

Ameren Illinois Company  
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Schedule E-4(a)

- a) 1) The 2014 test year billing determinants were primarily determined by applying the Company's current rates and rate structure to forecasted deliveries of natural gas to customers, plus the cost of natural gas delivered, as well as other miscellaneous charges. The Forecasted deliveries, including changes due to customer growth and conservation, were determined using internally developed models that consider various economic and demographic factors. The 2014 Forecasted deliveries were based on a 10 year normal (2002-2011). Other billing determinants such as billing demands were based on recent historical load data. The AIC forecast methodology is as follows:

Ameren Illinois Company ("AIC" or "Ameren Illinois") developed a natural gas sales forecast using traditional econometric forecasting techniques, as well as a functional form of forecasting called Statistically Adjusted End-Use (SAE). AIC primarily utilized the SAE approach for the residential and commercial classes, while developing traditional econometric models for the industrial and public authority<sup>1</sup> classes.

The traditional approach to forecasting monthly sales for a customer class requires the forecaster to develop an econometric model that relates monthly sales to weather, seasonal variables, and economic conditions. Under the SAE framework, variables of interest related to economic growth, price of natural gas, and energy efficiency and intensity, are combined into a smaller number of independent variables, which are used to predict the dependent variable (typically gas energy sales or sales per customer by class).

From a forecasting perspective, the strength of traditional econometric models is that such models are well suited to identifying historical trends and to projecting these trends into the future. In contrast, the strength of the end-use modeling approach is the ability to identify the end-use factors that are driving energy consumption. By incorporating end-use structure into an econometric model, the statistically adjusted end-use (SAE) modeling framework exploits the strengths of both approaches.

There are several advantages to this combined econometric-SAE approach:

- The equipment efficiency trends and saturations, and dwelling square footage and thermal integrity changes embodied in the long-run end-use forecasts are introduced explicitly into the short-term monthly sales forecast. This provides a strong bridge between the two forecasts;
- By explicitly introducing trends in equipment saturations, equipment efficiency, dwelling square footage, and thermal integrity levels, it is easier to identify and explain changes in usage levels and changes in weather-sensitivity over time; and

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<sup>1</sup> Public Authorities are represented as a separate class for forecasting load with the results being combined within the various non-residential rate classifications where they reside.

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- Data for short-term models are often not sufficiently robust enough to support estimation of a full set of price, economic, and demographic effects. By bundling these factors with equipment-oriented drivers, a rich set of elasticities can be built into the final model.

The SAE framework used in AIC's forecast was developed by Itron, a consulting firm Ameren Illinois has worked with for many years. Contained in the SAE framework are specific end uses for which saturation and efficiency must be estimated. The residential and commercial end uses include heating, cooking and water heating. The model used by AIC is based on stock accounting logic that projects appliance efficiency trends based on appliance life and past and future efficiency standards. The model embeds all currently appropriated laws and regulations regarding appliance efficiency, along with life cycle models of each appliance. The life cycle models are based on the decay and replacement rates, which are necessary to estimate how fast the existing stock of any given appliance turns over and is replaced by newer, more efficient equipment. The underlying efficiency data is based on estimates of energy efficiency developed by the US Department of Energy's Information Administration (EIA). The EIA estimates the efficiency of appliance stocks and saturation of appliances at the national and Census Region levels.

Ameren Illinois is in the East North Central Census EIA region, so data for that Census Region is the default information provided in Itron's spreadsheet analysis. Ameren Illinois has supplemented EIA information with utility-specific information on appliance saturation and natural gas prices. The primary source of for saturation data was the Ameren Illinois Potential Study conducted by The Cadmus Group and the 2007 Community Energy Cooperative of the Center for Neighborhood Technology Study.

### **AIC's Approach to Forecasting Residential and Commercial Load**

The functional framework of the Residential SAE model is:

Use per customer

$$= B1*((\text{heating use}) *(\text{heating index})) + B2* ((\text{other use}) * (\text{other index}))$$

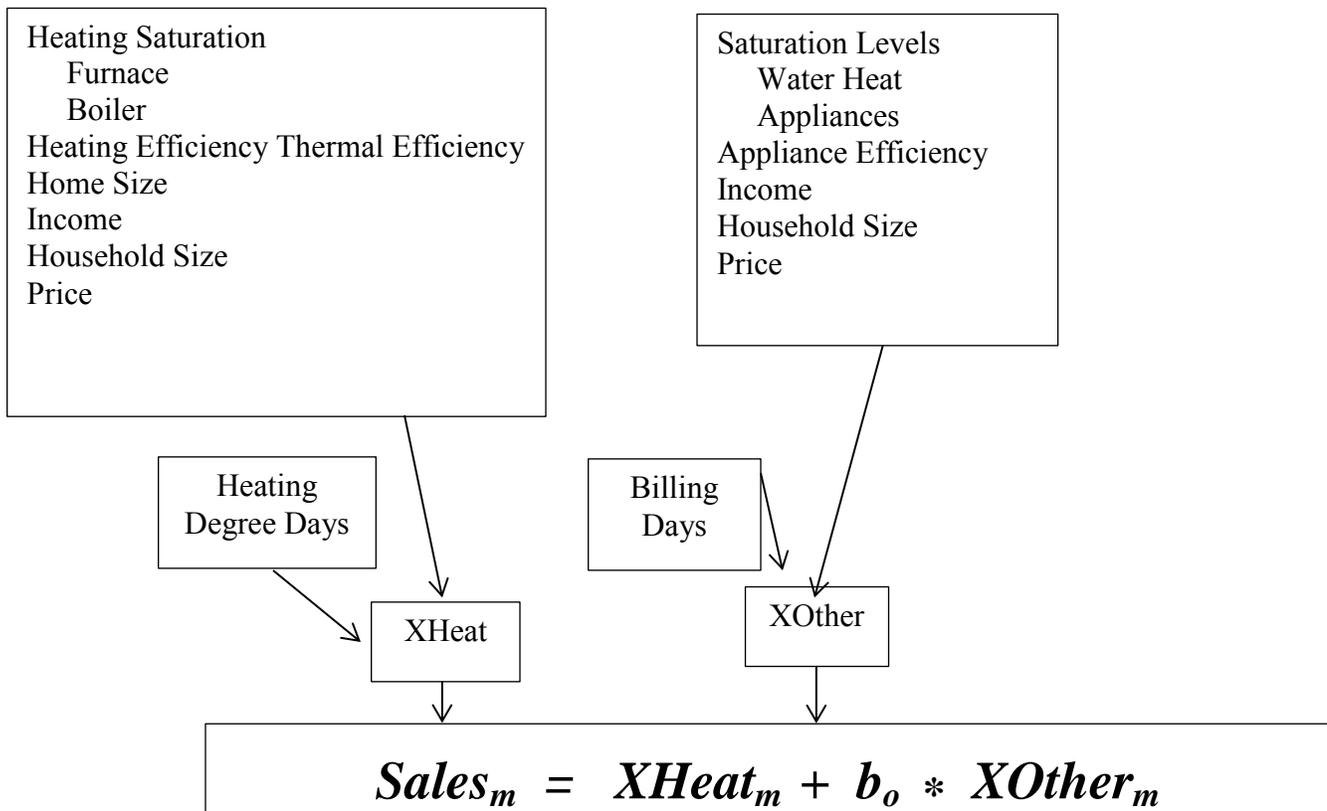
In each term the "index" variable captures past and future trends in appliance saturation and efficiency. The "use" variable is a combination of variables that characterize the utilization of the appliances, including household income, the number of people per household, heating degree days, and relevant elasticities.

The coefficients B1 and B2 are estimated with ordinary least squares (OLS) regression. One advantage of the SAE approach is that it produces very high, relative to most econometric models, t-statistics for each variable. Table 1 summarizes the regression coefficients for the heating use and other use.

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Table 1							
Residential SAE Model				Commercial SAE Model			
Rate Zone I Regression Coefficients				Rate Zone I Regression Coefficients			
Variable	Coefficient	Standar Error	T-Statistic	Variable	Coefficient	Standar Error	T-Statistic
Xheat	0.029	0.002	11.486	Xheat	0.646	0.088	7
Xother	0.036	0.002	16.183	Xother	0.140	0.014	10
Rate Zone II Regression Coefficients				Rate Zone II Regression Coefficients			
Variable	Coefficient	Standar Error	T-Statistic	Variable	Coefficient	Standar Error	T-Statistic
Xheat	0.028	0.003	10.773	Xheat	0.719	0.048	15
Xother	0.040	0.003	13.413	Xother	0.070	0.016	4
Rate Zone III Regression Coefficients				Rate Zone III Regression Coefficients			
Variable	Coefficient	Standar Error	T-Statistic	Variable	Coefficient	Standar Error	T-Statistic
Xheat	0.023	0.002	10.944	Xheat	0.86	0.017	51
Xother	0.033	0.002	15.956	Xother	0.15	0.062	2

The chart below shows in more detail the economic and various end uses saturation and efficiency variables, that make up SAE model framework.



## Statistically Adjusted End-Use Modeling Framework

The statistically adjusted end-use modeling framework begins by defining energy use ( $USE_{y,m}$ ) in year (y) and month (m) as the sum of energy used by heating equipment ( $Heat_{y,m}$ ) and other equipment ( $Other_{y,m}$ ). Formally,

$$USE_{y,m} = Heat_{y,m} + Other_{y,m} \quad (1)$$

Although monthly sales is measured for individual customers, the end-use components are not. Substituting estimates for the end-use elements gives the following econometric equation.

$$USE_m = XHeat_m + b_2 \times XOther_m + \varepsilon_m \quad (2)$$

Here,  $XHeat_m$  and  $XOther_m$  are explanatory variables constructed from end-use information, dwelling data, weather data, and market data. As will be shown below, the equations used to construct these X-variables are simplified end-use models, and the X-variables are the estimated usage levels for each of the major end uses based on these models. The estimated model can then be thought of as a statistically adjusted end-use model, where the estimated slopes are the adjustment factors.

### Constructing $XHeat$

As represented in end-use models, energy use by space heating systems depends on the following types of variables.

- Heating degree days,
- Heating equipment saturation levels,
- Heating equipment operating efficiencies,
- Average number of days in the billing cycle for each month,
- Thermal integrity and footage of homes, and
- Average household size, household income, and energy price.

The heating variable is represented as the product of an annual equipment index and a monthly usage multiplier. That is,

$$XHeat_{y,m} = HeatIndex_y \times HeatUse_{y,m} \quad (3)$$

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.

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The heating equipment index is defined as a weighted average across equipment types of equipment saturation levels normalized by operating efficiency levels. 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*). Formally, the equipment index is defined as:

$$HeatIndex_y = StructuralIndex_y \times \sum_{Type} Weight^{Type} \times \frac{\left( \frac{Sat_y^{Type}}{Eff_y^{Type}} \right)}{\left( \frac{Sat_{05}^{Type}}{Eff_{05}^{Type}} \right)} \quad (4)$$

The *StructuralIndex* is constructed by combining the EIA's building shell efficiency index trends with surface area estimates, and then it is indexed to the 2001 value:

$$StructuralIndex_y = \frac{BuildingShellEfficiencyIndex_y \times SurfaceArea_y}{BuildingShellEfficiencyIndex_{05} \times SurfaceArea_{05}} \quad (5)$$

The *StructuralIndex* is defined on the *StructuralVars* tab of the SAE spreadsheets. 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:

$$SurfaceArea_y = 892 + 1.44 \times Footage_y \quad (6)$$

In Equation 4, 2005 is used as a base year for normalizing the index. The ratio on the right is equal to 1.0 in 2005. In other years, it will be greater than one if equipment saturation levels are above their 2005 level. This will be counteracted by higher efficiency levels, which will drive the index downward. The weights are defined as follows. The weights are defined by the estimated 2005 heating energy use per household for each equipment type.

$$Weight^{Type} = \frac{Energy_{05}^{Type}}{HH_{05}} \times HeatShare_{05}^{Type} \quad (7)$$

In the SAE spreadsheets, these weights are referred to as *Intensities* and are defined on the *EIADData* tab. With these weights, the *HeatIndex* value in 2005 is equal to estimated annual heating intensity

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per household in that year. Variations from this value in other years will be proportional to saturation and efficiency variations around their base values.

For natural gas heating equipment, the SAE Spreadsheets contains two equipment types: natural gas furnaces and secondary heating units. Examples of weights for these two equipment types for the East North Central Region are given in Table 2.

**Table 2: Natural Gas Space Heating Weights for East North Central Region**

Equipment Type	Weight (Therms)
Natural Gas Furnace	608.6
Natural Gas Secondary Heating Units	4.9

The equipment saturation and efficiency trends data are contained in the SAE model. The efficiency for natural gas furnaces is given in terms of *Annual Fuel Utilization Efficiency* [%]. Unit energy consumption (UEC) values are used as a proxy for efficiency change in natural gas secondary heating units and given in terms of Therms/year.

Heating system usage levels are impacted on a monthly basis by several factors, including weather, household size, income levels, prices, and billing days. The estimates for space heating equipment usage levels are computed as follows:

$$\text{HeatUse}_{y,m} = \left( \frac{\text{BDays}_{y,m}}{30.5} \right) \times \left( \frac{\text{WgtHDD}_{y,m}}{\text{HDD}_{01}} \right) \times \left( \frac{\text{HHSize}_y}{\text{HHSize}_{01}} \right)^{0.30} \times \left( \frac{\text{Income}_y}{\text{Income}_{01}} \right)^{0.05} \times \left( \frac{\text{Price}_{y,m}}{\text{Price}_{01}} \right)^{-0.12} \quad (8)$$

where,  $\text{BDays}_{y,m}$  is the number of billing days in year (y) and month (m). These values are normalized by 30.5 which is the average number of billing days

$\text{WgtHDD}_{y,m}$  is the weighted number of heating degree days in year (y) and month (m). This is constructed as the weighted sum of the current month's HDD and prior month's HDD. The weights are 75% on the current month and 25% on the prior month,

$\text{HHSize}_y$  is average household size in a year (y),

$\text{Income}_y$  is average real income per household in year (y), and

$\text{Price}_{y,m}$  is the average real price of natural gas in year (y) and month (m).

By construction, the  $\text{HeatUse}_{y,m}$  variable has an annual sum that is close to one in the base year (2005). The first two terms, which involve billing days and heating degree days, serve 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, if the real price of natural gas goes up 10% relative to the

base year value, the price term will contribute a multiplier of about 0.99 (computed as 1.10 to the -0.12 power).

### **Constructing XOther**

Monthly estimates of non-weather sensitive sales can be derived in a similar fashion to space heating. Based on end-use concepts, other sales are driven by:

- Appliance and equipment saturation levels,
- Appliance and equipment efficiency levels,
- Average number of days in the billing cycle for each month, and
- Average household size, real income, and real prices.

The explanatory variable for other uses is defined as follows:

$$XOther_{y,m} = OtherEqIndex_{y,m} \times OtherUse_{y,m} \quad (9)$$

The first term on the right hand side of this expression (*OtherEqIndex<sub>y</sub>*) 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 SAE spreadsheets. The end-use indices are combined into an aggregate stock index (*OtherEqIndex*) in the *MetrixND* project files. The equipment index for water heaters (*NGWHeat*) and appliances are given in Equations 10 and 11, respectively.

$$NGWHeatIndex_{y,m} = Weight \times \frac{\left( \frac{Sat_y}{Eff_y} \right)}{\left( \frac{Sat_{05}}{Eff_{05}} \right)} \times MoMult_m \quad (10)$$

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$$NGApplianceIndex_{y,m} = Weight^{Type} \times \frac{\left( \frac{Sat_y^{Type}}{\frac{1}{UEC_y^{Type}}} \right)}{\left( \frac{Sat_{05}^{Type}}{\frac{1}{UEC_{05}^{Type}}} \right)} \quad (11)$$

where, *Weight* is the weight for natural gas water heater/appliance  
*Sat* represents the fraction of households who have a natural gas water heater/appliance,  
*Eff* is the average operating efficiency for natural gas water heaters,  
*UEC* is the unit energy consumption for natural gas appliances, and  
*MoMult* is a monthly multiplier for water heaters in month (m).

The index for other uses is derived by summing the above equations:

$$OtherEqpIndex_{y,m} = NGWHeatIndex_{y,m} + NGApplianceIndex_{y,m} \quad (12)$$

This index combines information about trends in saturation levels and efficiency levels for the natural gas water heating units and appliances with monthly multipliers for water heating. As with heating, the weights are defined as follows.

$$Weight^{Type} = \frac{Energy_{05}^{Type}}{HH_{05}} \times Share_{05}^{Type} \quad (13)$$

The appliance saturation and efficiency trends data are contained in the SAE model. The efficiency for natural gas water heating units is given in terms of *Efficiency Factor* [%]. UEC's are used as a proxy for efficiency change in other appliances and are given in terms of Therms/year.

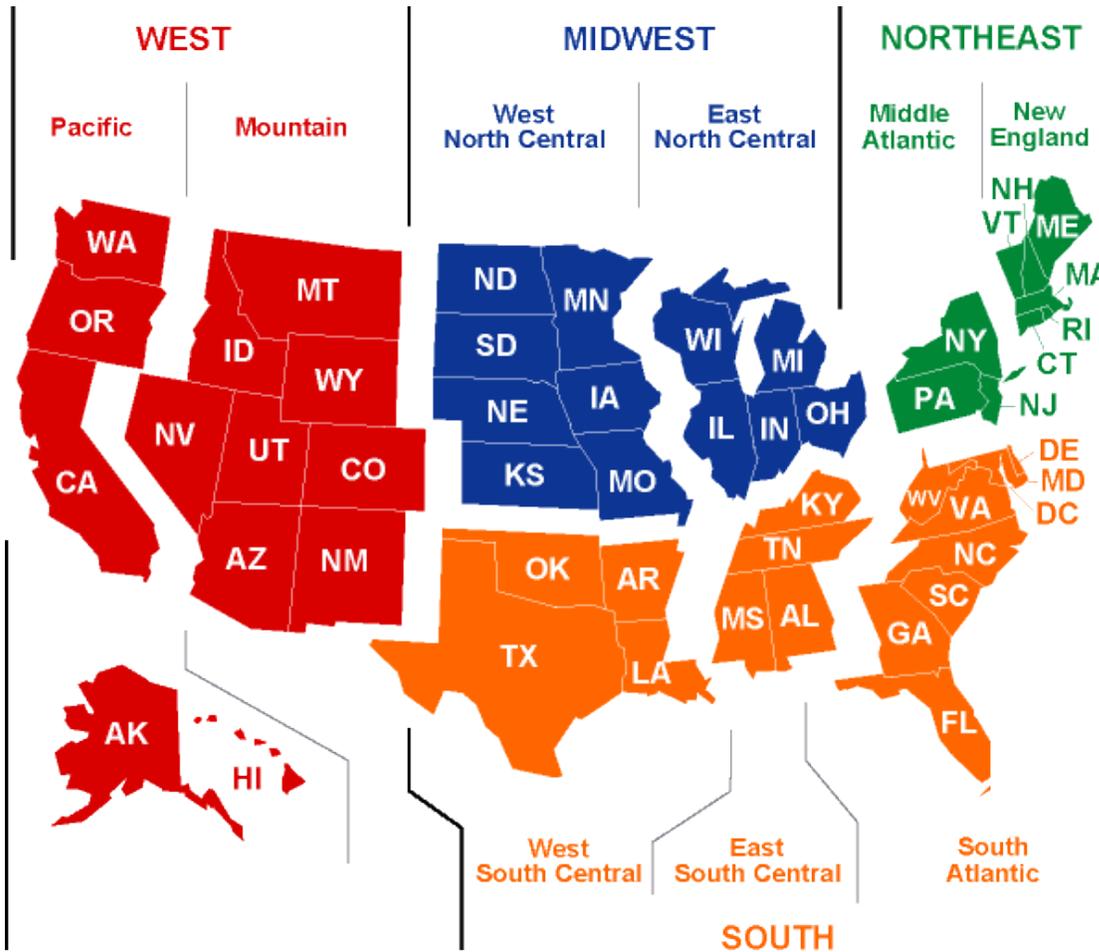
Further monthly variation is introduced by multiplying by usage factors that cut across all end uses, constructed as follows:

$$OtherUse_{y,m} = \left( \frac{BDays_{y,m}}{30.5} \right) \times \left( \frac{HHSize_y}{HHSize_{05}} \right)^{0.60} \times \left( \frac{Income_y}{Income_{05}} \right)^{0.10} \times \left( \frac{Price_{y,m}}{Price_{05}} \right)^{-0.12} \quad (14)$$

## 1.2 Supporting Spreadsheets and *MetrixND* Project Files

The SAE approach described above has been implemented for each of the nine census divisions. A mapping of states to census divisions is presented in Figure 1. This section describes the contents of each file and a procedure for customizing the files for specific utility data. A total of 18 files are provided. These files are listed in Table 2.

**Figure 1. Mapping of States to Census Divisions\***



The result of the model results projects residential natural gas heating use and other gas usage (natural gas water heating and natural gas cooking) for the residential class.

The SAE approach that Ameren Illinois used to forecast sales to the commercial class is very similar to that used in the residential model described above. As with the residential class, the index variable includes past and forecasted data on appliance efficiency and saturation, while "use" variable includes

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an economic driver, natural gas prices, weather and appropriate elasticities. The commercial SAE model also includes building types and gas intensity that are matched to our customer data base. The principal economic driver of the model is gross domestic product (GDP).

One difference between the commercial class SAE models and the residential SAE model is that in the residential model the SAE function is used to forecast use per customer, and a separate analysis predicts customer counts. Total therm usage in the residential class is the product of the result of the customer model and the SAE model. In the case of the commercial model, we are directly forecasting therms with the SAE models rather than use per customer.

### **Econometric Industrial and Other Models**

The industrial and other models were developed with a regression model with economic variables being drivers of the model. The economic variables used in the model include Gross Domestic Product for Manufacturing, GDP for Food Manufacturing and Total Employment for Industrial.

### **Customer Forecasts**

AIC developed forecast of customer counts at the class level and then allocated those counts to the rate class level based on historical shares. In each case, the Company attempted to use an econometric approach, with customers modeled as a function of an appropriate driver, such as households or employment. Normally this would be a straightforward process, but it was complicated by the fact that GDP and employment both contracted rather severely in the 2008 and 2009. The customer forecast is assumed to be flat for all classes due to the divergence in household and customer growth for the residential class and the divergence of employment and customer growth in the commercial and industrial classes.

### **Model Statistics**

The statistical reliability of the AIC models were measured first by the r-squared (R<sup>2</sup>) and then by adjusted r-squared. The R<sup>2</sup> is a statistic that will give some information about the goodness of fit of a model. In regression, the R<sup>2</sup> coefficient of determination is a statistical measure of how well the regression line approximates the real data points. An R<sup>2</sup> of 1.0 indicates that the regression line perfectly fits the data.

Adjusted R<sup>2</sup> is a modification of R<sup>2</sup> that adjusts for the number of explanatory terms in a model. Unlike R<sup>2</sup>, the adjusted R<sup>2</sup> increases only if the new term improves the model more than would be expected by chance. The adjusted R<sup>2</sup> can be negative, and will always be less than or equal to R<sup>2</sup>.

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The model statics as measured by the adjusted R-Squared is shown in the table 3 below for each major class and by Rate Zone. Overall a high level of goodness of fit is indicated by the AIC model results.

<b>Table 3</b>		
<b>AIC Rate Zone</b>	<b>Major Class</b>	<b>Adj. R-Squared</b>
	Residential	0.997
Rate Zone 1 - Ameren CIPS	Commercial	0.975
	Industrial	0.819
	Residential	0.996
Rate Zone II - Ameren CILCO	Commercial	0.964
	Industrial	0.622
	Residential	0.997
Rate Zone III - Ameren IP	Commercial	0.987
	Industrial	0.873

**Other General Assumptions**

Weather – AIC utilizes normal weather based on the ten-year period 2002-2011. Please see Schedule E-4 section a-2 for the basis of the ten year normal weather.

Economic Assumptions were from the Fourth-Quarter 2011 Moody's Analytics forecast for Ameren Illinois Company. In general the Ameren Illinois Company service territory is expected to grow at lower level than that of the nation due to the following:

- Over the long run, job and income growth will lag both the national and Midwest averages.
  - Few growth drivers downstate.
  - Huge state debt burden.
  - Poor long-term population trends.
  - Rising business costs.
- Much of Caterpillar’s growth will bypass IL. New facilities are being built or expanded in the South and overseas instead of Peoria and Decatur.
- Illinois’ economy will remain weaker than that of most states, held back by weaknesses in such previously strong industries as finance and tech and by the state’s severe fiscal austerity measures.

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- Long-run growth will be further restrained by the state’s reliance on declining manufacturing. Weak demographic and employment trends will further limit the long-run potential of the state’s consumer industries.

**Forecast Allocation**

Once the forecast models generated by major class (residential, commercial, industrial, and public authority) the forecast is ten separated by delivery service class and supply option for revenue forecasting purposes. The sub groupings are set forth in Table 4 below:

<b>Table 4</b>		
<b>Delivery Service Classification - GDS1</b>		
GDS1 - Residential Gas Delivery Service	Rider S	Residential
<b>Delivery Service Classification - GDS2</b>		
GDS2 - Small General Gas Service	Rider S	Commercial
GDS2 - Small General Gas Service	Rider T	Commercial
GDS2 - Small General Gas Service	Rider S	Commercial
GDS2 - Small General Gas Service	Rider T	Commercial
GDS2 - Small General Gas Service	Rider S	Public Authority
GDS2 - Small General Gas Service	Rider T	Public Authority
<b>Delivery Service Classification - GDS3</b>		
GDS3 - Intermediate General Gas Service	Rider S	Commercial
GDS3 - Intermediate General Gas Service	Rider T	Commercial
GDS3 - Intermediate General Gas Service	Rider S	Industrial
GDS3 - Intermediate General Gas Service	Rider T	Industrial
GDS3 - Intermediate General Gas Service	Rider S	Public Authority
GDS3 - Intermediate General Gas Service	Rider T	Public Authority
<b>Delivery Service Classification - GDS4</b>		
GDS4 - Large General Gas Service	Rider S	Commercial
GDS4 - Large General Gas Service	Rider T	Commercial
GDS4 - Large General Gas Service	Rider S	Industrial
GDS4 - Large General Gas Service	Rider T	Industrial
<b>Delivery Service Classification - GDS5</b>		
GDS5 - Seasonal Gas Service	Rider S	Commercial
GDS5 - Seasonal Gas Service	Rider T	Commercial
GDS5 - Seasonal Gas Service	Rider S	Industrial
GDS5 - Seasonal Gas Service	Rider T	Industrial

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**Basis for the Allocation**

Within each rate zone, the allocations by delivery service class and supply option are based on 2011 and 2012 sales and customer data from the AIC Customer Service System.

**Comparison of Comparative Year**

The comparative year of 2012 is compared to test year 2014 in the table below.

**Table 5 - Ameren Illinois Test Year Comparison December 2014 (Therms)**

Present Delivery Service Classification	Fiscal Year 2012	Weather Adjustment	Normalized Fiscal Year2012	Test Year 2014	Difference	% change
GDS1	468,036,739	86,302,179	554,338,918	542,281,322	(12,057,596)	-2%
GDS2	150,519,710	27,853,694	178,373,404	179,660,621	1,287,216	1%
GDS3	76,603,135	8,975,615	85,578,750	83,593,601	(1,985,149)	-2%
GDS4	701,650,144		701,650,144	645,552,713	(56,097,431)	-8%
GDS5	19,875,573		19,875,573	19,143,890	(731,684)	-4%
GDS7	87,094,597		87,094,598	65,077,211	(22,017,387)	-25%
Total Volumes	1,503,779,899	123,131,489	1,626,911,388	1,535,309,358	(91,602,030)	-5.6%

Overall, AIC load growth is expected to decline as energy efficiency improvements and measures reduce customer usage, and demographic and employment trends continued weakness. A weak manufacturing outlook will impact sales in some sectors. The manufacturing outlook will have the most pronounced effect on the GDS4 class. The GDS7 consist of two customers and the volumes for 2012 are higher than normal due partly to lower gas price.

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- a) 2) Ameren Illinois Company has used 10 year normal (2002-20011) for the forecasted test year. The calendar month heating degree days by Rate Zone are as follows:

Month	NHDD		
	Rate Zone 1	Rate Zone 2	Rate Zone 3
January	1,100	1,225	1,101
February	922	1,035	930
March	623	725	633
April	291	362	298
May	114	157	118
June	6	10	7
July	0	0	0
August	3	5	3
September	44	61	44
October	293	360	303
November	575	661	586
December	974	1,105	987
Total	4,945	5,706	5,011

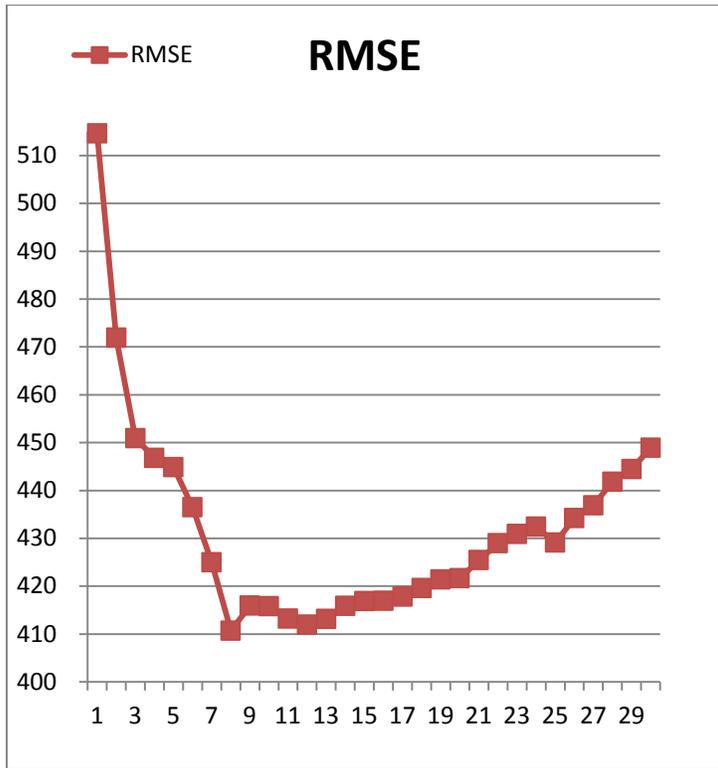
The basis of the ten year normal is an analysis conducted by Ameren that compares different normal periods. 124 years of Midwest Regional Climate Center (MRCC) monthly weather data (1889-2012) for Urbana, IL station are used to calculate yearly actual heating degree days (actual HDD). In seeking the optimal rolling period to use for normal weather determination, all possible averaging periods, 1 to 30 years, are considered and calculated as HDD moving averages. The moving averages in this study are first calculated for a given base period, and then the base period is shifted forward 1 year to come up with a new mean. For instance, a 10-year moving average uses 1996-2005 data range to predict 2006 value; next, same moving average uses 1997-2006 data to estimate 2007 value.

After calculating different HDD moving averages to be used as normal weather, one of the most commonly statistical methods is the root mean square error (RMSE) and it is used to evaluate the predictive ability of moving averages. The first step is to calculate the prediction error ( $\Delta X$ ), which means the difference between actual HDD for a particular year and an HDD moving average. Each year has up to 30 HDD moving averages. Therefore, the number of the prediction error for each year depends on the number of HDD moving averages. The second step is to square each prediction error  $(\Delta X)^2$  and accumulate them by rolling period  $\sum (\Delta X)^2$ . 30 different accumulation is then divided by the number of prediction error (n) accumulated and the square root is taken of each quotient: **RMSE**=  $[\frac{1}{n} \sum (\Delta X)^2]^{\frac{1}{2}}$

The RMSE results are sorted from the smallest to the largest because the smaller error means being closer to the actual value. According to the result summary shown below, 8-

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year rolling period has the best predictive capability to forecast 1 year into the future. The table also indicates that a short time period is better than longer period. It also shows that Ameren's 10 year normal value is superior to a 30 year average. The 10 year average had the 5<sup>th</sup> lowest RMSE compared to the 30 year average which had the 27<sup>th</sup> lowest RMSE.



<b>ROOT MEAN SQUARED ERROR</b>				
		Sorted		
# of Years	RMSE	# of Years	RMSE	
1	515	8	411	Best
2	472	12	412	
3	451	13	413	
4	447	11	413	
5	445	10	416	
6	436	14	416	
7	425	9	416	
8	411	15	417	
9	416	16	417	
10	416	17	418	
11	413	18	420	
12	412	19	421	
13	413	20	422	
14	416	7	425	
15	417	21	425	
16	417	22	429	
17	418	25	429	
18	420	23	431	
19	421	24	432	
20	422	26	434	
21	425	6	436	
22	429	27	437	
23	431	28	442	
24	432	29	444	
25	429	5	445	
26	434	4	447	
27	437	30	449	
28	442	3	451	
29	444	2	472	
30	449	1	515	Worst
Min	411			
Max	515			
Mean	432			

The calendar month 30 year normal weather, 1982-2011, as used by the national weather service follows:

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30 year calendar normal HDD			
Month	Rate Zone I	Rate Zone II	Rate Zone III
1	1,115	1,246	1,121
2	885	1,005	891
3	659	756	663
4	329	399	329
5	105	146	100
6	11	18	10
7	0	1	3
8	3	6	3
9	60	85	61
10	286	355	293
11	613	702	618
12	997	1,121	1,004
Total	5,062	5,840	5,098