

## 3. Load Analysis and Forecasting

### Highlights

- *Ameren Missouri expects energy consumption to grow 12% and peak demand to grow 8% over the next 20 years.*
- *The commercial class is expected to provide the most growth while federal efficiency standards continue to slow residential growth compared to historical trends.*
- *Key forecast uncertainties include growth in miscellaneous plug load, the future mix of customers and the impact that has on energy intensity of the local economy, and the impact of rising prices.*



Ameren Missouri has developed a range of load forecasts consistent with the scenarios outlined in Chapter 2. These load forecasts provide the basis for estimating Ameren Missouri's future resource needs and provide hourly load information used in the modeling and analysis discussed in Chapter 9. In addition, the Statistically Adjusted End-use forecasting tools and methods used to develop the forecasts provide a solid analytical basis for testing and refining the assumptions used in the development of the potential demand-side resource portfolios discussed in Chapter 7.<sup>1</sup> The energy intensity of the future economy and the inherent energy efficiency of the stock of energy using goods are explored throughout the analysis to arrive at reasonable estimates of high, base, and low load growth.

### 3.1 Energy Forecast

This chapter describes the forecast of Ameren Missouri's energy, peak demand, and customers that underlies the analysis of resources undertaken in this IRP. In order to account for a number of combinations of possible economic and policy outcomes, fifteen different forecasts were prepared. Based on the subjective probabilities of these scenarios identified by Ameren Missouri, a sixteenth case was developed to represent the planning case for the study. The planning case forecast projects Ameren Missouri's retail sales to grow by 0.59% annually between 2014 and 2034, and retail peak demand to grow by 0.40% per year.

<sup>1</sup> 4 CSR 240-22.030(1)(A)

Figure 3.12: Ameren Missouri Actual Historical Energy Sales and Past IRP Energy Forecasts

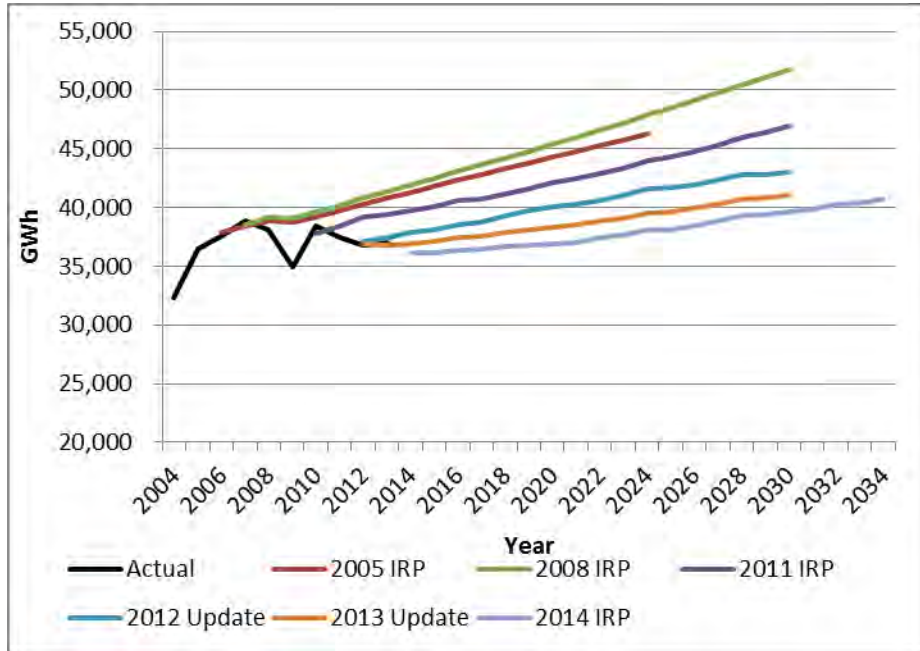
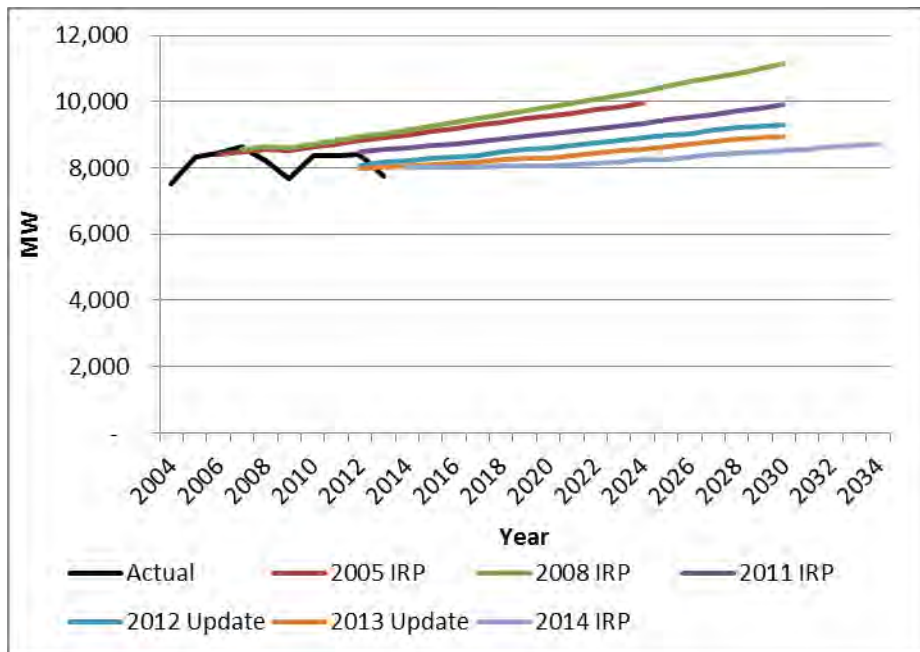
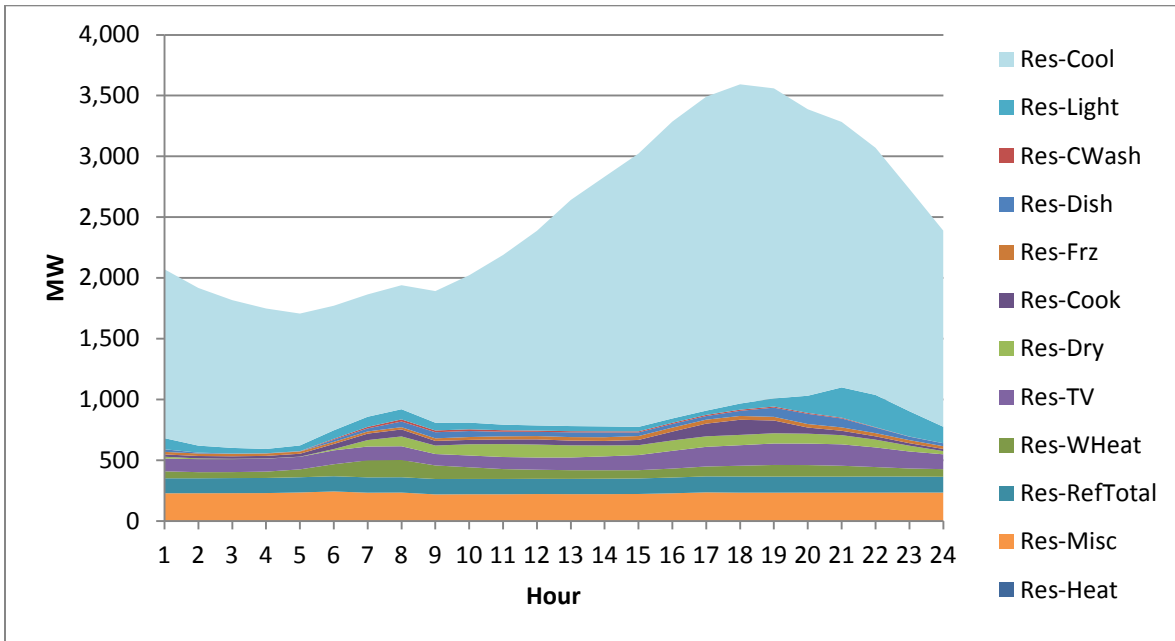


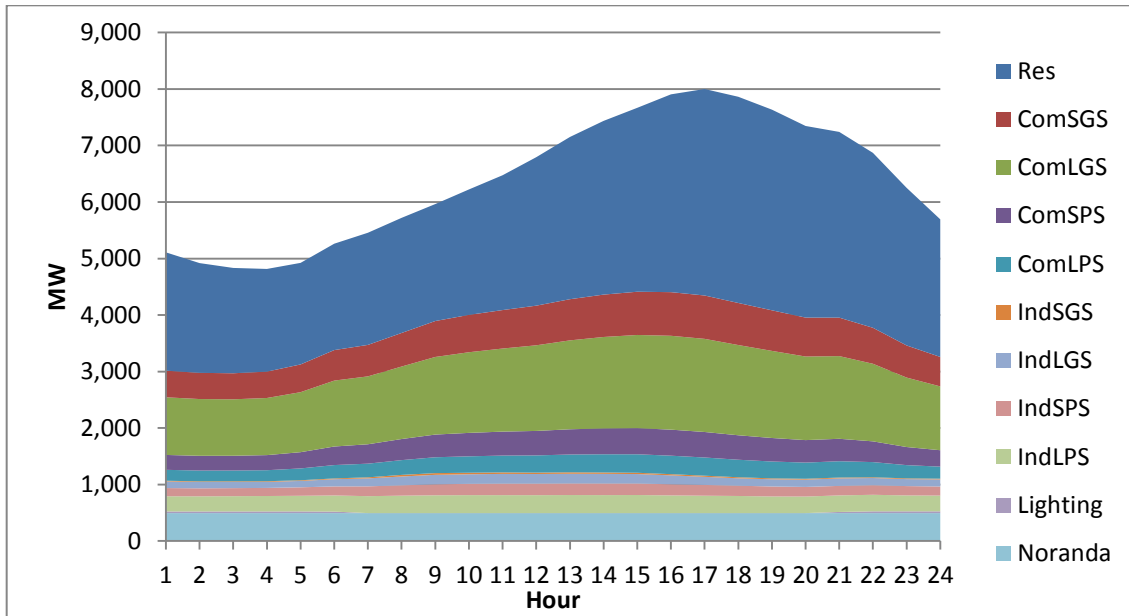
Figure 3.13: Ameren Missouri Actual Historical Peak Demand and Past IRP Peak Demand Forecasts



**Figure 3.24: Residential Summer Day Usage Built-Up by End Use**

Once each class load has been constructed on an hourly basis (either through direct application of the class profile to the class energy forecast or through the aggregation of the end-use scaled load shapes), transmission and distribution losses are applied. The transmission and distribution losses are based on the Ameren Missouri 2011 loss study performed by its distribution engineers. For purposes of calculating the load for the peak forecast, demand loss rates are utilized. Demand loss rates are the loss rates determined by the study to apply to loads at times of peak demand. Typically this loss rate is higher than average or energy loss rates due to the properties of the system that cause losses to increase both under high load conditions and high temperatures.

The demand loss rates are applied to the profiled loads based on the planning calendar. This is done because the planning calendar was created specifically to develop a consistent peak forecast across time and the demand loss rates are designed specifically for application to peak periods. Each class has the applicable loss rate applied to it based on the voltage level at which its customers are served. When each class' hourly load has been grossed up to represent the amount of energy that must be generated to serve them inclusive of applicable losses, the class loads are summed for each hour. This results in a forecast of the hourly load from which the maximum value for each month can be isolated as the forecasted peak load for that month. Similar to the build-up of the residential class from end-use data, a graphical representation of the build-up of the system load by class can be seen in Figure 3.25.

**Figure 3.25: 2014 Summer System Peak Day Usages Built-Up by Class**

### *Back Testing and Calibration of Peaks*

In order to ensure that the bottom-up forecast is producing a peak load estimate that is reliable, Ameren Missouri used the same methodology to backcast historical peaks for the period from 2007 through 2012. Historical calendar month actual sales were disaggregated into end uses where necessary by application of information from the Statistically Adjusted End Use models. The end use and class level profiles were updated with actual historical weather and calendar information to produce historical shapes to represent actual conditions. The historical sales were shaped using the profiles, grossed up for line losses, and aggregated. The peak values from those historical calculations for each year were compared to the actual peak loads observed in those years. The results are shown in the Table 3.7.

**Table 3.7: Actual vs. Model Peak**

Year	Modeled Peak (MW)	Actual Peak (MW)	Difference	% Diff
2007	8,458	8,784	326	3.7%
2008	8,254	8,367	113	1.3%
2009	7,750	7,761	11	0.1%
2010	8,248	8,444	196	2.3%
2011	8,037	8,413	376	4.5%
2012	8,744	8,439	-305	-3.6%
<b>Avg.</b>	<b>8,249</b>	<b>8,368</b>	<b>120</b>	<b>1.4%</b>