LONG-TERM LOAD FORECAST METHODOLOGIES

KENTUCKY MUNICIPAL POWER AGENCY ("KMPA")

KMPA Monthly Peak Load Forecast

Monthly peaks are forecasted using a regression analysis comparing the historical monthly peak for a month with the high or low temperature for the month and the United States GDP. Typically the past five years' data is used to create the regression formula that creates the peak forecast.

For the months of January, February, March, April, November and December, the low temperature for the month is used. The high temperature for the month is used for the other six months.

After creating a monthly peak forecast for 2018, each succeeding year is then forecasted to increase by a fixed percentage per year based on average member load forecasted growth from an econometric forecast completed by Leidos in 2014.

KMPA Monthly Energy Load Forecast

Monthly energy usage is forecasted using a regression analysis comparing the historical energy usage for a month with the cooling or heating degree days for the month and the United States GDP. Typically the past five years' data is used to create the regression formula that creates the energy forecast.

For the months of January, February, March, April, October, November and December, heating degree days are used. Cooling degree days are used for the other five months.

LONG-TERM LOAD FORECAST METHODOLOGIES

After creating a monthly energy forecast for 2018, each succeeding year is then forecasted to increase by a fixed percentage per year based on average member load forecasted growth from an econometric forecast completed by Leidos in 2014.

LONG-TERM LOAD FORECAST METHODOLOGIES

KENTUCKY MUNICIPAL ENERGY AGENCY ("KYMEA")

KYMEA develops long-term load forecasts for its members including several Kentucky municipal systems. This includes long-term demand forecasts for summer and winter as well as spring, fall, low load, and sixty-degree ambient forecasts pursuant to NERC Reliability Standard MOD-32 data requirements.

The forecasts rely upon historical demand and energy data including hourly load data for each of the municipal delivery points. Where available, other information used in the development of load forecasts includes the number of customers and energy sales for each rate class, weather data (temperature data, heating degree days, cooling degree days, etc.), employment data, and economic data.

Daily historical weather data is sourced from National Oceanic and Atmospheric Administration (NOAA). City, county, and regional economic, population and housing data is sourced from Woods & Poole.

Using a least-squares regression approach, different combinations of weather and economic variables are evaluated to determine a regression equation that best explains historic correlation between energy consumption and statistically significant independent variables. Once an equation has been developed, a forecast of independent economic variables is combined with normalized weather data to produce a base case forecast of monthly energy consumption is produced. The monthly energy consumption forecast is used to produce a forecast a monthly demand based on historic seasonal and/or monthly relationships between peak demand and total energy consumption. Finally, each independent variable included in the

regression analysis is simulated as constrained by historic distributions of each data point to provide an analysis of the forecast's sensitivity to each independent variable, as well as to convey results in the context of a probabilistic demand and energy forecast.

In addition to the data considerations above, each municipal utility system provides input relating to known or anticipated changes in retail customer load. Special attention is given to local knowledge about large commercial and/or industrial loads, and to other discrete changes in each utility's territory that impact energy usage on the system outside the ongoing impacts of the independent variables identified in the development of the forecasting regression equation.

LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY ("LG&E/KU")

The LG&E/KU Sales Analysis & Forecasting Group develops the Long Term Load Forecast (meaning the forecast for the peak and energy for each of the next 360 months) for LG&E/KU, which includes the load forecast for LG&E and KU (including KU's retail customers, KU's wholesale municipal customers and Old Dominion Power). The LG&E/KU OASIS only publishes the peak load forecast for each month for the next 18-36 months.

The LG&E/KU Long Term Load Forecast methodology is based on econometric modeling of energy sales by customer class, but also incorporates specific intelligence on the prospective energy requirements of the utility's largest customers. Econometric modeling captures the (observed) statistical relationship between energy consumption – the dependent variable – and one or more independent explanatory variables such as the number of households or the level of economic activity in the service territory. Forecasts of electricity sales are then derived from a projection of the independent variable(s).

This widely-accepted approach can readily accommodate the influences of national, regional, and local (service territory) drivers of utility sales. This approach may be applied to forecast customer numbers, energy sales, or use-per-customer. The statistical relationships will vary depending upon the jurisdiction being modeled and the class of service. For LG&E, only one jurisdiction is modeled, Kentucky-retail. The KU energy forecast identifies three separate jurisdictional groups: Kentucky-retail, Virginia-retail, and wholesale sales (to municipally-owned utilities in Kentucky). Within the LG&E and KU jurisdictions, the forecast typically distinguishes several classes of customers including residential, commercial, and industrial.

The econometric models used to produce the forecast passed two critical tests. First, the explanatory variables of the models were theoretically appropriate and have been widely used in electric utility forecasting. Second, inclusion of those explanatory variables produced statistically-significant results that led to an intuitively reasonable forecast. In other words, the models were proven theoretically and empirically robust to explain the behavior of the LG&E/KU customer and sales data.

Sales to several of LG&E/KU's large customers are forecast based on information obtained through direct discussions with these customers. These regular communications allow LG&E/KU to directly adjust sales expectations given the first-hand knowledge of the production outlook for these companies.

The modeling of residential and commercial sales also incorporates elements of end-use forecasting - covering base load, heating, and cooling components of sales – which recognize expectations with regard to appliance saturation trends, efficiencies, and price or income effects.

The energy forecasts for the LG&E and KU service territories are then converted from a billed basis to a calendar basis. The resulting estimate of monthly energy sales is then associated with class specific load profiles and load factors to generate hourly sales. Then the hourly sales are adjusted for company uses and losses to produce annual, seasonal, and monthly peak demand forecasts.

LONG-TERM LOAD FORECAST METHODOLOGIES

Data inputs to the forecasting process for LG&E and KU service territories come from a variety of external and internal sources. The national outlook for U.S. Gross Domestic Product, industrial production and consumer prices are key macro-level variables that establish the broad market environment within which LG&E/KU operate. Local influences include trends in population, household formation, employment, personal income, and cost of service provision (the 'price' of electricity). National, regional, and state level macroeconomic and demographic forecast data are provided by reputable economic forecasting consultants (IHS Global Insight).

Weather data for each service territory is provided by the National Climatic Data Center (NCDC), a branch of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce. Itron provides regional databases with information from the Energy Information Administration (EIA) that support the modeling of appliance saturation and efficiency trends and customer choice. The retail electric price forecast and class specific load profile/load factor data for both utilities are determined internally.

As mentioned previously, sales to several large customers for LG&E/KU are forecast based on information provided by these customers to LG&E/KU. Historical sales data for these customers and for the respective class forecasts are obtained via extracts from LG&E/KU's Customer Care Solution (CCS). Figure 1 illustrates the external and internal data sources used to drive the LG&E/KU forecasts.

Figure 1 – Data Inputs to LG&E and KU Customer, Sales, and Demand Forecasts

External	Internal
IHS Global Insight National Economic/Demographic Factors	Retail Electric Price Forecast
IHS Global Insight & Kentucky Data Center County and State Economic/Demographic Factors	LG&E/KU Customer and Sales History by Rate Class from CCS
NCDC Temperature Data for Lexington, Louisville, and Bristol, TN	Individual Large Customer Information

Itron/EIA Appliance Efficiency and Saturation Study

Service Territory Appliance Saturation Surveys
Class Specific Load Profile and Load Factor Assumptions

OWENSBORO MUNICIPAL UTILITIES ("OMU")

OMU develops a Long Term Load Forecast (meaning the forecast for the peak for each of the next 120 months) for the OMU City Load which includes the load forecast for OMU retail customers. This forecast projects energy and demand based upon historical data.

OMU utilizes an Annual Load Factor Methodology to develop its Long Term Load Forecast. Data inputs to the forecasting process for OMU City Load include external and internal sources. OMU utilizes previous load growth analyzed over a 10 year period and makes adjustments based upon significant industrial or commercial planned growth.

OMU provides an updated Long Term Load Forecast to the LG&E/KU ITO annually.