DFEB = Seasonal dummy value for February; value of 0 for all months except February
DMAY = Seasonal dummy value for May; value of 0 for all months except May
DJUNE = Seasonal dummy value for June; value of 0 for all months except June
DAUG = Seasonal dummy value for August; value of 0 for all months except August
DSEPT = Seasonal dummy value for September; value of 0 for all months except September
DOCT = Seasonal dummy value for October; value of 0 for all months except October
DNOV = Seasonal dummy value for November; value of 0 for all months except November
DDEC = Seasonal dummy value for December; value of 0 for all months except December
DMAY97 = Event variable to account for data error; value of 0 for all months except for May 1997
COOLING = Temperature at Peak, minus 70 degrees for cooling peaks
HEATING = Absolute value of the difference between temperature at peak and 65 degrees (for heating peaks)
GMP = Gross Metro Product, (Bil. Constant$, SAAR), Economy.com; Kansas City MSA
DJULYMAXTEMP = Max temp in July the day of peak; value of 0 for all months except for July, historical period equals actual max temp day of peak, forecast period sets max temp at 98.8

'04-'08 Budget Forecast – System Energy Model

Estimation Begin Date: 1990:1
Estimation End Date: 2003:12
Forecast Period End Date: 2008:12

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	154087.789379	25091.172091	6.141	0.00%
CDD_Cust	0.002524	0.000090	28.098	0.00%
HDD_Cust	0.000485	0.000035	13.685	0.00%
DJAN	4992.834750	10217.917964	0.489	62.60%
DFEB	-70331.409284	7571.047333	-9.290	0.00%
DAPR	-19829.808323	9187.312070	-2.158	3.30%
DMAY	62293.901230	12657.008007	4.922	0.00%
DJUNE	92019.062370	16623.052017	5.536	0.00%
DJULY	163756.284303	21122.051703	7.753	0.00%
DAUG	174409.975691	20353.381353	8.569	0.00%
DSEPT	97174.382112	14686.948011	6.616	0.00%
DOCT	43033.635688	10989.025273	3.916	0.02%
DNOV	-22368.120739	8884.384408	-2.518	1.32%
DDEC	15161.666602	9894.338261	1.532	12.82%
GMP	11254.192781	376.906369	29.859	0.00%
D911TEST	-4663.389708	7944.474629	-0.587	55.84%
AR(1)	0.331460	0.089276	3.713	0.03%

Regression Statistics

Iterations	1
Adjusted Observations	132
Deg. of Freedom for Error	115
R-Squared	0.993
Adjusted R-Squared	0.992
Durbin-Watson Statistic	1.914
Durbin-H Statistic	0.000
Std. Error of Regression	19657.48
Mean Abs. % Err. (MAPE)	1.36%

Variable Definitions

Dependent Variable = System Energy (MWh) minus GST Steel
CONST = Constant Term
CDD = Cooling Degree Days
HDD = Heating Degree Days
CDD_CUST =CDD multiplied by residential/commercial customers
HDD_CUST = HDD multiplied by residential/commercial customers
JAN = Seasonal dummy value for January; value of 0 for all months except January
FEB = Seasonal dummy value for February; value of 0 for all months except February
APR = Seasonal dummy value for April; value of 0 for all months except April
MAY = Seasonal dummy value for May; value of 0 for all months except May
JUNE = Seasonal dummy value for June; value of 0 for all months except June
JULY = Seasonal dummy value for July; value of 0 for all months except July
AUG = Seasonal dummy value for August; value of 0 for all months except August
SEPT = Seasonal dummy value for September; value of 0 for all months except September
OCT = Seasonal dummy value for October; value of 0 for all months except October
NOV = Seasonal dummy value for November; value of 0 for all months except November
DEC = Seasonal dummy value for December; value of 0 for all months except December
GMP = Gross Metro Product, (Bil. Constant$, SAAR), Economy.com; Kansas City MSA
D911TEST = Event variable to account for the events of September 11, 2001; value of 0 for all month except for September 2001 through February 2003

Kansas City Power & Light
ENERGIZING LIFE

'04-'08 Budget Forecast – Class Customers

Kansas Residential Urban

Estimation Begin Date: 1990:1
Estimation End Date: 2003:11
Forecast Period End Date: 2008:12

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	-61696.718	6245.718	-9.878	0%
Population	55.680	6.257	8.898	0%
LagDep(12)	0.799	0.031	25.795	0%

Regression Statistics

Iterations	1
Adjusted Observations	155
Deg. of Freedom for Error	152
R-Squared	0.996
Adjusted R-Squared	0.996
Durbin-Watson Statistic	0.668
Durbin-H Statistic	-0.102
Std. Error of Regression	1032.77
Mean Abs. % Err. (MAPE)	0.52%

Variable Definitions

Dependent Variable = Kansas Residential Urban Customers
CONST = Constant Term
Population = Total Population, (Ths.), economy.com – Kansas City MSA

Example of class models used to allocate system forecast to classes

Kansas City Power & Light®
ENERGIZING LIFE

'04-'08 Budget Forecast – Class kWh Model

Kansas Residential Urban

Estimation Begin Date: 1992:1
Estimation End Date: 2003:11
Forecast Period End Date: 2008:12

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	-39899363.776	10902242.939	-3.660	0%
CDD_70_30_Customers	1.545	0.160	9.682	0%
HDD_70_30_Customers	0.304	0.034	9.029	0%
Real_Per_Income	2245.374	297.421	7.549	0%
DJAN	10014300.096	4508761.661	2.221	3%
DJUNE	8098574.730	5096836.841	1.589	12%
DJULY	35322764.787	8821367.113	4.004	0%
DAUG	25791054.807	9172957.381	2.812	1%
DSEPT	43219704.139	6416115.318	6.736	0%
DDEC	5941807.619	4037340.572	1.472	14%
LagDep(24)	0.232	0.062	3.770	0%

Regression Statistics

Iterations	1
Adjusted Observations	119
Deg. of Freedom for Error	108
R-Squared	0.970
Adjusted R-Squared	0.967
Durbin-Watson Statistic	2.349
Durbin-H Statistic	0.000
Std. Error of Regression	9912390.00
Mean Abs. % Err. (MAPE)	4.20%

Variable Definitions

Dependent Variable = Kansas Residential Urban kWh
CONST = Constant Term
CDD = Cooling Degree Days
HDD = Heating Degree Days
CDD_70_30= ((Lag(Weather1.CDD,1))*.30+(Weather1.CDD*.70))
HDD_70_30 = ((Lag(Weather1.HDD,1))*.30+(Weather1.HDD*.70))
CDD_70_30_Customers = [CDD_HDD Billing Cycle Split].CDD_70_30*KS_Cus_ResUrban (customers)
HDD_70_30_Customers = [CDD_HDD Billing Cycle Split].HDD_70_30*KS_Cus_ResUrban (customers)
JAN = Seasonal dummy value for January; value of 0 for all months except January
JUNE = Seasonal dummy value for June; value of 0 for all months except June
JULY = Seasonal dummy value for July; value of 0 for all months except July
AUG = Seasonal dummy value for August; value of 0 for all months except August
SEPT = Seasonal dummy value for September; value of 0 for all months except September
OCT = Seasonal dummy value for October; value of 0 for all months except October
DEC = Seasonal dummy value for December; value of 0 for all months except December
Real_Per_Income = Real Personal Income, (Mil. $96, SAAR), economy.com – Kansas City MSA

Example of class models used to allocate system forecast to classes

Kansas City Power & Light
ENERGIZING LIFE

'02-'20 Long-Term Forecast – Peak Demand Model

Estimation Begin Date: **1992:1**
Estimation End Date: **2002:9**
Forecast Period End Date: **2020:12**

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	-1797.3535436	855.2313666	-2.102	3.79%
DJAN	63.7192220	42.8136009	1.488	13.95%
DFEB	1.3100435	40.7500449	0.032	97.44%
DAPR	-84.9428209	47.5200557	-1.788	7.66%
DMAY	221.1072889	63.6721156	3.473	0.07%
DJUNE	482.7678048	74.6945173	6.463	0.00%
DAUG	647.9619938	80.6245476	8.037	0.00%
DSEPT	527.7860886	69.8459920	7.556	0.00%
DOCT	-58.5528485	61.0296341	-0.959	33.95%
DDEC	103.2302693	39.7916425	2.594	1.08%
DMAY97	-551.4238684	103.8476386	-5.310	0.00%
TCool95_RCCUS	0.0000713	0.0000064	11.142	0.00%
TCOOL95P_CUST	0.0000296	0.0000148	1.999	4.80%
THeat_Cust	0.0000122	0.0000027	4.499	0.00%
Gross_Metro_Product	2.9638560	7.5580379	0.392	69.57%
Total_RES_COM	0.0071987	0.0029274	2.459	1.55%
HeatBuildUp	6.9139042	0.8878853	7.787	0.00%

Regression Statistics

Iterations	1
Adjusted Observations	129
Deg. of Freedom for Error	112
R-Squared	0.973
Adjusted R-Squared	0.969
Durbin-Watson Statistic	1.722
Durbin-H Statistic	-0.706
Std. Error of Regression	98.98
Mean Abs. % Err. (MAPE)	3.18%

Variable Definitions

Dependent Variable = Gross Peak Demand (MW) minus GST Steel plus PLCC curtailment load
CONST = Constant Term
DJAN = Seasonal dummy value for January; value of 0 for all months except January
DFEB = Seasonal dummy value for February; value of 0 for all months except February
DAPR = Seasonal dummy value for April; value of 0 for all months except April
DMAY = Seasonal dummy value for May; value of 0 for all months except May
DJUNE = Seasonal dummy value for June; value of 0 for all months except June
DAUG = Seasonal dummy value for August; value of 0 for all months except August
DSEPT = Seasonal dummy value for September; value of 0 for all months except September
DOCT = Seasonal dummy value for October; value of 0 for all months except October
DDEC = Seasonal dummy value for December; value of 0 for all months except December
DMAY97 = Event variable to account for data error; value of 0 for all months except for May 1997
TCOOL = On-peak cooling requirements defined as temperature at peak, less 70 degrees
TCOOL95_RCCUS = On-peak cooling requirements for temperature range of 70-95 degrees, defined as TCOOL, but with a maximum value of 25 * residential and commercial customers
TCOOL95P_CUST = On-peak cooling requirements for temperature at peak range of greater than 95 degrees, which is essentially the difference between TCOOL and T95 * residential and commercial customers
THEAT_CUST = (If (Temp_at_Peak < 65) THEN 65 - Temp_at_Peak ELSE 0)*residential/commercial customers
GMP = Gross Metro Product, (Bil. Constant$, SAAR), Economy.com; Kansas City MSA
TOTAL_RES_COM = Total residential and commercial customers
HEATBUILDUP = Djuly (Seasonal dummy value for July; value of 0 for all months except July) multiplied by DJULYTWODAYAVG (Temp dummy value for July; value of 0 for all months except July; value for July is a two day average of max temp before the day of peak)

Kansas City Power & Light
ENERGIZING LIFE

'02-'20 Long-Term Forecast – Energy Model

Estimation Begin Date: **1995:1**
Estimation End Date: **2002:9**
Forecast Period End Date: **2020:12**

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	294453.808478	37322.350657	7.889	0.00%
GST	-23344.389000	12313.005073	-1.896	6.19%
CDD_Cust	0.002488	0.000136	18.314	0.00%
HDD_Cust	0.000418	0.000057	7.346	0.00%
DJAN	24587.815712	15592.601030	1.577	11.91%
DFEB	-67283.229123	11977.053103	-5.618	0.00%
DAPR	-31241.128701	15500.328774	-2.016	4.75%
DMAY	43119.027570	19793.224780	2.178	3.26%
DJUNE	79438.251677	25818.653641	3.077	0.29%
DJULY	157206.635473	32918.932910	4.776	0.00%
DAUG	168639.233969	31209.202651	5.404	0.00%
DSEPT	101974.748157	23070.236359	4.420	0.00%
DOCT	35715.884318	16826.346920	2.123	3.71%
DNOV	-21340.227520	12340.535996	-1.729	8.79%
DDEC	24629.002329	14665.659899	1.679	9.73%
Gross_Metro_Product	10402.730728	519.670407	20.018	0.00%
D911	-36524.182929	13017.761601	-2.806	0.64%

Regression Statistics

Iterations	1
Adjusted Observations	93
Deg. of Freedom for Error	76
R-Squared	0.990
Adjusted R-Squared	0.988
Durbin-Watson Statistic	1.496
Durbin-H Statistic	1.628
Std. Error of Regression	23571.89
Mean Abs. % Err. (MAPE)	1.36%

Variable Definitions

Dependent Variable = System Energy (kWh) minus GST Steel
CONST = Constant Term
GST = Event dummy value for the loss of GST Steel; Value of 0 until April 01 then a value of 1 going forward
CDD = Cooling Degree Days
HDD = Heating Degree Days
CDD_CUST = Cooling degree days multiplied by residential/commercial customers
HDD_CUST = Heating degree days multiplied by residential/commercial cusotmers
DJAN = Seasonal dummy value for January; value of 0 for all months except January
DFEB = Seasonal dummy value for February; value of 0 for all months except February
DAPR = Seasonal dummy value for April; value of 0 for all months except April
DMAY = Seasonal dummy value for May; value of 0 for all months except May
DJUNE = Seasonal dummy value for June; value of 0 for all months except June
DJULY = Seasonal dummy value for July; value of 0 for all months except July
DAUG = Seasonal dummy value for August; value of 0 for all months except August
DSEPT = Seasonal dummy value for September; value of 0 for all months except September
DOCT = Seasonal dummy value for October; value of 0 for all months except October
DDEC = Seasonal dummy value for December; value of 0 for all months except December
DMAY97 = Event variable to account for data error; value of 0 for all months except for May 1997
GMP = Gross Metro Product, (Bil. Constant$, SAAR), Economy.com; Kansas City MSA
D911 = Event variable to account for the events of September 11, 2001; value of 0 for all month except for September 2001 through May 2003

Kansas City Power & Light
ENERGIZING LIFE

8) SAE Methodology

Current Modeling Efforts

- Completing Statistically-Adjusted End-Use Models (SAE) capability development
  - Blend of End-Use and Econometric Approaches
  - Class energy forecasts converted to hourly system loads with MetrixLT ("HELM")
  - RER/ITRON

End Use Modeling

- Each component is modeled separately over time
  - Saturation = f (Prices, Income, Costs, Appliance Life)
  - Efficiency and Size = f (Prices, Standards, Costs, House Structure)
  - Usage = f (Weather, Income, Prices)
  - Households = f (Population)
- Forecast generated through a set of pre-defined structural relationship and parameters

SAE Approach

- Economic impacts – income, household size, household growth
- Price impacts
- Structural changes – saturation, efficiency, footage, thermal integrity trends
- Weather impacts
- Appropriate interaction of these variables

Statistically Adjusted End-use Modeling

Blend end-use concepts into an econometric modeling framework:

- Average Use = Heating + Cooling + Other Use

Define components in terms of its end use structure: e.g.

- Cooling = f (Saturation, Efficiency, Utilization)
  - Utilization = g (Weather, Price, Income, Household Size)

Estimate model using *Ordinary Least Squares*

- $AvgUse_t = b_0 + (b_1 \times XHeat_t) + (b_2 \times XCool_t) + (b_3 \times XOther_t) + e_t$

Residential Cooling End Use

$$XCool_{y,m} = CoolIndex_y \times CoolUse_{y,m}$$

$$CoolUse_{y,m} = \left(\frac{Price_{y,m}}{Price_{98}}\right)^{-0.20} \times \left(\frac{Income_{y,m}}{Income_{98}}\right)^{0.20} \times \left(\frac{HHSize_{y,m}}{HHSize_{98}}\right)^{0.20} \times \left(\frac{CDD_{y,m}}{CDD_{98}}\right)$$

$$CoolIndex_y = Structural\,Index_y \times \sum_{Type} Weight^{Type} \times \frac{\left(Sat_y^{Type} / Eff_y^{Type}\right)}{\left(Sat_{98}^{Type} / Eff_{98}^{Type}\right)}$$

Kansas City Power & Light
ENERGIZING LIFE

Residential Cooling End Use (Cont.)

Structural index accounts for

- Change in housing square footage
- Change in structural thermal integrity – Overall R-Value

where:

$$\text{Structural Index}_y = \frac{\text{Building Shell Efficiency Index}_y \times \text{Surface Area}_y}{\text{Building Shell Efficiency Index}_{98} \times \text{Surface Area}_{98}}$$

$$\text{Surface Area}_y = 892 + 1.44 \times \text{Footage}_y$$