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November 25, 2014

RECEIVED
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PUBLIC SERVICE COMMISSION

Via Federal Express

Mr. Jeff Derouen
Executive Director
Public Service Commission
211 Sower Boulevard, P.O. Box 615
Frankfort, Kentucky 40602-0615

Re: In the Matter of: 2014 Integrated Resource Plan of Big Rivers Electric Corporation, P.S.C. Case No. 2014-00166

Dear Mr. Derouen:

The Kentucky Public Service Commission issued an order on November 20, 2014, directing Big Rivers Electric Corporation ("Big Rivers") to re-file Appendix A of Big Rivers' 2014 Integrated Resource Plan, reflecting the redaction of information granted confidential treatment and reflecting as unredacted the information denied confidential treatment. Big Rivers does not believe Appendix A contains information for which confidential treatment was granted. As such, enclosed are an original and ten (10) copies of the unredacted Appendix A. I certify that on this date, a copy of this letter and a copy of the unredacted Appendix A was served on each of the persons listed on the attached service list by first-class mail. Please feel free to give me a call if you have any questions.

Sincerely,

Tyson Kamuf

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GDS Associates, Inc.
Engineers and Consultants

2013 Load Forecast

Energy and Peak Demand Projections for 2013- 2028

Big Rivers Electric Corporation

Henderson, Kentucky

April 2013

In Cooperation with
Meade County Rural Electric Cooperative Corporation
Jackson Purchase Energy Corporation
Kenergy Corp.

GDS Associates, Inc.
1850 Parkway Place
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APPENDICES

1. Executive Summary

Big Rivers Electric Corporation (Big Rivers) is an electric generation and transmission cooperative headquartered in Henderson, Kentucky. The 2013 Load Forecast was completed in April 2013 and updates the most recent forecast that was completed in January 2013.[1] The forecast contains projections of energy and demand requirements for a forecast horizon spanning years 2013-2028. High and low range forecast scenarios were developed to address uncertainties regarding the factors expected to influence energy consumption in the future. In addition to the energy and demand projections, this report presents the assumptions upon which the forecast is based and the methodologies employed in development of the forecast.

1.1 Forecast Results

Total system energy and coincident peak demand requirements are projected to drop significantly in 2013 and 2014 before rising significantly in 2016-2021. Sharp declines in 2013-2014 are due to the expiration of power contracts with two large industrial customers. The annual impact is estimated at 850 MW and 7,400 MWH. Large increases in demand and energy requirements beginning in 2016 and continuing through 2021 correspond to new power contracts Big Rivers expects to execute as a result of the Cooperative's efforts to market excess capacity. Sales associated with these new contracts are expected to increase from 657 GWh in 2016 to 5,256 GWh by 2021.

Aside from the impacts associated with the expiring and new contracts, native system energy and peak demand requirements, defined as total system requirements less smelter requirements, are projected to increase at average compound rates of 0.6% and 0.8%, respectively over the forecast horizon.[2] Rural system[3] energy sales and peak demand are projected to increase at average annual compound rates of 0.6% and 0.9%, respectively.

Projected growth rates for the rural system are lower than in previous forecasts and the result of retail price increases over the near term. Due to the termination of the smelter contracts in 2013 and 2014, retail electricity prices are projected to increase by approximately 40%, in aggregate, over years 2014-2016. As result, rural system sales are expected to decline by just 3.2% over the course of these three years before reestablishing a positive trend of approximately 1.0% per year thereafter.

[1] The January 2013 forecast reflects several revisions to the 2011 Load Forecast, but the forecasting models were not updated until the April 2013 forecast.

[2] Growth rates for native system and rural system requirements are based on values that exclude requirements corresponding to the projected new power contract loads beginning in 2016.

[3] Rural system customers include all retail customers served by Big Rivers' three member cooperatives.

The primary influence on growth in the rural system requirements over the forecast period will continue to be growth in the number of customers. Following near term declines in average use per customer due to retail price increases, average use is expected to be relatively flat over the remainder of the forecast horizon, increasing minimally. Big Rivers is projected to be a summer peaking system under normal peaking weather conditions; however, as in past years, the annual peak can occur during a winter month if peaking temperatures are colder than normal.

The forecast is summarized in Table 1.1 and Table 1.2.

Table 1.1
Load Forecast Summary

		Total System		Native System		Rural System	
Year	Consumers	Energy (GWH)	NCP Peak Demand (MW)	Energy (GWH)	CP Peak Demand (MW)	Energy (MWH)	CP Peak Demand (MW)
2002	103,482	10,493	1,481	3,174	595	2,115	462
2007	110,585	10,697	1,526	3,288	654	2,404	532
2012a	113,131	10,831	1,569	3,320	654	2,321	542
2012n	113,131	10,831	1,528	3,321	613	2,322	501
2017	117,835	4,733	897	3,375	642	2,282	522
2022	122,754	8,911	1,539	3,476	663	2,380	547
2028	128,156	9,072	1,571	3,623	694	2,522	583

2012a represent actual values; 2012n represents weather adjusted values
Energy and peak demand values reflect DSM/EE adjusted amounts
Total system and Native system energy and peak demand values include average generation and transmission losses

Table 1.2
Load Forecast – Average Annual Growth Rates

Description	2012–2017	2012-2028
Total System Energy Requirements	-15.3%	-1.1%
Total System Peak Demand (NCP)	-10.6%	0.0%
Native System Energy Requirements	0.3%	0.6%
Native System Peak Demand (CP)	0.9%	0.8%
Rural System Energy Requirements	-0.3%	0.5%
Rural System Peak Demand (CP)	0.6%	0.8%

Total system energy and demand include smelters
Native and rural system energy and demand exclude smelters

All projections presented in this report include impacts associated with energy efficiency and demand-side management programs that Big Rivers' member cooperatives will continue to implement in the coming years.

Section 2 of the report presents a brief summary of the cooperative background and service area characteristics. Section 3 identifies the sources of the data used to prepare the forecast. Section 4 presents the assumptions made during the forecasting process. Sections 5 and 6 present the short and long-term base case forecasts. Section 7 presents four forecast scenarios, which address optimistic/pessimistic economic growth and extreme/mild weather conditions. Section 8 describes the forecasting methodologies incorporated in developing the forecasting models.

1.2 Forecast Assumptions

The forecast is based upon a number of assumptions regarding factors that impact energy consumption, including: demographics, economic activity, price of electricity, electric market share, appliance efficiencies, and weather conditions. The assumptions were developed by GDS Associates and Big Rivers. The economic outlook for the base case forecast was based on information collected from Moody's Analytics.

- Number of households will increase at an average rate of 0.4% per year from 2012-2028.
- Employment will increase at an average rate of 0.5% per year from 2012-2028.
- Real gross regional product will increase at an average rate of 2.3% per year from 2012-2028.
- Real average income per household will increase at an average rate of 1.9% per year from 2012-2028.
- Real retail sales will increase at an average rate of 1.4% per year from 2012-2028.
- Inflation, as measured by the Gross Domestic Product Price Index, will increase at an average compound rate of 2.0% per year from 2012-2028.
- The average price of electricity to rural system customers for the member cooperatives will increase by 39% over 2014-2016 and then increase at the rate of inflation over the long term.
- Heating and cooling degree days for Evansville, Indiana and Paducah, Kentucky will be equal to averages based on the twenty years ending 2012.
- Impacts of existing energy efficiency programs will increase during the forecast horizon and will impact both energy and peak demand requirements.

1.3 Forecasting Process

A bottom-up approach was followed in developing Big Rivers' load forecast as projections were developed for each of three member cooperatives and aggregated to the Big Rivers level. Projections were developed for two customer classifications: rural system and direct serve. The rural system is comprised of all residential, commercial, and other customers that are served at the retail level by Big Rivers' member cooperatives. The direct serve class includes all member large commercial and industrial customers that are served directly by Big Rivers.

Econometric models were developed to project the number of rural system customers and average use per customer at the member cooperative level. Rural system peak demand was developed at the Big Rivers level. Direct serve demand and energy projections were developed using information provided by cooperative management regarding local industrial operations. Projections of total system NCP demand was computed as the sum of rural system CP demand and direct-serve NCP demand.

1.4 Changes from Prior Load Forecast

The 2013 load forecast is considerably lower than the 2011 forecast with respect to projected energy and peak demand requirements, due primarily to the expiration of contracts with two aluminum smelter loads, which represented approximately two-thirds of total system requirements.

Figure 1.1
Total System Energy Requirements (GWh)

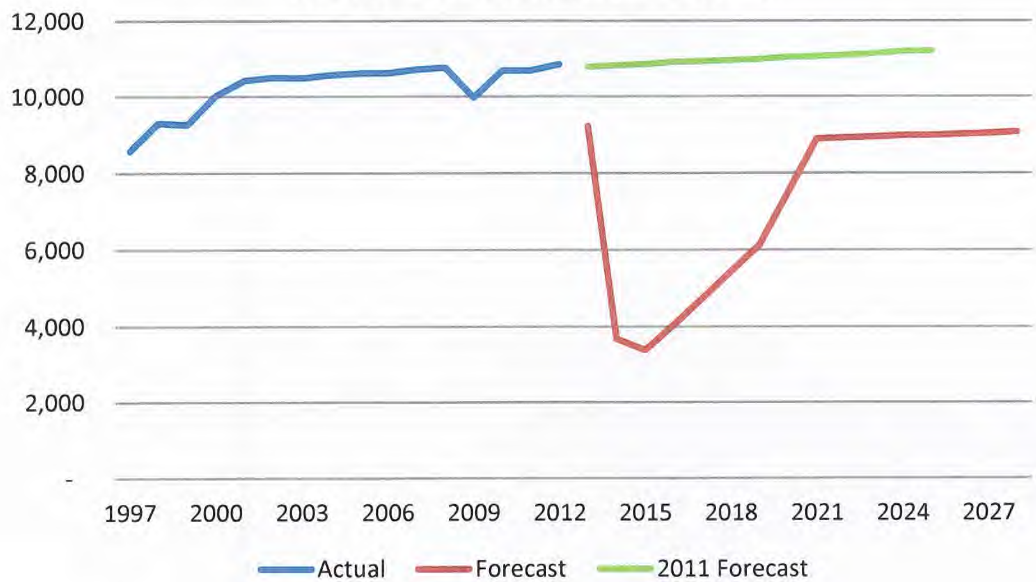


Figure 1.2
Total System Peak Demand (MW)

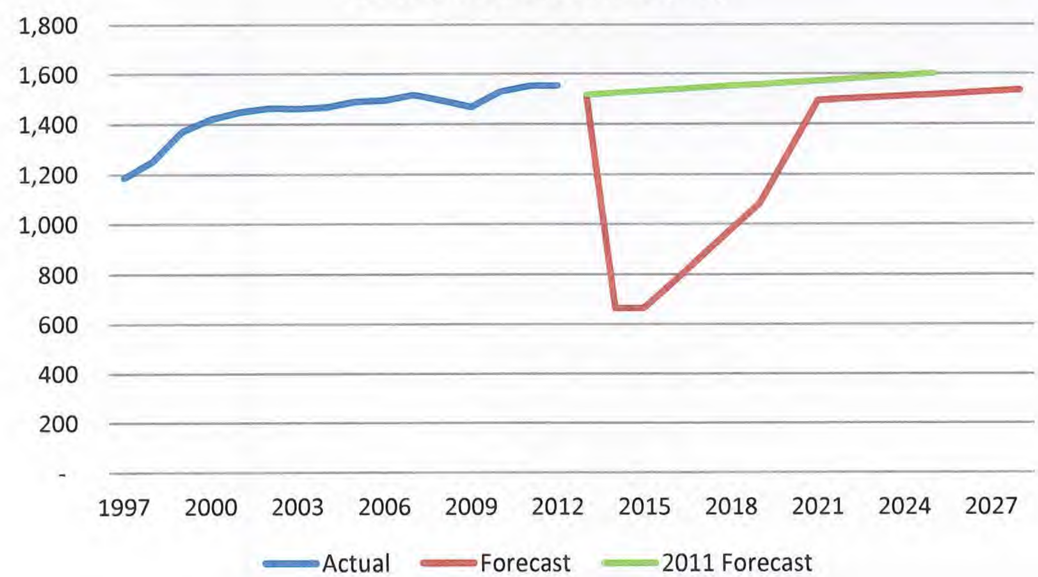


Figure 1.3
Total Native System Energy Requirements (GWh)

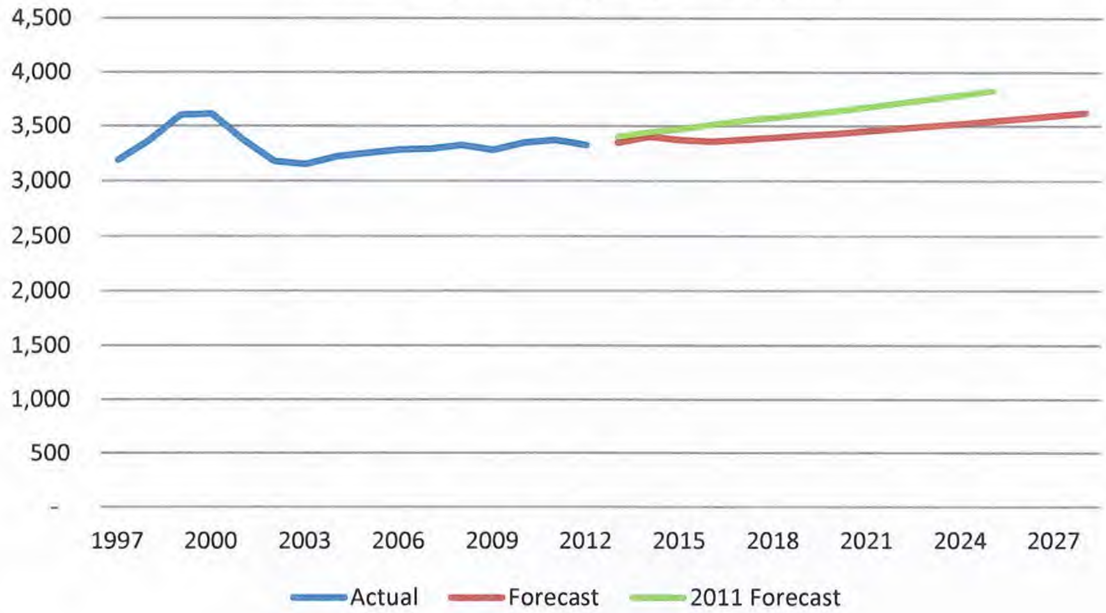
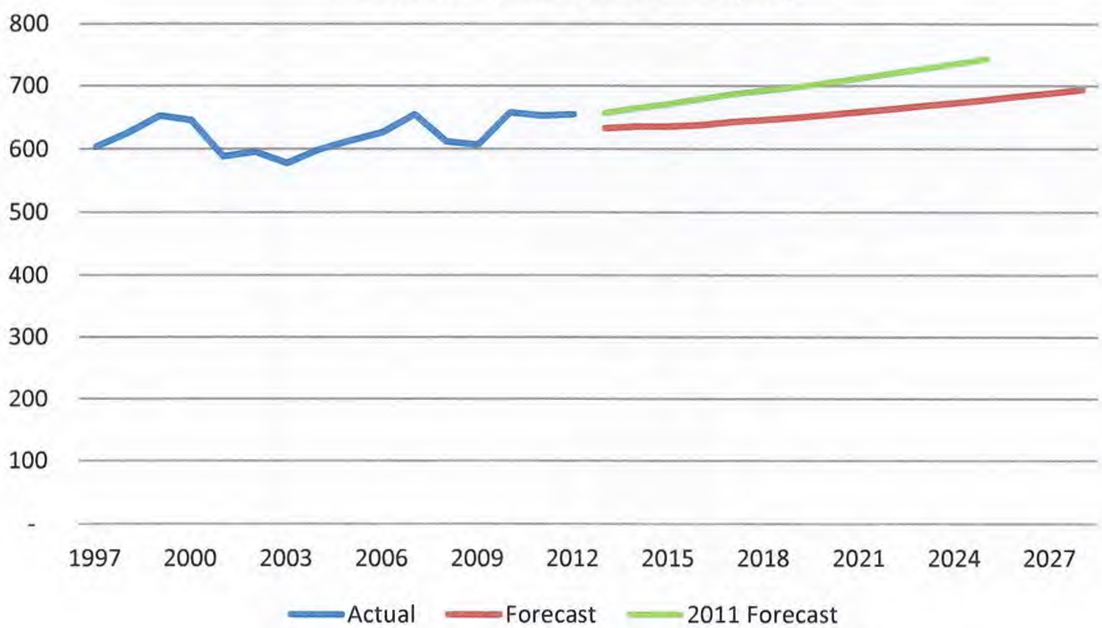


Figure 1.4
Total Native System Peak Demand (MW)



Rural system energy requirements in the current forecast are lower than in the 2011 forecast, as the current forecast reflects significant retail price increases over the near term, lower long term customer growth, a lower economic outlook, and slightly lower average consumption per customer. Similarly, the rural system peak demand forecast is lower than in the 2011 forecast.

Figure 1.5
Rural System Energy Requirements (GWh)

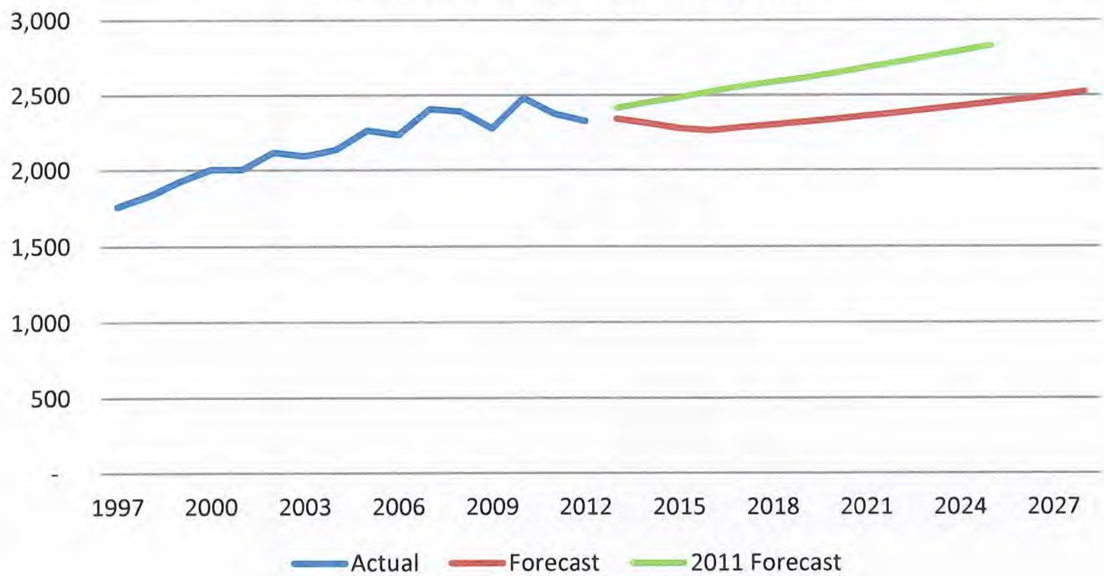
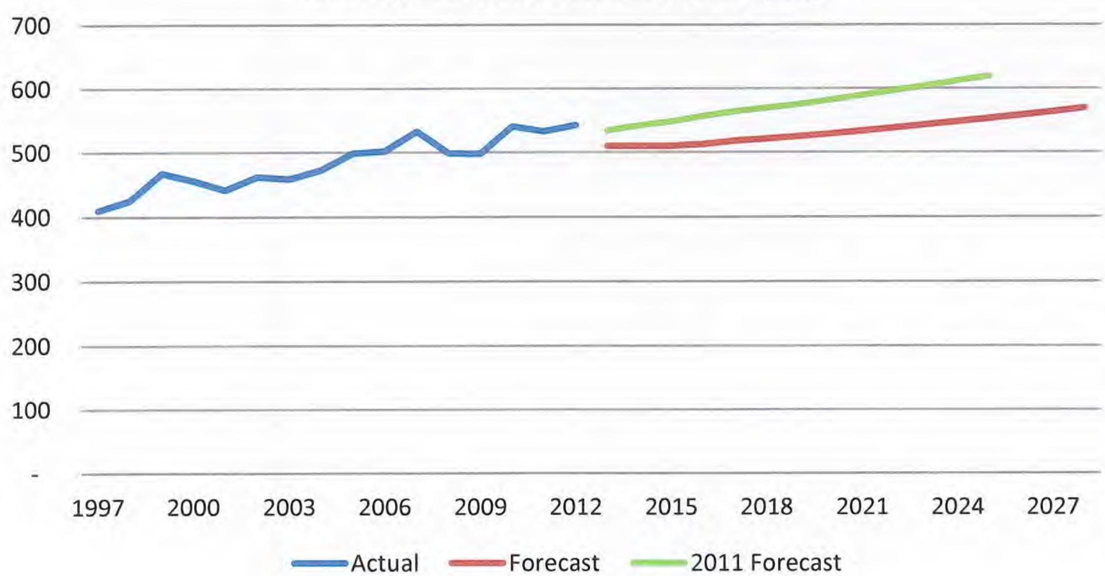


Figure 1.6
Rural System Coincident Peak Demand (MW)



2. Introduction

The 2013 Load Forecast was conducted by representatives from Big Rivers, the member cooperatives of Big Rivers, and GDS Associates, Inc. Big Rivers provided all system data and developed key forecast assumptions in conjunction with GDS. GDS developed the forecasting models and prepared the forecast. The member cooperatives participated in reviewing the forecast with Big Rivers and GDS and provided inputs that were incorporated in the final forecast.

2.1 Purpose

The purpose of the long-term load forecast is to provide reliable load projections for the Cooperative's resource, distribution, and financial planning functions. This forecast of system requirements includes the following:

- Number of consumers by customer classification
- Energy sales by customer classification
- Generation and Transmission losses
- Total system energy and peak demand requirements
- Native system energy and peak demand requirements
- Rural system energy sales and peak demand

Five forecast scenarios were developed in the forecast: a base case, which focuses on expected economic conditions and normal weather, and two sets of high-range and low-range projections, both of which consider deviations from expected economic conditions and deviations from normal weather conditions.

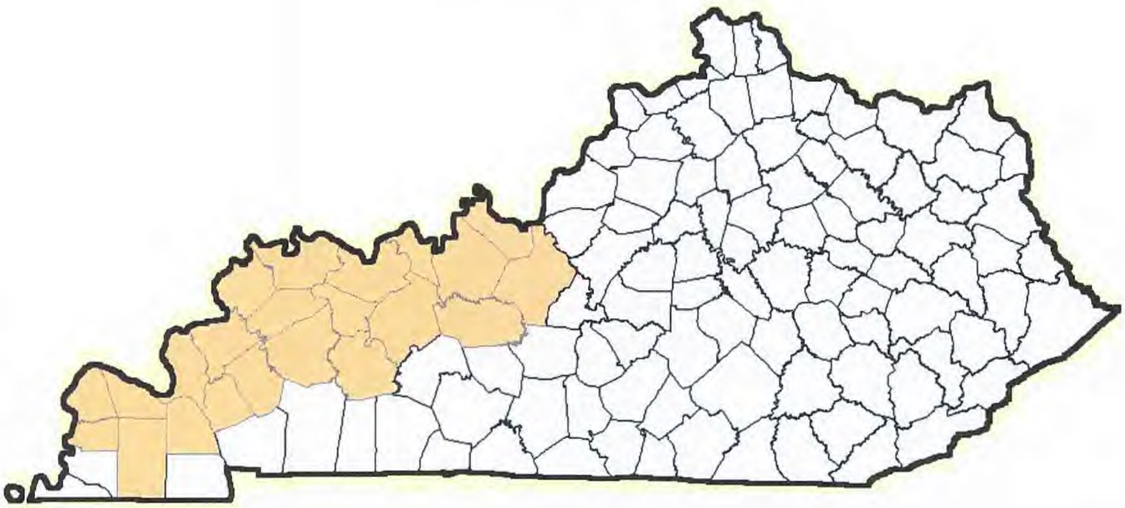
2.2 Cooperative Background

Big Rivers is headquartered in Henderson, Kentucky, and provides wholesale power to three member cooperatives: Kenergy Corp. ("Kenergy"), Jackson Purchase Energy Corporation ("JPEC"), and Meade County RECC ("MCRECC"), all of which provide retail electric service to consumers located in western Kentucky. Approximately 89% of all customers served by the member cooperatives are residential. Kenergy Corp. provides electric service to two aluminum smelters, which together consume over 7 billion kWh per year and contribute approximately 850 MW to total system peak demand. Contracts with the smelters are set to terminate in 2013 and 2014.

2.3 Service Area

Big Rivers' member cooperatives provide electric service in 22 counties located in western Kentucky, which are presented in Figure 2.1.

Figure 2.1
Service Area Counties



2.3.1 Geography

The topography of Big Rivers' member cooperatives' service areas ranges from rolling, sandy embayment areas to flat plateau areas with low relief and subterranean drainage. Typical elevations range from approximately 340 to 1000 feet above sea level. The climate in the area is humid, temperate and continental.

2.3.2 Climate

Weather conditions are similar to those of Evansville, Indiana and Paducah, Kentucky. Daily and seasonal changes in temperature, cloudiness, wind and precipitation may be sudden and extreme. The seasons are well defined, but changes between the seasons are gradual. Winters are harsh with sustained periods of very low temperatures. Snowfall provides minimal precipitation, averaging 10 inches per year. The frequent thunderstorms that occur in the spring bring rainfall, which is beneficial to area crops. Annual rainfall averages 46 to 50 inches. The summer season is long, humid and hot.

Heating and cooling degree days for Evansville, Indiana and Paducah, Kentucky were used in the forecasting models to quantify the impacts of weather on energy consumption. A degree day represents the difference between the average temperature for a given day and a base temperature. Positive differences represent cooling degree days, and negative differences represent heating degree days. For example, if the average temperature for a day is 80 degrees, and the base temperature used is 65 degrees[4], there would be 15 cooling degree days for that day. Cooling and heating degree days are presented in Table 2.1.

Table 2.1
Degree Days

	Evansville, IN		Paducah, KY	
Year	Heating Degree Days	Cooling Degree Days	Heating Degree Days	Cooling Degree Days
1993	4,652	1,613	4,531	1,686
1994	4,180	1,489	3,911	1,409
1995	4,314	1,773	4,129	1,615
1996	5,068	1,224	4,573	1,390
1997	4,901	1,119	4,445	1,271
1998	3,863	1,629	3,535	1,798
1999	4,149	1,284	3,650	1,531
2000	4,710	1,289	4,273	1,566
2001	4,233	1,377	3,921	1,540
2002	4,410	1,737	4,099	1,877
2003	4,529	1,143	4,150	1,289
2004	4,253	1,269	3,885	1,394
2005	4,320	1,544	3,904	1,685
2006	4,044	1,342	3,672	1,512
2007	4,159	1,888	3,823	1,958
2008	4,690	1,421	4,274	1,508
2009	4,413	1,281	3,877	1,444
2010	4,676	1,904	4,377	2,013
2011	4,195	1,616	3,911	1,703
2012	3,666	1,845	3,342	1,978
Average	4,371	1,489	4,014	1,608

2.4 Power Supply

Big Rivers provides wholesale power to three member cooperatives: Kenergy, JPEC, and MCRECC, all of which provide retail electric service to consumers located in western Kentucky. Two aluminum smelters, Alcan Primary Products Corporation ("Alcan") and Century Aluminum of Kentucky, LLC ("Century"), are served under special contracts with Big Rivers and Kenergy. The smelter contracts terminate in 2013 and 2014. Big Rivers provides all of the power requirements of its three member cooperatives.

Big Rivers owns and operates the 443 MW three unit coal-fired Coleman Plant, the 454 MW two unit coal-fired Green Plant, the Reid Plant, which consists of a 65 MW coal and natural gas-fired unit as well as a 65

[4] The National Oceanic and Atmospheric Administration computes degree days using a base of 65 degrees.

MW natural gas or oil-fired combustion turbine, and the 417 MW coal-fired Wilson unit. Big Rivers also has contractual rights to a portion of 312 MW at Henderson Municipal Power and Light's ("HMP&L's") Station Two facility. Big Rivers has one purchase power agreement, that being with the Southeastern Power Administration ("SEPA").

2.5 Alternative Fuels

Electricity, natural gas, and propane are the primary heating fuels available in the service area. Some consumers use wood as a supplemental heating source as timber is readily available in western Kentucky. Refer to Big Rivers' End-Use and Energy Efficiency Survey (December 2007) for details regarding specific fuels used for heating, water heating, and air conditioning.

2.6 Economic Conditions

Energy consumption is influenced significantly over the long-term by economic conditions. As the local economy expands, population and employment increase, which translate into new cooperative consumers and additional energy sales and peak demand. The economy of western Kentucky depends primarily upon mining, agriculture, manufacturing, services, and wholesale and retail trade. Coal mining and related operations are located throughout the state. Data used to represent economic activity for the service area was computed using county level information. Refer to section 4 of this report for details regarding historical and projected growth in the economic variables included in this forecast.

3. Load Forecast Database

A load forecast database was created to house the data used in development of the load forecast. This section identifies the data collected and used in the study, sources from which the data were collected, and computations that were conducted. Four classes of data were collected for this study: (i) system data, (ii) price data, (iii) economic and demographic data, and (iv) meteorological data. The data elements collected under each category, as well as the source and time period, are presented in Table 3.1.

Table 3.1
Load Forecast Database

Class of Data	Source	Data Element	Units	Time Period
System	RUS Form 7	Number of Customers by RUS Classification	Meters	1970 – 2012
		Energy Sales by RUS Classification	kWh	1970 – 2012
		Revenue by RUS Classification	$	1970 – 2012
		Purchases	kWh	1970 – 2012
		Power Cost	$	1970 – 2012
		Peak Demand	NCP	1970 – 2012
Price Index	Moody's Analytics	Implicit Price Deflator, Gross National Product, 2004=100, Seasonally Adjusted	Index	1970.01 – 2012.12
Economic and Demographic	Moody's Analytics	Average Household Income	Real $	1970 – 2030
		Retail Sales	Real $	1970 – 2030
		Gross Regional Product (GRP)	Real $	1970 – 2030
		Total Population	Number of People	1970 – 2030
		Households	Number of Households	1970 – 2030
		Total Employment	Number of Employees	1970 – 2030
End-Use Data	Energy Information Administration	Unit Energy Consumption	kWh	2005-2030
	U.S. Census Big Rivers Surveys	Electric Market Share	Percent	1990, 2000, 2005 2007
Meteorological	National Oceanic and Atmospheric Administration	Heating and Cooling Degree Days	Base of 65°F	1970.01 – 2012.12
		Temperatures	Degrees F	1970.01 – 2012.12

3.1 Weather Data

Weather conditions recorded at Evansville, Indiana and Paducah, Kentucky were used to represent weather within the member cooperative service territories. Heating and cooling degree days were used in projecting residential and small commercial energy sales. Data for years 1983-2012 are actual amounts, while data for 2013-2028 are equal to the average for the most recent 20 years.

3.2 End-Use Data

End-use energy data was obtained from the Department of Energy, Energy Information Administration (EIA). End-use market share data is collected through customer surveys conducted periodically by Big Rivers.

4. Forecast Assumptions

4.1 Forecast Methodology

Econometrics was the forecasting methodology employed in developing the energy sales forecasting models for the rural system class. When using econometric techniques to forecast energy sales, it is assumed that the relationships between energy consumption and those influential factors included in the models remain the same in both the historical and forecast periods.

4.2 Economic Outlook

It is assumed that growth in peak demand and energy requirements over time has been strongly influenced by economic conditions, including number of households, employment, total personal income, and retail sales. It is assumed that the influences of these factors will continue over the next sixteen years. The economic outlook used in developing the base case forecast was based on information obtained from Moody's Analytics. The outlook presented in this forecast reflects a relatively slow recovery from the economic recession followed by moderate growth over the extended long term. Projections for key economic data used in this forecast are presented in Table 4.1.

4.2.1 Number of Households

Number of households is an excellent measure of number of residential cooperative customers. The number of households in the service area has increased, while population has flattened, indicating that the average household size has declined over time. Growth in the number of households is projected to increase at an average rate of 0.4% per year.

4.2.2 Employment

Employment is a measure of economic activity and, with respect to this forecast, captures growth in the number of commercial accounts over time. Employment is projected to increase at an average compound rate of 0.5% per year over the 16 year forecast horizon, which is higher than the growth over the most recent ten years. Employment projections are based on data obtained from Moody's Analytics.

4.2.3 Household Income

Household income, expressed in real dollars (adjusted for inflation using the GDP price index), represents income received from all sources. Household income provides a measure of consumer spending potential, including electricity. Household income is projected to increase at an average rate of 1.9% per year from 2012 to 2028. This rate of growth is comparable to growth over the previous 10 years.

4.2.4 Gross Regional Output

Gross regional product (GRP) is expressed in real dollars and represents the monetary value of all the finished goods and services produced within the service area and includes private and public consumption, government outlays, investments and exports less imports. GRP is an indicator of commercial and industrial energy sales. GRP for the service area is estimated by allocating state GRP to counties on the proportion of total state earnings of employees originating in the respective counties. County GRP estimates are constrained to the state total for each year. GRP in the service area is projected to increase at an average rate of 2.3% per year from 2012 through 2028. Projected growth in GRP is higher than growth measured over the most recent 10 year period.

4.2.5 Retail Sales

Retail sales represent all sales dollars (adjusted for inflation using the personal consumption expenditures index), for all business establishments, including mail order and on-line sales. Retail sales provide a measure of commercial activity in the service area. Retail sales are projected to increase at an average rate of 1.4% over the forecast period.

4.3 Electric Appliance Market Shares

It is assumed that the market shares for major electric appliances (heating, cooling, water heating) will show minimal growth over the forecast horizon as the market shares for each are relatively high and have leveled in recent years. Electric markets shares are based on Big Rivers' 2007 End-Use and Energy Efficiency Study and data obtained from the Energy Information Administration's Residential Energy Consumption Surveys.

4.4 Appliance Efficiencies

The average operating efficiencies of electric heating, electric water heating, and air conditioning systems are expected to continue to increase at a decreasing rate over the next 20 years. Historical and projected average appliance efficiencies were collected from the Energy Information Administration's 2013 Annual Energy Outlook.

4.5 Weather Conditions

It is assumed that the weather conditions measured at the Evansville, Indiana and Paducah, Kentucky airports are representative of the member cooperative service areas. Heating and cooling degree days were used to represent weather conditions, and values for each year of the forecast period are based on the average amounts computed for the 20 year period ending in 2012.

4.6 Retail Electricity Prices

The average price of electricity to rural system customers is expected to increase, in real terms, by 39% by 2016 and then at the rate of inflations 2016-2028.

4.7 Alternative Fuel Prices

Natural gas and liquid propane are the two primary alternative heating fuels in the service area. This load forecast contains no direct impacts of changes in alternative fuel prices as it was assumed that the changes in alternative fuel prices will not be significant enough over the long term to impact electricity consumption.

Table 4.1
Key Economic Variables

	Population (Ths.)	Households (Ths.)	Real Average Household Income	Real Gross Regional Product (Mil. $)	Real Retail Sales (Mil. $)	Employment (Ths.)
1990	503.5	192.8	$53,718	$11,150	$4,484	176.8
1991	505.1	194.2	$54,096	$11,311	$4,382	176.8
1992	508.7	196.4	$56,103	$11,807	$4,490	180.3
1993	513.1	198.9	$55,712	$12,170	$4,777	184.8
1994	516.7	201.1	$57,029	$13,091	$5,041	191.5
1995	520.6	203.4	$57,263	$13,569	$5,208	196.7
1996	523.9	205.5	$59,025	$14,150	$5,385	200.6
1997	527.0	207.6	$60,243	$15,092	$5,451	204.4
1998	529.4	209.4	$61,964	$15,411	$5,543	208.4
1999	531.1	210.9	$62,365	$15,830	$5,949	213.4
2000	534.2	212.9	$65,358	$15,226	$6,143	215.8
2001	533.3	212.8	$64,804	$14,870	$5,947	210.5
2002	534.5	213.4	$64,068	$15,596	$5,972	209.6
2003	536.2	214.3	$64,321	$15,726	$6,140	207.0
2004	538.3	215.2	$65,579	$15,629	$6,308	208.1
2005	540.3	216.1	$66,707	$15,696	$6,414	208.7
2006	541.5	216.8	$67,129	$16,162	$6,404	210.4
2007	543.0	217.7	$67,910	$15,834	$6,520	212.6
2008	545.2	218.8	$71,257	$15,675	$6,311	211.3
2009	545.2	219.1	$69,971	$15,172	$5,834	202.4
2010	546.6	219.8	$70,207	$16,092	$6,134	203.5
2011	549.2	221.4	$72,567	$16,114	$6,526	207.6
2012	551.1	222.4	$73,174	$16,326	$6,737	210.3
2013	553.1	223.5	$73,335	$16,635	$6,794	212.0
2014	555.0	224.9	$75,751	$17,176	$6,937	215.5
2015	556.8	226.6	$78,084	$17,804	$7,084	220.0
2016	558.5	228.2	$80,106	$18,352	$7,194	223.6
2017	560.6	229.7	$81,561	$18,793	$7,314	225.3
2018	562.7	230.9	$82,763	$19,185	$7,412	225.8
2019	564.7	232.0	$83,911	$19,568	$7,509	226.1
2020	566.8	233.0	$85,145	$19,974	$7,602	226.4
2021	568.8	233.9	$86,574	$20,391	$7,696	226.6
2022	570.9	234.7	$88,157	$20,821	$7,794	226.8
2023	572.9	235.3	$89,719	$21,238	$7,896	227.0
2024	574.8	235.8	$91,326	$21,650	$7,992	226.9
2025	576.8	236.3	$93,046	$22,065	$8,087	227.0
2026	578.8	236.7	$94,789	$22,477	$8,174	227.0
2027	580.7	236.9	$96,577	$22,890	$8,260	226.9
2028	582.6	237.2	$98,482	$23,312	$8,351	226.8

5. Monthly Energy Sales and Peak Demand Forecast

The short-term forecast contains energy and demand projections by month for years 2013-2017. The short-term forecast includes projections of rural system energy sales, rural system coincident peak demand, total system energy sales, and total system non-coincident peak demand. A summary of projected growth rates is presented in Table 5.1. Projected energy sales and peak demand requirements are presented by month in Appendix A, Tables – Short-Term Forecast.

Table 5.1
Monthly Forecast Growth Rates

Description	2013	2014	2015	2016	2017
Total System Energy Requirements	-15.0%	-60.2%	-8.1%	19.8%	17.2%
Total System Peak Demand (NCP)	-2.5%	-55.4%	0.1%	15.4%	13.8%
Native System Energy Requirements	0.8%	1.6%	-0.8%	-0.4%	0.5%
Native System Peak Demand (CP)	-3.3%	0.4%	0.0%	0.3%	0.8%
Rural System Energy Requirements	0.9%	-1.0%	-1.3%	-0.5%	1.0%
Rural System Peak Demand (CP)	-5.9%	0.2%	0.2%	0.7%	1.2%

5.1 Monthly Energy Sales Forecast

Regression models were developed to project monthly energy consumption and number of customers for the rural system classification for each of the three member cooperatives and aggregated to the G&T level. Energy sales projections for the direct serve class were developed individually by customer based on historic trends, operating characteristics, and information made available to the cooperatives by individual consumers.

5.2 Monthly Peak Demand Forecast

Projections of Big Rivers rural system CP demand were developed on a monthly basis using an econometric model. Projections of direct serve peak demand were based on historic trends, operating characteristics, and information made available to the cooperatives by individual consumers. Total system NCP is equal to the sum of rural system CP and direct-serve NCP amounts. Native system CP is equal to rural system CP plus an estimate of direct serve CP. Direct serve CP was based on class NCP times an assumed coincidence factor, which ranged between 0.77 and 0.83 depending on month and based on historical load data that provided the means for estimating the coincidence factor.

6. Long-Term Energy Sales and Peak Demand Forecast

Over the course of the next sixteen years, there will be significant increases and decreases in both energy and peak demand requirements. In the near term, the loss of load at two aluminum smelters will reduce total system power requirements by more than 50% by the end of 2014. A price increase of nearly 40% over the near term is expected to reduce rural system sales by about 3% from 2014-2016. Over the long term, Big Rivers expects to enter into new power contracts that will increase sales by 800 MW and 5.3 million MWh by 2021, which will replace the majority of load and energy that will no longer be under contract with the smelters. Beyond these significant events, the primary impact on growth in rural system sales will continue to be increases in the number of consumers. Tables presenting the long-term energy sales and peak demand forecast are included in Appendix B, Tables - Long-Term Forecast.

Table 6.1
Load Forecast – Average Annual Growth Rates

Description	2012 - 2017	2012 - 2028
Total System Energy Requirements	-15.3%	-1.1%
Total System Peak Demand (NCP)	-10.6%	0.0%
Native System Energy Requirements	0.3%	0.6%
Native System Peak Demand (CP)	0.9%	0.8%
Rural System Energy Requirements	-0.3%	0.5%
Rural System Peak Demand (CP)	0.6%	0.8%

6.1 Forecast Methodology

The forecast was developed using econometrics and informed judgment. Details on econometric modeling are presented in section 8 of this report.

Econometric models were used to project number of customers and average energy use per customer for the rural system class. Informed judgment was used to forecast energy sales of each large commercial customer included in the direct serve class. An econometric model was developed to project rural system coincident peak demand for 2013-2017. Rural peak demand for years 2018-2028 is projected by applying the derived 2017 load factor to the rural system energy forecast. Demand was projected on a monthly basis and provided the means for developing projections of summer and winter peaks from one model. The summer season includes months June through September, and the winter season includes months January, February, and March of the current year and December from the prior year.

The energy sales forecast is based on a bottom-up approach. Rural system projections were developed individually for each member cooperative, and the results were aggregated to the Big Rivers level. The peak demand model and forecast for the rural system class was developed at the Big Rivers level.

6.2 Forecast Results

6.2.1 Rural System

The rural system class consists of all retail customers receiving service from Big Rivers' member cooperatives. In 2012, the rural system accounted for 99% of all accounts and 71% of total native system energy. Weather normalized class sales over the past ten years increased at an average rate of 1.2% per year; however, growth in the most recent five years has been relatively flat. Sales are projected to increase at a rate of 0.6% per year from 2012 through 2028. Growth in average consumption per customer is expected to be low in future years due primarily to the vintaging of heating and cooling systems, energy conservation, and a slowing of increases in electric heating market share. Customer growth is projected at 0.8% per year. After declines in the near term due to sharp price increases, average use per customer is projected to increase at an average rate of 0.2% per year from 2016-2028.

The rural system sales forecast is based on the product of number of customers and average use per customer. The customer forecast is based on an econometric model that specifies a relationship between number of customers and number of households. Autoregressive parameters were also included in the consumer models to correct for serial autocorrelation. Projections of the number of households were obtained from Moody's Analytics.

The average monthly energy consumption per customer forecast is based on an econometric model that specifies a relationship between average use, average household income, real price of electricity, heating degree days, cooling degree days, electric heating market share, air conditioning market share, and the appliance efficiencies of electric heating and cooling systems. Projections of average household income were obtained from Moody's Analytics. Projected retail prices were developed internally by Big Rivers. Heating and cooling degree days were collected from the National Oceanic and Atmospheric Adminstration, and projected values represent averages for the most recent 20 years. Appliance market shares are based on appliance saturation surveys. Projected appliance efficiencies were obtained from the Energy Information Administration's 2013 Annual Energy Outlook. Impacts on average use over the long term include:

- Leveling in electric heating, electric air conditioning, and electric water heating market share;
- Increases in average home size, which result in higher heating and cooling load as well as increases in "plug-in" loads;
- Increases in "plug-in" loads, regardless of home size;

- Growth in average household income, which increases disposable income available to purchase electric goods;
- Increased efficiencies in new electric appliances;
- Regulatory energy standards;
- Energy conservation.

Statistical outputs for the average energy consumption and customer models are presented in the appendix.

6.2.2 Direct Serve

The direct serve class includes all commercial and industrial customers that are served directly from a dedicated point of delivery. The class represents less than 1% of total system customers, but in it accounts for 78% of total system sales and 29% of total native system sales. The two aluminum smelters accounted for 69% of total system sales in 2012. Contracts with the two smelters are set to terminate in 2013 and 2014; therefore, sales to customers in this class will fall. Growth in class sales, net of smelters, from 2012 through 2028 is projected to increase by 20,000 MWh by 2017 before leveling the remainder of the forecast horizon. Only growth for known and measurable changes is included in projections for this class.

6.2.3 Projected New Load

Over the long term, Big Rivers expects to replace the majority of smelter sales through new contracts. Projected new load composition is unknown. For the purposes of this forecast, Big Rivers assumed a 75% load factor. Big Rivers believes this load may be comprised of rural, industrial, or firm purchase power agreements. Due to the uncertainty of the mix of these future sales, they are included separately in the presentation of this forecast.

6.3 Distribution and Transmission Losses

Distribution losses, defined as losses from the substation to the customer meter, are included in the rural system energy values presented in this forecast. The average generations and transmission loss factor is projected to increase from its current level once the contracts with the two aluminum smelters terminate. The average G&T loss factor is projected to increase from 1.08% in 2012 to 3.28% in 2015 and then remain flat the remainder of the forecast period.

6.4 Peak Demand

This forecast contains projections of rural system coincident peak (CP) demand, native system CP demand, and total system non-coincident peak (NCP) demand. Rural CP demand is the maximum aggregated simultaneous load of all rural substations on the Big Rivers' system. Native CP demand is represented as the sum of rural system CP plus direct serve CP, less smelter load. Total system NCP is represented as the sum of native system CP, total direct serve NCP, and the new load identified above in section 6.2.3. Big Rivers is projected to be a summer peaking system under normal peaking weather conditions; however, the annual peak could be set during the winter season when colder than normal weather conditions prevail during peak periods.

Rural system CP demand is projected to increase at an average rate of 0.9% over the forecast period, reaching 583 MW by 2028.

An econometric model was developed to project Big Rivers rural CP demand for years 2013-2017. Peak demands for years thereafter were computed by applying the derived 2017 load factor to the rural system energy sales forecast. The peak model was developed using monthly data and quantifies the relationship between peak demand, energy sales, peak day average temperature, and average temperature on the two days prior to the peak day. Binary variables for March, April, May, and October were also included to account for lower peak demands in valley periods. The impacts of price are captured through energy sales, the model for which incorporates the expected near term price increases. The model outputs and statistics are included in the appendix.

6.5 Energy Efficiency Program Impacts

Each of Big Rivers' three member cooperatives have implemented energy efficiency programs in recent years that are expected to provide future energy and demand savings above and beyond the 2012 impacts. A comprehensive energy efficiency and demand-side management study was conducted in 2010 by Big Rivers Electric Corporation[5], and the seven programs listed in Table 6.2 were concluded to be economically feasible. Details for each of the seven programs are described in that report.

Table 6.2
Energy Efficiency Programs

Residential Programs	Commercial Programs
Lighting	Lighting
Efficient Appliances	HVAC
Advanced Technologies	
Weatherization	
New Construction	

[5] Demand-Side Management (DSM) Potential Report for Big Rivers Electric Corporation, October 2010

The portfolio of programs was designed at the Big Rivers level rather than at each of Big Rivers' three member cooperatives. Total program potential through 2020 is estimated at 1 percent of rural system energy sales and 1.4 percent of rural system peak demand. Energy and peak savings are based on total funding by Big Rivers of $11.2 million, consisting of $1 million in 2011, followed by increases of 2.5 percent annually from 2012-2020.

The Big Rivers study examined over 200 energy efficiency measure permutations in the residential, commercial and industrial sectors combined. The findings suggest that Big Rivers could save up to 31.6% of total energy sales and 40.1% of winter peak demand by pursuing "Economic Potential" energy efficient technologies. In the base case "Achievable Potential" scenario, savings of approximately 8.8% of total energy sales (311,744 MWh) and 11.6% of winter peak demand (79.5 MW) are possible by 2020.

Table 6.3 presents the forecast of rural system energy and peak demand, estimated program impacts at all three member cooperatives in the aggregate, and projected rural system requirements adjusted for the programs. The impacts reflect additional DSM/EE savings expected from the programs that were implemented over the past two years.

Table 6.3
Energy Efficiency Programs

Year	Rural Energy Sales (MWh)	Energy Efficiency Program Impact (MWh)	Adjusted Energy Sales (MWh)	Rural Peak Demand (MW)	Energy Efficiency Program Impact (MW)	Adjusted Peak Demand (MW)
2013	2,342,123	3,823	2,338,300	510	1.0	509
2014	2,317,871	7,306	2,310,565	511	2.0	509
2015	2,286,963	10,870	2,276,093	512	2.9	509
2016	2,276,671	14,534	2,262,137	516	3.9	512
2017	2,299,846	18,275	2,281,571	522	4.9	517
2018	2,320,926	21,401	2,299,525	526	5.8	520
2019	2,341,852	24,689	2,317,163	531	6.7	524
2020	2,364,109	27,706	2,336,403	536	7.6	528
2021	2,388,083	30,563	2,357,520	541	8.4	533
2022	2,413,050	33,204	2,379,846	547	9.2	538
2023	2,437,959	35,801	2,402,158	552	10.0	542
2024	2,462,848	38,247	2,424,601	558	10.8	547
2025	2,488,591	40,748	2,447,843	564	11.6	552
2026	2,515,002	43,249	2,471,753	570	12.4	558
2027	2,541,881	45,750	2,496,131	576	13.2	563

7. Forecast Scenarios

The base case projections reflect expected economic growth for the area as well as average weather conditions. To address the inherent uncertainty related to these factors, long-term high and low range projections were developed. The range forecasts reflect the energy and demand requirements corresponding to more optimistic or pessimistic economic growth and to mild or extreme weather conditions. Such forecast scenarios are useful for various planning functions. Four scenarios were generated: (i) base case economics and mild weather, (ii) base case economics and extreme weather, (iii) optimistic economics and normal weather, and (iv) pessimistic economics and normal weather.

The optimistic and pessimistic economy scenarios for rural system sales were developed by revising the economic inputs in the forecast models. The growth rate for number of households was adjusted to reflect the base case growth rate ±1 standard deviation of the historical growth rates. The growth rate for average household income was adjusted to reflect the base case growth rate ±1%.

The extreme and mild weather scenarios for rural system sales were developed by revising the heating and cooling degree day inputs in the forecasting models. The extreme and mild degree day values were set to the actual values from the historical years when total degree days established the highest and lowest totals. For the extreme case, degree days were set at the values in 1980; for the mild case, they were set at values in 1990.

The forecast for direct serve customers was developed using judgment; therefore, the forecast ranges for the class were developed using the same approach. The optimistic scenario reflects 400 MW of new load by 2018. The pessimistic economy scenario is based on the assumption that Big Rivers will establish contracts to replace only 25% of the sales to the smelters and that electricity sales to existing customers will fall by 25% due to price increases and a stagnate economy.

The range forecasts are summarized in the following page and presented in table form in Appendix C, Range Forecasts

Table 7.1
Summary of Forecast Scenarios

Economy Scenarios						
Average Annual Growth Rate: 2012-2028						
	Energy			Demand		
	Base Case	Optimistic	Pessimistic	Base Case	Optimistic	Pessimistic
Total System Requirements	-1.1%	-1.1%	-7.4%	0.0%	0.2%	-5.3%
Native System Requirements	0.6%	7.0%	-0.4%	0.4%	6.1%	-0.2%
Rural System	0.5%	4.5%	0.0%	0.3%	4.1%	-0.3%

Weather Scenarios						
Percent Difference from Base Case						
	Energy			Demand		
	Year	Extreme	Mild	Year	Extreme	Mild
Total System Requirements	2013	1%	-1%	2013	4%	-1%
	2018	3%	-2%	2018	4%	-4%
	2028	2%	-1%	2028	3%	-3%
Native System Requirements	2013	4%	-2%	2013	10%	-3%
	2018	3%	-1%	2018	4%	-4%
	2028	2%	-1%	2028	3%	-3%
Rural System	2013	6%	-3%	2013	12%	-3%
	2018	6%	-3%	2018	8%	-7%
	2028	5%	-3%	2028	8%	-7%

8. Forecast Methodology

A bottom-up approach was developed to project energy sales. Number of consumers and energy sales were projected at the member cooperative level and aggregated to produce the Big Rivers sales forecast. Econometric models were used to forecast the number of rural system customers and energy use per customer. Econometrics was also used to project rural system peak demand. Energy sales and peak demand for the direct serve class were developed individually for each customer using information available from the member cooperatives. Energy and demand requirements at the generation level were computed by applying average distribution and transmission line loss factors to projections of energy and demand at the distribution level.

8.1 Forecasting Process

Econometric models have the advantage of explicitly tracking the underlying causes of trends and patterns in historical data. They provide information that allows Cooperative management to estimate the impacts of certain factors on energy consumption. The methodology has proven very useful for simulation and "what-if" study. In addition, econometric models can be used to identify sources of forecasting error. On the other hand, econometric models require considerable amounts of data, and when used for forecasting, force the assumption that relationships developed during historical period will remain the same throughout the forecast horizon. Econometric models have been developed to project residential and small commercial requirements as these two consumer classifications account for the overwhelming majority of total system energy sales.

Expert opinion is used when other techniques are ineffective. This approach is utilized to project industrial requirements. Projections are made individually for each account and are based upon information collected from the account's management. The advantages of this method include simplicity and expert input. The major disadvantage is that forecasts based on expert opinion can be biased by one person's opinion.

8.2 Econometrics

Econometrics is a forecasting technique in which the relationship between a variable of interest and one or more influential factors is quantified. Econometrics is based on an area of statistical theory known as regression analysis. Regression analysis is a statistical technique for modeling and testing the relationship between two or more variables. The general form of an econometric model can be expressed as:

$$y_t = ß_0 + ß_1(x_{t1}) + ß_2(x_{t2}) + ß_3(x_{t3}) + \ldots ß_k(x_{tn}) + e_t$$

where:

t	= time element
y_t	= the dependent variable
$x_1, x_2, \ldots x_n$	= the set of independent variables
$ß_0, ß_1, \ldots ß_k$	= the set of parameter coefficients
e_t	= modeling error

8.2.1 Model Specification

In the context of this report, model specification refers to the process of defining: (i) the explanatory variables to incorporate in the model and (ii) the form of the model. Explanatory variables, also referred to as independent or exogenous variables, represent factors which are hypothesized to influence a change in the dependent, or endogenous variables. Definition of the explanatory variables should be based upon sound economic principles and assumptions. For example, it is reasonable to assume that local economic conditions produce significant impacts on energy consumption. Variables such as a gross state product and per capita income are often used as explanatory variables to represent, or indicate, the level of economic activity.

In the utility industry, an econometric model is usually developed using some combination of economic, demographic, price, and meteorological variables. It is desirable to also include specific information in the econometric model concerning the end-users, or consumers, of electricity; this information may be in the form of appliance saturation levels or indicators of consumer attitudes toward conservation. Inclusion of these types of explanatory variables in a model enables the forecaster to identify the major factors influencing periodic changes in a variable such as peak demand or energy sales. Inclusion of these variables also makes possible a better estimation of the impact these factors have on changes in consumption.

Models sometime include as an independent variable the lag of the dependent variable. Such models are commonly referred to as adaptive expectation or Koyck distributed lag models. L.M. Koyck demonstrated in 1954 that this specification is equivalent to an infinite geometric lag model. Under such a specification, the assumption is made that the impacts of the explanatory variables included in the model are significant over a period of years, with the current year weighted the heaviest, the previous year weighted less, and so on until the earliest year has no impact.

Econometric models can be specified in linear or log-linear form. When the model is specified in linear form, the assumption is made that elasticities are not constant, and that a unit change in a given explanatory variable will influence a change in the dependent variable equal to the unit change in the explanatory variable times the corresponding coefficient.

When the model variables are expressed in natural log form, it is assumed that elasticities are constant and that a percentage change in a given explanatory variable influences a constant percentage change in the dependent variable based upon the coefficient of the given explanatory variable. A second assumption made when specifying a log-linear model is that changes in the dependent variable are greater at lower levels of the explanatory variables than at higher levels. With respect to energy consumption, this assumption applies primarily to increases in income. Consumption increases rapidly when income increases from lower levels as consumers purchase electric goods and services; however, once income reaches a certain level, most high use electric end-uses have been purchased. As a result, additional increases in income tend to have less impact on consumption than the same level of increase from a lower level of income.

8.2.2 Model Estimation

Once a hypothesized relationship or model is specified, historical data are used to estimate the model parameters, β_0, β_1, β_2,... β_k and quantify the empirical relationship that exists between the variable of interest and the chosen set of explanatory variables. Investigation of the relationship between the dependent variable, y, and an independent variable, x, leads to one of three conclusions: (i) a change in variable x impacts no change in variable y, and a change in variable y impacts no change in variable x, (ii) a change in variable x impacts a change in variable y, while a change in variable y impacts no change in variable x, and (iii) a change in variable x impacts a change in variable y, and a change in variable y impacts a change in variable x. Under conclusion (i), no relationship exits and the explanatory variable should be omitted from further analysis. Under conclusion (ii) variable x is said to be exogenous; its value is determined outside of the marketplace. Under conclusion (iii), both variables x and y are said to be endogenous; both are determined within the marketplace.

The appropriate regression technique to employ in estimating the model depends upon the relationship between the dependent and independent variables. When all explanatory variables are exogenous, ordinary least squares is appropriate. When one or more of the explanatory variables are endogenous, two-stage least squares is appropriate.

8.2.3 Ordinary Least Squares (OLS)

Regression analysis is a statistical procedure that quantifies the relationship between two or more variables. Based upon available input data, a regression equation provides a means of estimating values of a dependent variable. The difference between the actual value of the dependent variables and its regression based estimated value is the error term, generally referred to as the residual. Ordinary least squares is the technique employed which minimizes the sum of the squared errors. A tentative least square model, for example, for residential usage, might be expressed as:

$$RUSE_t = \beta_0 + \beta_1(PCAP_t) - \beta_2(RRPE_t) + \beta_3(CDD_t) + \beta_4(HDD_t) + e_t$$

$RUSE_t$	=	residential energy use in year t
$PCAP_t$	=	per capita income in year t
$RRPE_t$	=	price of electricity in year t
CDD_t	=	number of cooling degree days in year t
HDD_t	=	number of heating degree days in year t
e_t	=	represents the unexplained error in year t

8.2.4 Model Validation

In this study, the model validation process involved evaluation of the models for theoretical consistency, statistical validity, and estimating accuracy. From a theoretical standpoint, the model should be consistent with economic theory and specify a relationship that addresses those factors known to influence energy usage. For models that address customer growth, it is appropriate to include a demographic variable such as population, number of households, or employment to explain growth in the number of consumers. For models that address changes in energy sales, more types of variables are needed. An economic variable such as income explains customers' ability to purchase electric goods and services. Weather variables explain changes in consumption due to weather conditions. Price of electricity and price of electricity substitutes measure consumer conservation. Appliance saturation levels measure change in consumption due to changes in end-use equipment. Lagged dependent variables account for the lagged effect of all explanatory variables from previous periods.

The coefficients for each parameter included in the models were tested to insure the proper sign (+ or -). The number of customers increases with population or some other demographic variable; therefore, the sign of demographic variables in the customer model should be positive. There is a direct relationship between energy consumption and income; as income increases, consumption will increase as well. The sign on the income variable in the energy consumption model should be positive. The sign on the price of natural gas, or some other electricity substitute should be positive. Energy consumption increases as weather conditions, as measured by degree days, become more extreme; the sign of both the heating and cooling degree day variables should be positive. There is an indirect relationship between energy consumption and price of electricity. As price increases, consumers tend to conserve energy, and consumption decreases.

The statistical validity of each model is based on two criteria. One, each model was examined to determine the statistical significance of each explanatory variable. Two, tests were performed to identify problems resulting from autocorrelation and/or multicollinearity. An analysis of the models' residuals was performed to determine whether mathematical transformations of the independent variables were required.

Each model was evaluated with respect to its estimating accuracy. The standard error of regression, a statistic generated during the regression analysis, was used to measure accuracy. Tentative models that initially had low degrees of accuracy were tested using alternative specifications.

8.2.5 Model Building Process

The development of forecasts using econometric modeling is a multi-step process. A substantial portion of the effort involved in effective model building is the collection of reliable data for both the historical and projected periods. It is critical, in building models which explain changes in load growth, that the appropriate influential factors be considered, and that the correct explanatory variables be collected to quantify those influential factors.

There are many factors that influence consumers to change their usage levels of electricity. A partial list would include changes in the economy, new industry in an area, key industry leaving an area, population shifts, temperature, unemployment levels, attitudes toward conservation, precipitation amounts, improved appliance efficiencies, political events, inflation, and increases in the price of electricity. The relationship between these factors and energy usage is further complicated since most of these factors are interrelated; for example, when inflation is rampant, increases in the price of electricity may not significantly lower usage by the consumer.

After all necessary data are collected, the model building process begins. During this process, numerous models containing various combinations of candidate explanatory variables are estimated and tested. Each tentative model is examined to see if the explanatory variables included in that particular model specification contribute significantly to the "explanation" of the variable of interest. For those models that pass this preliminary examination, the appropriate regression diagnostic tools are used to test the validity of the underlying statistical assumptions. Included in this examination are tests for autocorrelation and multicollinearity.

The tentative models are tested, not only for statistical reliability, but also for reasonableness of practical interpretation. For example, the model should not show that the effect of extremely cold winter weather has been a reduction in usage. The potential performance of a tentative model for forecasting purposes is also investigated. A model that contained only one explanatory variable (one which measured only weather effects, for example) might not be a good predictive model.

If a tentative model is found to have significant statistical problems, or if the model is simply found to be misspecified, the model is discarded, and a new tentative model is specified. Analysis of the residuals (actual minus estimated values) from the discarded model is helpful in the reformulation of the model and might indicate whether some mathematical transformation of the existing set of explanatory variables is required. This process of specification, estimating, and reformulation continues until a model is found which is statistically sound and which has a sound practical interpretation as well.

8.2.6 Final Model Selection

If a model is found to be a good representation of the proposed relationship, and if it is also determined to be statistically sound, it can be used to estimate values of the variable of interest in future time periods. It is important to note that the forecaster makes the assumption that the modeled relationship between the response and explanatory variables remains the same in the forecast period as it was measured in the historical period. Forecasts are calculated by inserting projected values of the explanatory variables into the estimated model equation. Different forecast scenarios can also be considered by incorporating different values of forecasted explanatory variables. Managerial judgment, based on practical estimations of future trends, can then be used to select the most appropriate and reasonable forecast.

Appendix A
Tables – Monthly Forecast

Monthly Forecast

Year	Month	Rural kWh (Wthr Adj)	Rural CP kW (Wthr Adj)	Rural DSM Impact kWh	Rural DSM Impact kW	Rural Energy with DSM Impact kWh	Rural CP with DSM Impact kW	New Load kWh	New Load kW	Direct Serve Less Smelters kWh	Direct Serve Less Smelters NCP kW
2013	1	234,958,661	496,126	318,583	1,000	234,640,078	495,126			76,081,453	134,538
2013	2	200,453,293	438,651	318,583	1,000	200,134,710	437,651			74,445,410	135,553
2013	3	184,372,795	387,173	318,583	1,000	184,054,212	386,173			78,803,043	134,198
2013	4	152,680,672	325,968	318,583	1,000	152,362,089	324,968			77,738,580	136,938
2013	5	164,988,988	380,183	318,583	1,000	164,670,404	379,183			79,839,750	139,001
2013	6	199,404,770	470,999	318,583	1,000	199,086,187	469,999			78,331,643	140,773
2013	7	232,559,900	509,990	318,583	1,000	232,241,317	508,990			85,915,380	147,273
2013	8	227,432,411	493,264	318,583	1,000	227,113,828	492,264			87,827,956	148,717
2013	9	176,102,440	447,000	318,583	1,000	175,783,856	446,000			79,170,915	143,842
2013	10	160,651,343	329,355	318,583	1,000	160,332,760	328,355			82,861,652	142,954
2013	11	179,656,330	398,857	318,583	1,000	179,337,747	397,857			78,104,600	142,779
2013	12	228,861,219	460,487	318,583	1,000	228,542,636	459,487			79,660,833	144,697
2014	1	232,630,131	497,357	608,833	2,000	232,021,298	495,357			78,414,637	139,858
2014	2	197,956,885	439,881	608,833	2,000	197,348,052	437,881			76,552,802	140,873
2014	3	181,975,316	388,403	608,833	2,000	181,366,483	386,403			81,136,227	139,518
2014	4	150,159,590	327,198	608,833	2,000	149,550,757	325,198			81,000,900	144,508
2014	5	162,785,118	381,414	608,833	2,000	162,176,285	379,414			82,261,470	144,251
2014	6	197,437,768	472,230	608,833	2,000	196,828,935	470,230			80,675,243	146,023
2014	7	231,037,846	511,220	608,833	2,000	230,429,013	509,220			87,299,220	150,273
2014	8	225,851,305	494,494	608,833	2,000	225,242,472	492,494			89,211,796	151,717
2014	9	174,161,941	448,231	608,833	2,000	173,553,108	446,231			80,510,115	146,842
2014	10	158,597,731	330,586	608,833	2,000	157,988,898	328,586			84,245,492	145,954
2014	11	177,828,480	400,088	608,833	2,000	177,219,646	398,088			79,443,800	145,779
2014	12	227,449,191	461,718	608,833	2,000	226,840,358	459,718			81,044,673	147,697
2015	1	230,914,772	498,381	905,833	2,900	230,008,939	495,481			79,798,477	142,858
2015	2	195,861,037	440,906	905,833	2,900	194,955,203	438,006			77,802,722	143,873
2015	3	179,637,830	389,428	905,833	2,900	178,731,997	386,528			82,520,067	142,518
2015	4	147,370,877	328,223	905,833	2,900	146,465,044	325,323			81,000,900	144,508
2015	5	159,865,603	382,438	905,833	2,900	158,959,769	379,538			82,261,470	144,251
2015	6	194,473,956	473,254	905,833	2,900	193,568,123	470,354			80,675,243	146,023
2015	7	228,181,973	512,245	905,833	2,900	227,276,140	509,345			87,299,220	150,273
2015	8	222,993,482	495,519	905,833	2,900	222,087,649	492,619			89,211,796	151,717
2015	9	171,186,021	449,255	905,833	2,900	170,280,188	446,355			80,510,115	146,842
2015	10	155,753,707	331,610	905,833	2,900	154,847,873	328,710			84,245,492	145,954
2015	11	175,282,425	401,112	905,833	2,900	174,376,591	398,212			79,443,800	145,779
2015	12	225,441,319	462,742	905,833	2,900	224,535,485	459,842			81,044,673	147,697
2016	1	230,882,599	501,932	1,211,167	3,900	229,671,432	498,032	55,800,000	100,000	79,521,709	142,258
2016	2	195,438,520	444,457	1,211,167	3,900	194,227,354	440,557	52,200,000	100,000	80,322,479	143,273
2016	3	178,987,997	392,979	1,211,167	3,900	177,776,830	389,079	55,800,000	100,000	82,243,299	141,918
2016	4	146,295,425	331,773	1,211,167	3,900	145,084,259	327,873	54,000,000	100,000	80,733,060	143,908
2016	5	158,704,095	385,989	1,211,167	3,900	157,492,928	382,089	55,800,000	100,000	81,984,702	143,651
2016	6	193,318,870	476,805	1,211,167	3,900	192,107,703	472,905	54,000,000	100,000	80,407,403	145,423
2016	7	227,146,815	515,795	1,211,167	3,900	225,935,648	511,895	55,800,000	100,000	87,022,452	149,673
2016	8	221,929,152	499,069	1,211,167	3,900	220,717,985	495,169	55,800,000	100,000	88,935,028	151,117
2016	9	169,941,388	452,806	1,211,167	3,900	168,730,222	448,906	54,000,000	100,000	80,242,275	146,242
2016	10	154,590,636	335,161	1,211,167	3,900	153,379,469	331,261	55,800,000	100,000	83,968,724	145,354
2016	11	174,386,129	404,663	1,211,167	3,900	173,174,963	400,763	54,000,000	100,000	79,175,960	145,179
2016	12	225,049,649	466,293	1,211,167	3,900	223,838,482	462,393	55,800,000	100,000	80,767,905	147,097
2017	1	233,317,258	507,977	1,522,917	4,900	231,794,341	503,077	111,600,000	200,000	79,521,709	142,258
2017	2	197,621,623	450,501	1,522,917	4,900	196,098,707	445,601	100,800,000	200,000	77,552,738	143,273
2017	3	181,087,261	399,024	1,522,917	4,900	179,564,344	394,124	111,600,000	200,000	82,243,299	141,918
2017	4	148,176,128	337,818	1,522,917	4,900	146,653,211	332,918	108,000,000	200,000	80,733,060	143,908
2017	5	160,554,549	392,034	1,522,917	4,900	159,031,633	387,134	111,600,000	200,000	81,984,702	143,651
2017	6	195,062,855	482,850	1,522,917	4,900	193,539,939	477,950	108,000,000	200,000	80,407,403	145,423
2017	7	228,924,602	521,840	1,522,917	4,900	227,401,685	516,940	111,600,000	200,000	87,022,452	149,673
2017	8	223,702,799	505,114	1,522,917	4,900	222,179,883	500,214	111,600,000	200,000	88,935,028	151,117
2017	9	171,683,017	458,851	1,522,917	4,900	170,160,101	453,951	108,000,000	200,000	80,242,275	146,242
2017	10	156,367,217	341,206	1,522,917	4,900	154,844,300	336,306	111,600,000	200,000	83,968,724	145,354
2017	11	176,218,222	410,708	1,522,917	4,900	174,695,305	405,808	108,000,000	200,000	79,175,960	145,179
2017	12	227,130,503	472,338	1,522,917	4,900	225,607,587	467,438	111,600,000	200,000	80,767,905	147,097