8.0 NEED FOR POWER

This chapter demonstrates the need for the power to be generated by Callaway Plant Unit 2. Also provided is a description of the existing regional electric power system, current and future demand for electricity, and present and planned power supplies within AmerenUE's service territory.

AmerenUE, the applicant electric utility, operates as a regulated, franchised utility. It supplies all end-use customers within its certificated service territory with the three principal components of electric power service: generation, transmission, and distribution. AmerenUE's service territory, number and types of customers, and major electricity load centers are described in Section 8.1.1.

The assessment of power needs is developed based on the methodology required by the Missouri Public Service Commission (PSC) regulatory Integrated Resource Planning Process, which provides a framework for the development of the Integrated Resource Plan (IRP) for the AmerenUE service territory.

The Missouri PSC monitors and reports on the adequacy and reliability of electric power supply in the state. The Missouri PSC's regulations require electric utilities under its jurisdiction to periodically undertake an exhaustive resource planning exercise in compliance with detailed Electric Resource Planning Rules (DED, 1993).

The IRP process involves preparing an IRP that analyzes and forecasts the need for power over a twenty year planning period according to regulatory prescribed criteria. The objective of the IRP is to accurately estimate the need for power in order to identify the most appropriate measures necessary to ensure adequate future energy supply for AmerenUE's service territory. AmerenUE's service territory is described in Section 8.1.1. The IRP process is described in Section 8.1.2. The IRP need for power analysis for the AmerenUE service territory is discussed in Section 8.2, 8.3, and 8.4.

Missouri's IRP process is consistent with the NRC's guidance in NUREG-1555, "Standard Review Plan for Environmental Reviews of Nuclear Power Plants" (ESRP) Section 8.1 (NRC, 2007):

> Affected States and/or regions may prepare a need-for-power evaluation as part of a State or regional energy planning exercise. Similarly, State or regional agencies may require the applicant to document a need for power or plan for future plant construction. The applicant may choose to rely on those documents rather than prepare a description of the power system of its own. If so, NRC staff should review these documents to determine if they are (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty…If NRC staff conclude these other documents are acceptable, no additional independent review by NRC staff may be needed and that analysis can be the basis for ESRPs 8.2 through 8.4 (NRC, 2007).

Missouri's IRP process is designed to be a systematic, comprehensive, high quality planning process that is responsive to uncertainty in assessing the need for power and evaluating the options for meeting power capacity in the relevant service area. This process culminates in the Missouri PSC's independent review and confirmation of a utility's compliance with the IRP process.

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AmerenUE's implementation of the IRP process is highly detailed and involves the Missouri PSC and numerous other stakeholders. AmerenUE's implementation of the IRP process is discussed in Section 8.4.

AmerenUE has a long and successful record of accurately assessing the need for power in its service territory and planning and implementing cost-effective power supply measures that have met its customers' increasing energy demand reliably over more than a century. This is demonstrated by AmerenUE's record of maintaining affordable energy rates which are currently 37% below the national average (AUE, 2008).

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NRC, 2007. Standard Review Plans for Environmental Reviews of Nuclear Power Plants, Revision 1, NUREG-1555, Draft for Review and Use, Nuclear Regulatory Commission, July 2007.

8.1 DESCRIPTION OF POWER SYSTEM

This section describes and assesses the regional power system in which the proposed facility would operate. This section describes: (i) AmerenUE's electric distribution service territory, (ii) the Midwest Independent Transmission System Operator, Inc. (MISO) market, in which AmerenUE operates; and (iii) the Regional Reliability Organization – SERC Reliability Corporation (SERC) to which AmerenUE belongs. This section further discusses AmerenUE's obligations as a regulated electric utility in Missouri. As discussed below, Missouri requires AmerenUE, among other things, to develop a need for power analysis for its service territory according to a rigorous, state-mandated process that is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty.

Section 8.1.1 describes the applicant's relevant service territory, transmission system, and power generation system. Section 8.1.2 describes the regional organizations in which AmerenUE participates for transmission, energy dispatch, and reliability purposes, as well as AmerenUE's state regulator. Section 8.1.3 discusses the need for power analysis required by Missouri and demonstrates that the need for power analysis presented in this chapter is both subject to confirmation and responsive to forecasting uncertainty.

8.1.1 AMERENUE'S SERVICE TERRITORY

AmerenUE is applying as a 100% owner of the proposed Callaway Plant Unit 2 generating unit that will have a net electrical rating of 1600 megawatts (MWe). For planning purposes, AmerenUE has assumed that Callaway Plant Unit 2 will be operational in the year 2018.

Founded in 1902, AmerenUE is Missouri's largest electric utility, providing electric service to approximately 1.2 million customers across Central and Eastern Missouri, including the greater St. Louis area. AmerenUE serves 57 Missouri counties and 500 towns. More than half (55%) of AmerenUE's electric customers and its largest power demand, as well as its load center, is located in the St. Louis Metropolitan Area (AUE, 2008a). Figure 8.1-1 shows AmerenUE's service territory and the transmission lines including interconnections. As shown in Table 8.2-1, the

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customer base consists of 1,027,667 Residential; 145,506 Commercial; 4,770 Industrial; and 55,768 Other in 2007.

The State of Missouri has historically not pursued electric power industry deregulation. Missouri has no recent record, pending legislative initiatives, or regulatory activities to deregulate its electric utility industry as many other states in the United States have over the past two decades (EIA, 2003). As a regulated electric utility in Missouri, AmerenUE must have sufficient generating capacity with which to serve the forecasted demands of its electric service customers and to maintain an adequate reserve margin. Under 4 CSR 240-22.010(2):

> The fundamental objective of the resource planning process at electric utilities shall be to provide the public with energy services that are safe, reliable and efficient, at just and reasonable rates, in a manner that serves the public interest.

AmerenUE's certificated service territory is the "relevant market area" for the need for power analysis. Missouri requires electric utilities to undergo a comprehensive and systematic process of evaluation of the need for power.

AmerenUE's transmission system is directly connected to all of the utilities that surround the AmerenUE service territory. There are 53 circuits connecting with nine different utilities – Associated Electric Cooperatives, Inc., Central Illinois Public Service Company (d/b/a AmerenCIPS, an Ameren UE affiliate), Electric Energy Inc. (Joppa), Illinois Power Company (d/b/a AmerenIP, an AmerenUE affiliate), Southwestern Power Administration, Missouri Public Service, Kansas City Power & Light Company, Alliant West, and MidAmerican Energy Company (Iowa). Figure 8.1-4 illustrates these regional transmission ties.

The majority of AmerenUE's electricity is produced from coal-fired steam generating plants. AmerenUE's generating assets include one nuclear power plant, four coal-fired facilities, fifteen oil- and natural gas-fired facilities and three hydroelectric plants (including one pumped storage). AmerenUE's existing resources are discussed in greater detail in Section 8.3.2.

8.1.2 REGIONAL ORGANIZATIONS AND STATE REGULATION

AmerenUE participates in three regional organizations with respect to transmission planning and coordination, capacity reserve margins, and system reliability. In addition, AmerenUE's retail operations are regulated by the Missouri Public Service Commission. A summary of each entity's function and AmerenUE's obligations with respect to each organization are provided below.

8.1.2.1 MISO

MISO is an independent regional transmission organization (RTO) whose mission is to facilitate the safe, cost-effective delivery of electric power and ensure the reliability of the bulk power system in its region which encompasses all or parts of Illinois, Indiana, Iowa, Kentucky, Manitoba, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, Ohio, Pennsylvania, South Dakota and Wisconsin (See Figure 8.1-2). MISO was created to optimize the efficiency of the interconnected system, provide regional solutions to regional planning needs, and minimize any risk to reliability. MISO operforms systematic regional electric power reliability planning (MISO, 2008). As a regional transmission organization, MISO provides regional grid management and open access to the transmission facilities under its functional supervision. MISO manages the energy market using security-constrained economic dispatch of generation. Market operations include a Day-Ahead Market, a Real-Time Market, a Financial

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Transmission Rights (FTR) Market, and will operate an Ancillary Services Market (ASM) starting in September 2008.

AmerenUE is a transmission-owning member of MISO and is a market participant in the MISO energy market.

With regard to AmerenUE's planning reserve margin obligations, MISO, under Module E of its Transmission and Energy Markets Tariff (TEMT) is responsible for determining and monitoring the generation resource adequacy of its load serving members, including AmerenUE. This includes analyzing and establishing a Planning Reserve Margin for each load serving entity (LSE) in MISO. AmerenUE is required as an LSE to demonstrate ownership of or contractual rights to generation capacity to meet its forecasted peak demand and planning reserve margin and to designate this generation capacity as the resources to serve its load. At present, AmerenUE's required reserve margin under Module E of the TEMT is 14.3%. AmerenUE included this required reserve margin in its integrated resource plan (IRP) filed on February 5, 2008, with the Missouri Public Service Commission, but bases its long-term planning reserve margin on the results of the Mid-American Interconnected Network (MAIN) Guide 6 and Loss of Load Expectation (LOLE) studies (17%) as described in Section 8.4.2. Additionally, SERL-Gateway established a minimum reserve requirement of 15%.

AmerenUE is required to offer all of its generation resources that it has designated as resources required to meet its load and reserve margin obligations into the day-ahead and real-time MISO market. AmerenUE must also provide generation resources for regulation and contingency reserves until the start of the ASM.

As a market participant in the MISO market, AmerenUE offers its generation resources and serves its load through the market. In order to obtain the least cost energy for AmerenUE customers, AmerenUE structures its generation offers and load bidding in MISO to be able to obtain the least cost resources for its hourly energy needs – from AmerenUE or from the market. Because of AmerenUE's relatively low cost generation portfolio, and the locational proximity of that generation to the AmerenUE load, the least cost energy procurement effectively results in AmerenUE providing for substantially all of its load's energy needs by generation owned by AmerenUE. AmerenUE's congestion hedging strategies are also tailored to reflect the fact that AmerenUE meets its needs with its own generation resources. To the extent that the market dispatch results in AmerenUE generation greater than AmerenUE load, that excess generation results in wholesale energy sales revenues to offset AmerenUE customer costs.

The fact that AmerenUE essentially provides for virtually all its energy and capacity needs with its own generation has prompted AmerenUE to periodically evaluate its participation in MISO to ensure that it is in the best interests of Missouri ratepayers.

MISO also focuses on planning the enhancement and expansion of transmission capability on a regional basis. As a transmission owning member of MISO, AmerenUE participates with MISO in regional transmission expansion studies. MISO also manages open access to the transmission facilities of its transmission owning members and provides regional grid management for congestion. MISO also serves as AmerenUE's Reliability Coordinator, with responsibility for the wide area view of the electric system and the authority to prevent or mitigate emergency operational situations.

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8.1.2.2 SERC

AmerenUE is a member of SERC, one of the 8 Regional Entities within the North American Electric Reliability Council (NERC). NERC is certified by the Federal Energy Regulatory Commission as the electric reliability organization (ERO) for the United States with a mission to improve reliability and adequacy of the bulk power system in North America. To achieve this goal, NERC develops and enforces reliability standards; the operation of the bulk power system and assesses future adequacy; audits owners, operators and users for preparedness; and educates and trains industry personnel. SERC serves as a regional entity with delegated authority from NERC for the purpose of proposing and enforcing reliability standards within the SERC Region. SERC is divided geographically into five sub-regions that are identified as Entergy, Gateway, Southern, TVA, and VACAR. AmerenUE is part of the Gateway subregion of SERC. The region is illustrated in Figure 8.1-3.

With respect to planning for resource adequacy, NERC no capacity reserve margin requirements.

8.1.2.3 Midwest Contingency Reserve Sharing Group

AmerenUE is also a member of the Midwest Contingency Reserve Sharing Group (CRSG). The purpose of the CRSG is to allow the members as a group to comply with the NERC standard regarding Disturbance Control Performance. The CRSG must, at a minimum, have sufficient generating capacity available on a continuous basis to be able to recover from the loss of the largest generating unit or other resource among its members within 15 minutes plus maintain adequate regulating reserves. Each member is obligated to deploy its respective Contingency Reserve resources when called upon by a member system experiencing the loss of a resource to maintain electric system reliability and to comply with the NERC standard. MISO is the administrator of the CRSG and maintains the system which calls for deployment when a contingency occurs.

8.1.2.4 Missouri Public Service Commission

The Missouri Public Service Commission's regulations require electric utilities under its jurisdiction to periodically undertake an exhaustive resource planning exercise in compliance with detailed Electric Resource Planning Rules (see 4 CSR 240-22).

> "The purpose of the Commission's integrated resource planning rule is to require Missouri's electric utilities to undertake an adequate planning process to ensure that the public interest in a reasonably priced, reliable, and efficient energy supply is protected." (AUE, 2007)

The end result of this process is an Integrated Resource Plan (IRP) which is filed with the Commission, undergoes review and comment by the Missouri PSC Staff and other interested stakeholders, and is ultimately the subject of an order issued by the Missouri PSC. Missouri PSC Commission Rule 4 CSR 240-22.080(13) requires that after considering an electric utility's IRP filing, the Commission must issue an order containing findings that the filing "either does or does not demonstrate compliance with the requirements of this chapter, and that the utility's resource acquisition strategy either does or does not meet the requirements stated in 4 CSR 240-22.010(2)(A)-(C)." (AUE, 2007)

8.1.3 THE MISSOURI INTEGRATED RESOURCE PLANNING REQUIREMENTS

The State of Missouri requires AmerenUE to produce an IRP that details how AmerenUE expects to supply safe, reliable electricity in coming years following an exhaustive, rigorous and

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disciplined planning process to fully comply with Missouri regulations and to meet its statutory obligation to reliably serve load in its service territory. A detailed description of the methodology used for the IRP is included in Section 8.2 and the need for power analysis is presented in Section 8.4.

AmerenUE submitted its previous IRP to the Missouri PSC on December 5, 2005, which was docketed as Case No. EO-2006-0240. The Missouri PSC determined that "AmerenUE's resource acquisition strategy described in its 2005 IRP filing meets the requirements stated in Commission Rule 4 CSR 240-22.010(2)(A)-(C)." (AUE, 2007)

8.1.3.1 The Missouri IRP Process is Comprehensive

The Missouri PSC's mission is to ensure Missouri consumers have access to safe, reliable, and reasonably priced utility service while allowing those utility companies under its jurisdiction an opportunity to earn a reasonable return on their investment. The PSC regulations and regulatory programs include the governing of utility rate schedules, affiliate transactions, accounting practices, metering, fuel and purchased power cost recovery mechanisms, and Electric Utility Resource Planning. The regulations for electric utility resource planning are found in 4 CSR 240-22.010 – 080 (MO Secretary of State, 1993). The electric utility Integrated Resource Planning (IRP) process is defined by these regulations which are designed to achieve the objective of providing the public with safe, reliable, efficient energy services at just and reasonable rates in a manner that serves the public interest.

These regulatory requirements include provisions that require each utility to consider and analyze Demand Side Management (DSM), energy efficiency and demand response programs, on an equivalent basis with supply-side alternatives in the IRP process. The IRP regulations require the use of minimization of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan; and that the utility explicitly identify and, where possible, quantitatively analyze any other considerations which are critical to meeting the fundamental objectives of the IRP process.

The IRP Process includes the following components:

- Load Analysis and Forecasting;
- Supply-Side Resource Analysis;
- Demand-Side Resource Analysis;
- Integrated Resource Analysis; and
- Risk Analysis and Strategy Selection.

The IRP process and the resulting plan serve to document the process and rationale used to assess the tradeoffs and appropriate balance between minimization of expected utility costs and other considerations in selecting the preferred resource plan and in developing contingency options. These considerations include the mitigation of:

1. Risks associated with critical uncertain factors that will affect the actual costs associated with alternative resource plans;
2. Risks associated with new or more stringent environmental laws or regulations that may be imposed at some point within the planning horizon; and

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3. Rate increases associated with alternative resource plans.

The planning horizon of the IRP is 20 years, over which costs and benefits of alternative resource plans are evaluated. The rule sets minimum standards for the maintenance and updating of historical data, and specifies the level of detail required in analyzing and forecasting loads, and for the documentation of the inputs, components, and methods used to derive the load forecasts.

8.1.3.2 The Missouri IRP Process is Systematic

The IRP Process is systematic with each component being laid out in detail by the governing regulations. With respect to each component, the IRP uses systematic and rigorous methodologies for forecasting the need for power as described in Section 8.2. The components that are analyzed in the IRP include as discussed below.

8.1.3.2.1 Load Analysis and Forecasting

The electric utility resource planning rule sets minimum standards for the maintenance and updating of historical data, the level of detail required in analyzing and forecasting loads, and for the documentation of the inputs, components and methods used to derive the load forecasts (4 CSR 240-22.030). The utility is required to:

- Develop and maintain data on the actual historical patterns of energy usage within its service territory;
- Analyze the historical relationship between the number of units and the economic or demographic factors (driver variables) that affect the number of units for each major class or subclass;
- Analyze historical use per unit by end use;
- Develop a consistent set of daily load profiles for the most recent year for which data are available; for each month, develop load profiles for a peak weekday, a representative of at least one weekday and a representative of at least one weekend day;
- Prepare a base-case load forecast based on projections of the major economic and demographic driver variables that utility decision-makers believe to be most likely, based on the assumption of normal weather conditions;
- Analyze the sensitivity of the components of the base-case forecast for each major class to variations in the key driver variables including the real price of electricity, the real price of competing fuels and economic and demographic factors;
- Produce at least two additional load forecasts (a high-growth case and a low-growth case) that bracket the base-case load forecast; and
- Prepare a comprehensive report to demonstrate compliance with provisions of the rule.

8.1.3.2.2 Supply Side Resource Analysis

The Missouri PSC regulations establish minimum standards for the scope and level of detail required in supply-side resource analysis (4 CSR 240-22.040). The utility is required to:

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- Identify a variety of potential supply-side resource options which the utility can reasonably expect to develop and implement solely through its own resources or for which it will be a major participant;
- Subject each of the supply-side resource options to a preliminary screening analysis;
- Develop cost rankings based on estimates of the installed capital costs plus fixed and variable operation and maintenance costs levelized over the useful life of the resource using the utility discount rate; alternatively, the utility may use an economic carrying charge annualization process;
- Analyze thoroughly existing and planned interconnected generation resources;
- Identify and analyze opportunities for life extension and refurbishment of existing generation plants;
- Identify and evaluate potential opportunities for new long-term power purchases and sales, both firm and nonfirm;
- For the preferred resource plan, determine if additional future transmission facilities will be required;
- Assess the age, condition and efficiency level of existing transmission and distribution facilities, and analyze the feasibility and cost-effectiveness of transmission and distribution system loss-reduction measures as a supply-side resource;
- Before developing alternative resource plans and performing the integrated resource analysis, develop ranges of values and probabilities for several important uncertain factors related to supply resources; and
- Prepare a report to demonstrate compliance with the provisions of the rule.

8.1.3.2.3 Demand-Side Resource Analysis

This rule specifies the methods by which end-use measures and demand-side programs are to be developed and screened for cost-effectiveness (4 CSR 240-22.050). It also requires the ongoing evaluation of end-use measures and programs, and the use of program evaluation information to improve program design and cost-effectiveness analysis. Utilities are required to:

- Identify end-use measures;
- Develop estimates of the cost savings that can be obtained by substituting demand-side resources for existing and new supply-side resources;
- Evaluate the cost-effectiveness of each end-use measure identified using the probable environmental benefits test;
- Estimate the technical potential of each end-use measure that passes the screening test;
- Conduct market research studies, customer surveys, pilot demand-side programs, test marketing programs, and other activities as necessary to estimate the technical

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potential of end-use measures and to develop the information necessary to design and implement cost-effective demand-side programs;

- Develop a set of potential demand-side programs that are designed to deliver an appropriate selection of end-use measures to each market segment;
- Evaluate the cost-effectiveness of each potential demand-side program using the total resource cost test;
- For each demand-side program that passes the total resource cost test, develop time-differentiated load impact estimates over the planning horizon at the level of detail required by the supply system simulation model used in the integrated resource analysis;
- Develop evaluation plans for all demand-side programs that are included in the preferred resource plan;
- Separately design and administer demand-side programs and load-building programs, and classify all costs separately; and
- Prepare a report to demonstrate compliance with the provisions of this rule.

8.1.3.2.4 Integrated Resource Analysis

This rule requires the utility to design alternative resource plans to meet the PSC's planning objectives, and sets minimum standards for the scope and level of detail required in resource plan analysis, and for the logically consistent and economically equivalent analysis of alternative resource plans (4 CSR 240-22.060). The utility is required to:

- Design alternative resource plans to satisfy at least the objectives and priorities specified in 4 CSR 240-22.010(2);
- Specify a set of quantitative measures for assessing the performance of alternative resource plans with respect to identified planning objectives;
- Use appropriate combinations of candidate demand-side and supply-side resources to develop a set of alternative resource plans, not including load-building programs;
- Assess the relative performance of the alternative resource plans;
- Analyze existing or new load-building programs in the context of one or more of the alternative resource plans; and
- Prepare a report to demonstrate compliance with the provisions of this rule.

8.1.3.2.5 Risk Analysis and Strategy Selection

This rule requires the utility to identify the critical uncertain factors that affect the performance of resource plans, establishes minimum standards for the methods used to assess the risks associated with these uncertainties and requires the utility to specify and officially adopt a resource acquisition strategy (4 CSR 240-22.070). The utility is required to:

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- Use the methods of formal decision analysis to assess the impacts of critical uncertain factors on the expected performance of each of the developed alternative resource plans;
- Conduct a preliminary sensitivity analysis to identify the uncertain factors that are critical to the performance of the resource plan;
- For each alternative resource plan, construct a decision-tree diagram that appropriately represents the key resource decisions and critical uncertain factors that affect the performance of the resource plan;
- Include at least two chance nodes for load growth uncertainty over consecutive subintervals of the planning horizon;
- Use the decision-tree formulations to compute the cumulative probability distribution of the values of each performance measure;
- Select a preferred resource plan from among the alternative plans that have been analyzed;
- Model explicitly and quantify the impact of the preferred resource plan on future requirements for emergency imported power;
- Quantify the expected value of better information concerning at least the critical uncertain factors that affect the performance of the preferred resource plan;
- Develop an implementation plan that specifies the major tasks and schedules necessary to implement the preferred resource plan over the implementation period;
- Develop, document and officially adopt a resource acquisition strategy; and
- Prepare a report to demonstrate compliance with the provisions of this rule.

In summary, Missouri's electric utility resource planning rule is a highly systematic and comprehensive process.

8.1.3.3 The Missouri IRP Process is Subject to Confirmation

The IRP is subject to confirmation by the Missouri PSC. Moreover, there is extensive stakeholder input into the creation of the IRP before it is filed. The Missouri PSC Commission Rule 4 CSR 240-22.080(13) requires that after considering an electric utility's IRP filing, the Commission must issue an order containing findings that the filing "either does or does not demonstrate compliance with the requirements of this chapter, and that the utility's resource acquisition strategy either does or does not meet the requirements stated in 4 CSR 240-22.010(2) (A)-(C)." These regulations require that the utility shall:

1. Consider and analyze demand-side efficiency and energy management measures on an equivalent basis with supply-side alternatives in the resource planning process;
2. Use minimization of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan; and

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3. Explicitly identify and, where possible, quantitatively analyze any other considerations which are critical to meeting the fundamental objective of the resource planning process, but which may constrain or limit the minimization of the present worth of expected utility costs. The utility shall document the process and rationale used by decision makers to assess the tradeoffs and determine the appropriate balance between minimization of expected utility costs and these other considerations in selecting the preferred resource plan and developing contingency options. These considerations shall include, but are not necessarily limited to, mitigation of –

    a. Risks associated with critical uncertain factors that will affect the actual costs associated with alternative resource plans;

    b. Risks associated with new or more stringent environmental laws or regulations that may be imposed at some point within the planning horizon; and

    c. Rate increases associated with alternate resource plans.

The Missouri PSC Staff, the Office of the Public Counsel (representing members of the public) and any intervener may review the utility's plan and file a report identifying any deficiencies in the IRP, including the load analysis and forecasting contained within the plan. The Missouri PSC Staff employs experts who review each section of the IRP to determine whether it complies with regulatory requirements. If any deficiencies are identified, the utility is required to remedy the identified deficiency. The Missouri PSC may issue an order which establishes a hearing and procedural schedule for a hearing on any deficiencies in the IRP. Regardless of whether any deficiencies are identified, the IRP rules require the Missouri PSC to independently review and determine, among other things, whether the IRP complies with the resource planning rules.

The 2005 IRP Order also prescribed how and when AmerenUE would file its most recent IRP. (AUE, 2007) Before the filing of its most recent IRP in February 2008, the AmerenUE IRP went through an extensive stakeholder review and input process. AmerenUE sought involvement of a number of stakeholders while performing its 2008 resource planning analysis. During 2007, AmerenUE held more than two dozen meetings with representatives from organizations that included consumer advocates, representatives of low-income customers, advocates for large business interests, environmental activists and officials from the Missouri Department of Natural Resources, the Office of the Public Counsel and the Missouri PSC Staff.

As part of the stakeholder involvement, AmerenUE included every aspect of the IRP process in its meetings:

A. Project Plan and Schedule

B. Load Analysis and Forecast

C. Supply-side Resources

D. Demand-side Resources

E. Risk Analysis: Uncertainty Factors, Sensitivities, Scenarios, Estimated Value of Better Information

F. Market Forecast: Commodities and Electricity Price

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G. Alternative Resource Plans

H. Environmental Compliance Strategy

I. Results

J. Preferred Resource Plan

K. Demand-Side and Supply-Side Implementation Plans, including environmental compliance and investments for a three year period.

L. Contingency Options and a process for monitoring critical uncertain factors.

The above topics were covered in five phases:

1. Initiation - The focus of workshops during the initiation phase was on process and potential waiver requests. The emphasis was on three planning areas during this phase: demand side management, load analysis and forecasting, and risk analysis.

2. Staging - The focus of workshops during the pre-integration analysis phase was on load analysis, load forecasting, cost-effective demand-side measures and programs, demand-side uncertainty factors, supply-side candidate resource options, supply-side uncertainty factors, probable environmental costs (including environmental laws and regulations), avoided costs, uncertain factors, and critical uncertain factors.

3. Analysis - This phase includes integration analysis (alternative resource plan definition), performing the deterministic phase, probabilistic phase, and expected value of better information analysis. Stakeholders had the opportunity to provide feedback on the alternative resource plans evaluated, risk analysis, and uncertain factor analysis.

4. Preferred plan selection and development of resource acquisition strategy - This phase included the development of the demand-side management evaluation strategies (process and impact), selection of the preferred resource plan, definition of uncertainty limits, description of contingency options, and documentation of a monitoring process.

5. Reporting - This phase consisted of AmerenUE's preparation of the appropriate documents for filing.

In each phase there was extensive participation by stakeholders and there will ultimately be review of the IRP process by the Missouri PSC, which must independently determine whether the IRP, among other things, has an appropriate load analysis and load forecast, provide confirmation that AmerenUE has engaged in a robust resource planning process and that its need for power analysis complies with that required under state law.

8.1.3.4 The Missouri IRP Process is Responsive to Forecasting of Uncertainty

The IRP process considers uncertainty in multiple respects. Forecasting the power demand, supply, and growth over a twenty year planning horizon involves the analyses of a broad range of unpredictable factors, risk and uncertainty. The PSC's regulatory requirements with respect to risk analysis and strategy selection (4 CSR 240-22.070), as detailed in the IRP process, requires AmerenUE to:

- ♦ Identify the critical uncertain factors that affect the performance of the IRP;

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- Establish the standards for the risk assessment methods associated with the identified uncertainties; and
- Ensure that specific and successful resource acquisition strategy is ultimately implemented.

The uncertain factors analyzed under 4 CSR 240-22.070 include:

- The range of future load growth represented by low-case and high-case load forecasts;
- Future interest rate levels and other credit market conditions that can affect the utility's cost of capital;
- Future changes in environmental laws, regulations, or standards including global warming and greenhouse gas reduction initiatives;
- Relative fuel prices;
- Siting and permitting costs and schedules for new generation and generation-related transmission facilities;
- Construction costs and schedules for new generation and transmission facilities;
- Purchased power availability, terms, and costs;
- Sulfur dioxide emission allowance prices;
- Fixed operations and maintenance costs for existing generation facilities;
- Equivalent or full- and partial-forced outage rates for new and existing generation facilities;
- Future load impacts of demand-side programs; and
- Utility marketing and delivery costs for demand-side programs.

In addition, other uncertainty factors are also analyzed in the IRP process. For example, the elasticity of consumer response to higher electricity prices, on both a short-term and long-term basis, is a source of uncertainty. Customers might not reduce demand for electricity as much as one might otherwise expect in the face of higher prices and widespread availability of demand-reduction programs. On the other hand, these price signals could encourage demand response and energy efficiency programs and ultimately cause consumer demand to differ from levels assumed by MISO reliability studies and the utilities. Given the long lead times required to plan and construct generation and transmission facilities, the PSC recognizes that it needs to assess the extent to which it can rely on the most optimistic and most pessimistic of the load forecasts.

The PSC also recognizes that uncertainties in market trends, income, rapid increase in population and demand, and fuel supply diversity will remain significant uncertainties in forecast methodology. These are taken into account in the forecast methodology as described in Section 8.2.1.3.

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Figure 8.1-1—AmerenUE Relevant Service Territory and Transmission Map

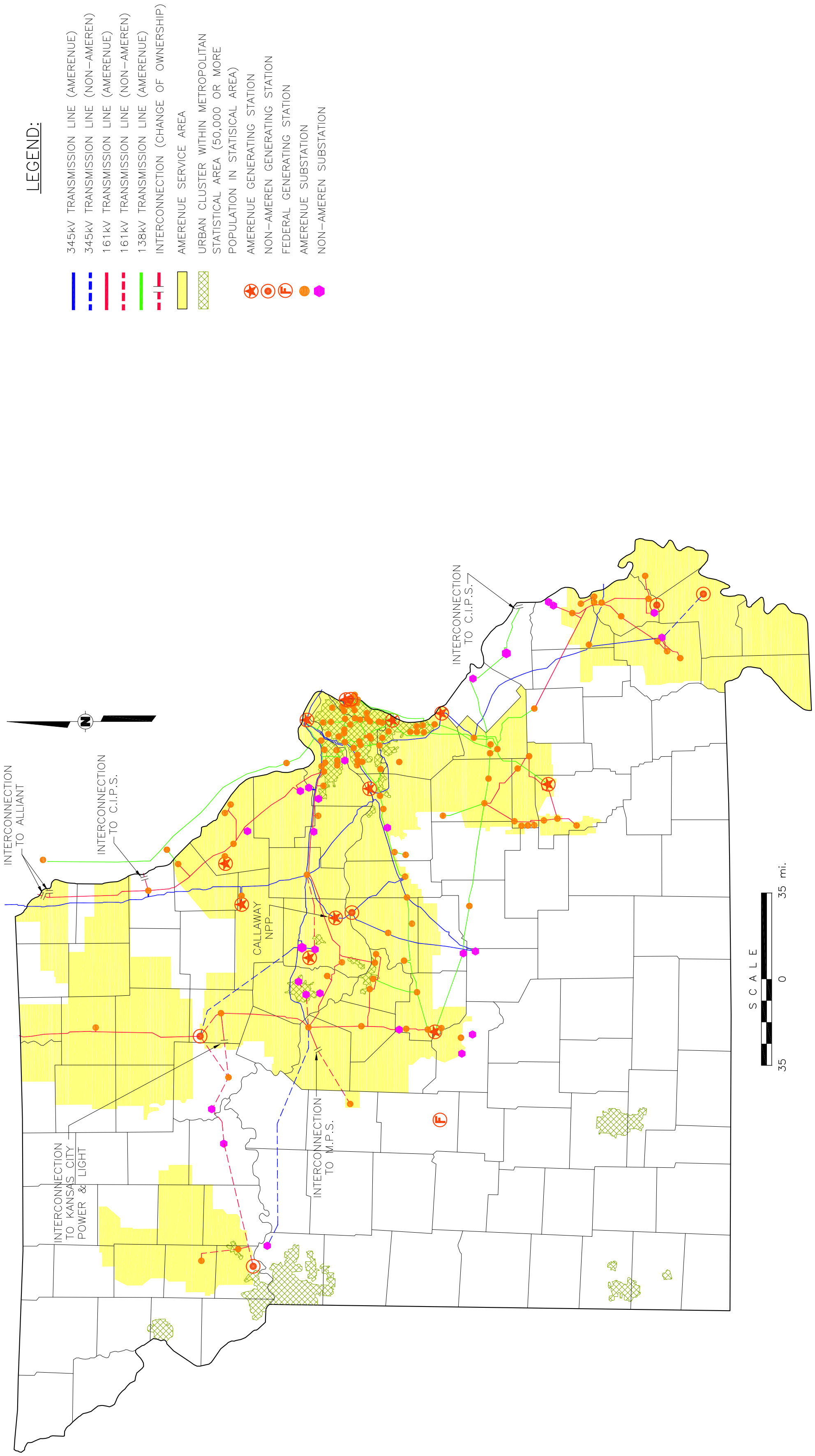

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Figure 8.1-2—Midwest ISO Market Areas

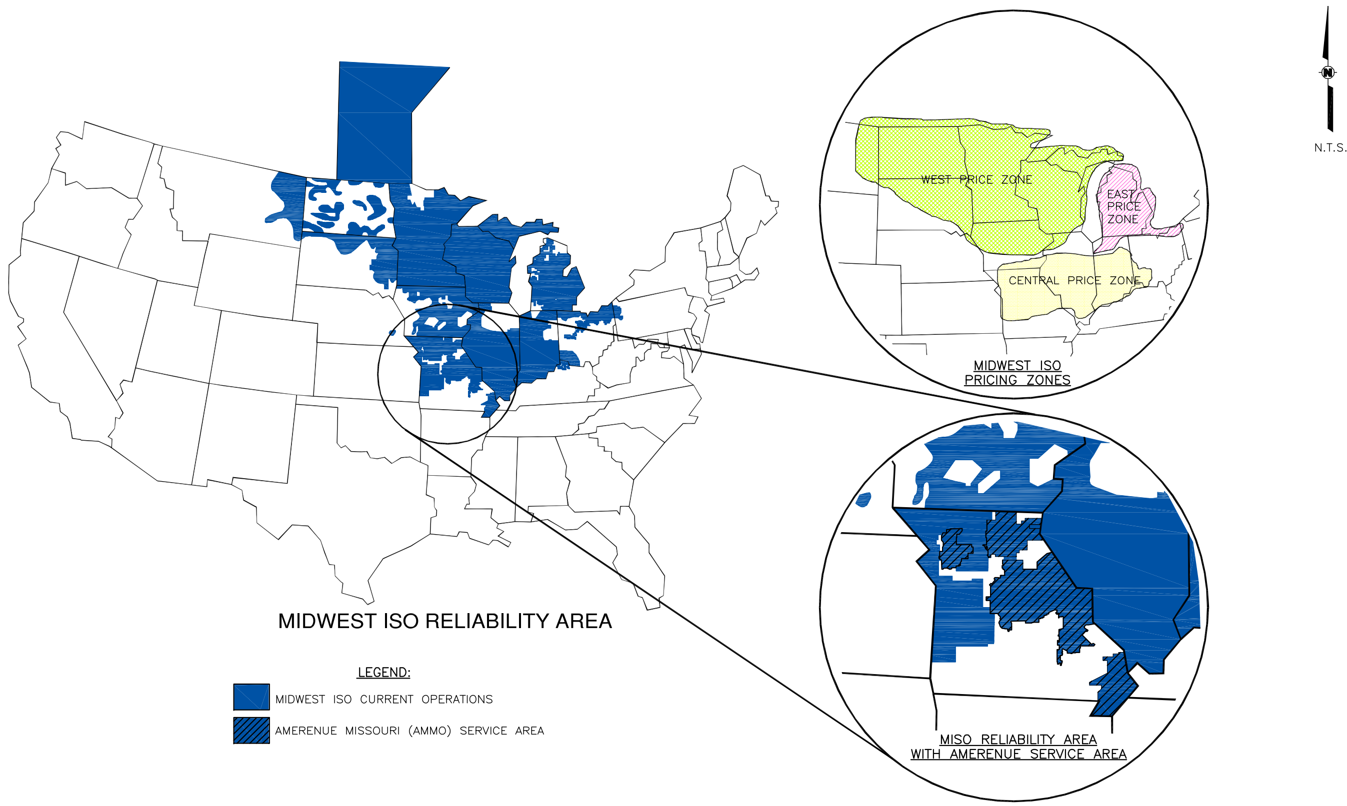

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Figure 8.1-3—NERC/SERC Market Areas

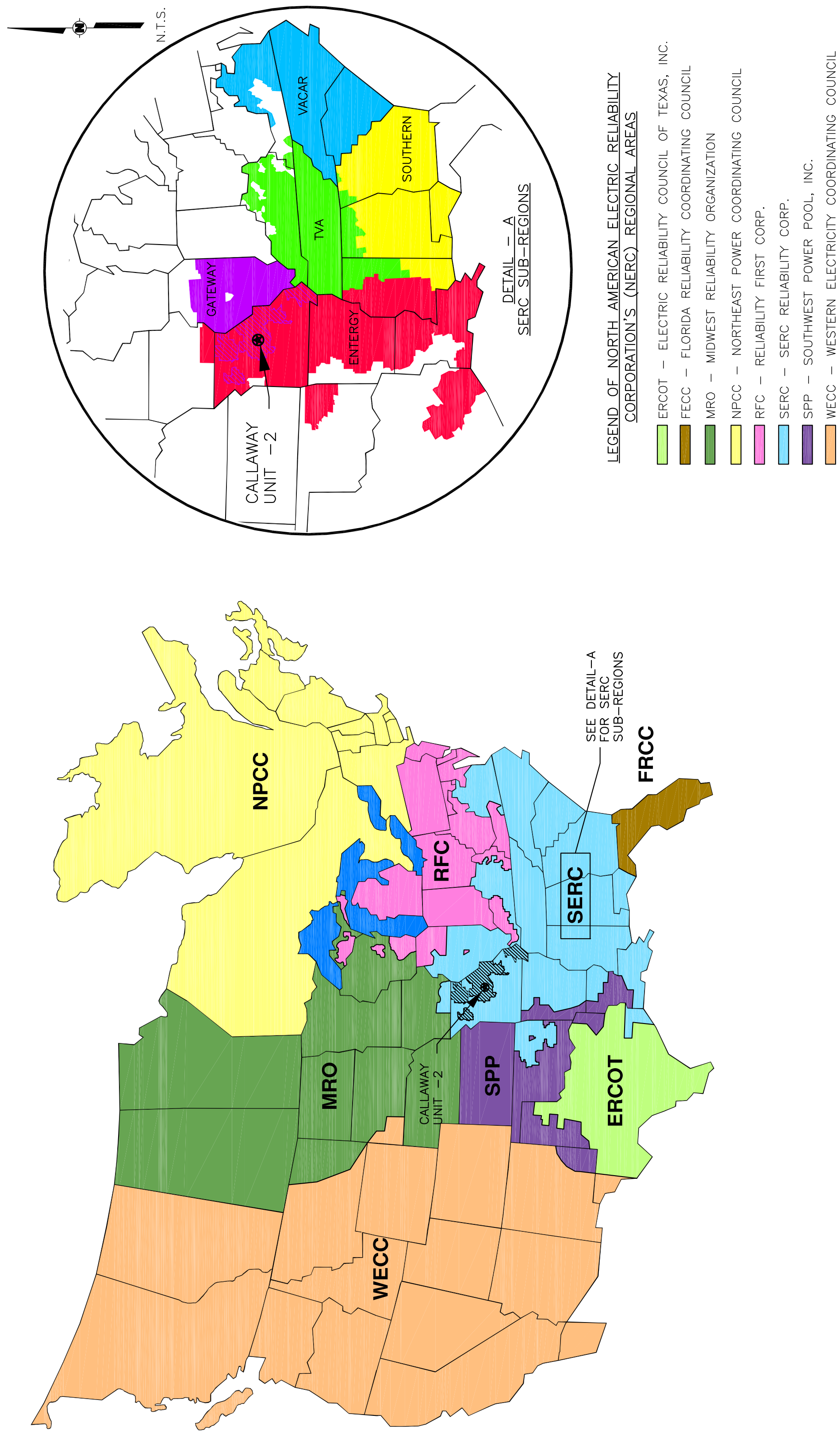

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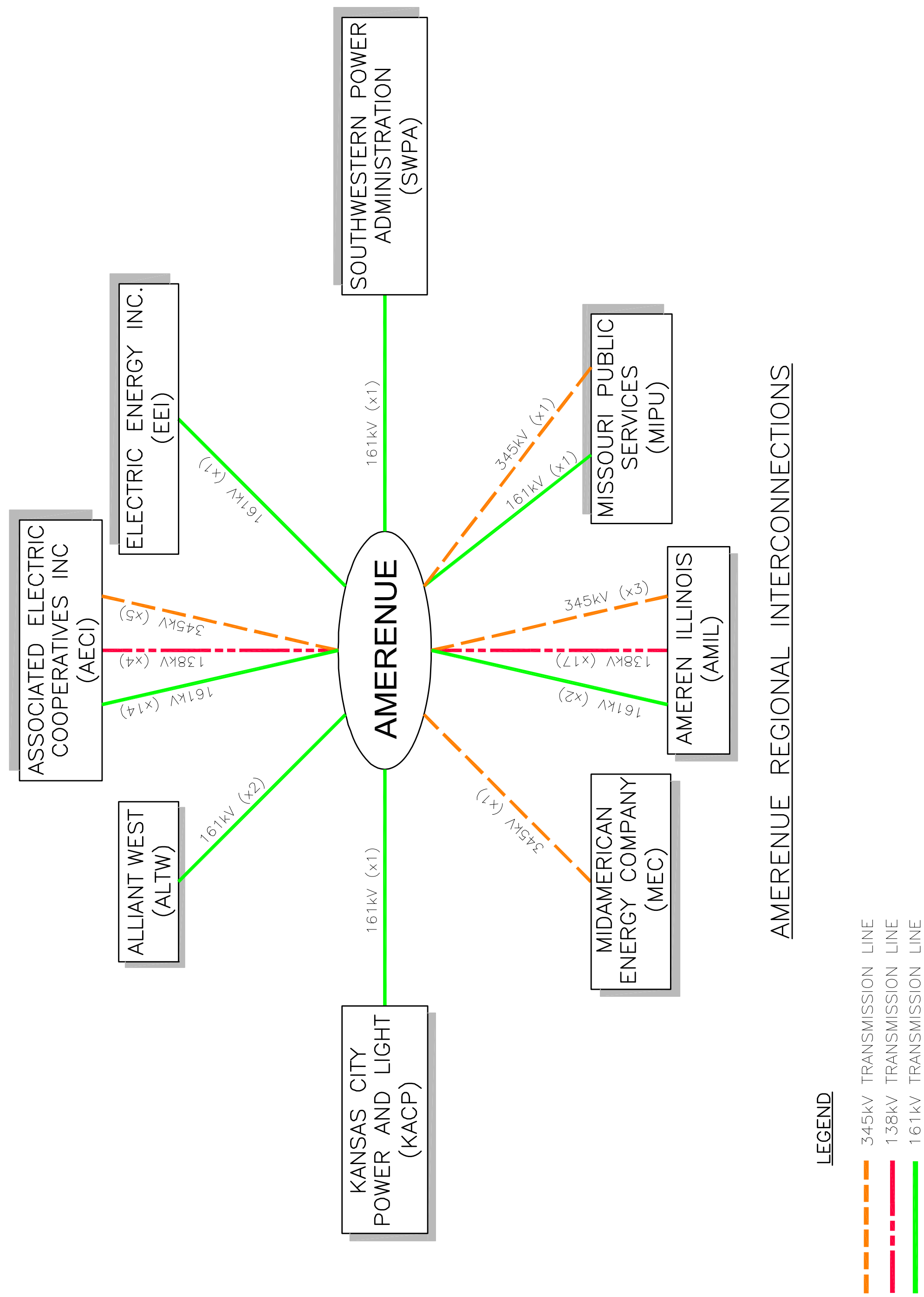
Figure 8.1-4—AmerenUE Regional Interconnections



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8.2 POWER DEMAND

8.2.1 POWER AND ENERGY REQUIREMENTS

This subsection is a description of the methodology employed to forecast energy and peak demand in AmerenUE's service territory. For purposes of this section,"energy" will refer to total metered electricity consumption in the service territory and "peak demand" will refer to the highest hourly demand on the system that occurs within the year. The regulations for electric utility resource planning, found in 4 CSR 240-22.010 – 080 (MO Secretary of State, 1993) set forth an electric utility Integrated Resource Plan (IRP) planning process. AmerenUE has produced the 2008 IRP for AmerenUE's service territory, which was filed by AmerenUE with the Missouri Public Service Commission on February 5, 2008. In the process of developing the IRP forecast, AmerenUE engaged Itron, one of the leading energy forecasting consulting companies in the industry to provide oversight, review and forecasting services. AmerenUE also engaged all stakeholders throughout the IRP process and solicited feedback and comments on the methodology as it was developed. The forecast methodology utilized by AmerenUE in its IRP filing will be discussed along with the results of the forecast. Moderate growth in the population and economy will keep the energy requirements of AmerenUE's service territory growing over the forecast horizon. As shown in Table 8.2-4, over the years from 2007 through 2018, retail energy requirements excluding Noranda, Inc., a large aluminum smelting customer, are expected to grow at an annual rate of 1.4%. Over the same time horizon retail peak demand excluding Noranda is expected to grow at 1.3% per year.

8.2.1.1 Energy Forecast

8.2.1.1.1 Introduction

Missouri has a rigorous set of requirements for IRP load analysis and forecasting. As a part of the 2008 IRP filing, AmerenUE followed a detailed process designed to meet these requirements. AmerenUE's IRP load forecast utilized Statistically Adjusted End-Use ("SAE") models for Residential and most Commercial customer class forecasts. Industrial class forecasts were done using econometric models. Econometric models are statistical models that explain a variable of interest (energy usage) through its relationship with other observable variables (weather, economy, etc.) SAE models are similar to econometric models, but go one step further by introducing data regarding specific electric end-use appliances into the equation and interacting that data with the more traditional econometric variables. AmerenUE has four basic rate classes under which Commercial customers may take service: Small General Service, Large General Service, Small Primary Service, and Large Primary Service. The first two classes are handled with SAE models as they are typically made up of smaller customers for whom end-use appliance saturation data is available. The Primary Service classes are made up of larger customers that are modeled more like Industrial customers with a purely econometric approach.

8.2.1.1.2 Energy Forecast Methodology – SAE (Residential and most Commercial Classes)

For the forecast of Residential electricity usage and for the forecast of sales for most groups of Commercial customers, the SAE modeling framework was employed. SAE modeling is a statistical technique that allows the forecast to incorporate the impacts of changing saturation and efficiency trends in end-use appliances along with traditional economic drivers, prices, and weather in an interactive manner.

There are numerous variables of interest that are gathered in order to construct the variables that will be included in the SAE model. They include:

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- Cooling/Heating Degree Days;
- Population (Residential Models Only);
- Real Personal Income (Residential Models Only);
- Real Price of Electricity;
- Household Size (Residential Models Only);
- Gross Domestic Product (GDP) (Commercial Models Only);
- Saturation of Numerous End-Use Appliances;
- Efficiency Ratings of Numerous End-Use Appliances;
- Improvements in Thermal Shell Integrity of Building Structures; and
- Elasticity of Demand with Respect to Price, Income, and Household Size.

These variables are treated interactively in the statistical models. As an example of what this means, consider the heating end-use. If there is an increase in the saturation of electric space heaters, the model will increase the response of load to temperature. This is logical, in that more space heating equipment in use in the service territory will necessarily mean that electric loads will increase more during cold weather than they otherwise would have. Similarly, an increase in the real price of electricity will cause the model to reduce the response of load to temperature. This is capturing the effect of the consumers' response to price. Under higher prices, more consumers would tend to dial back their thermostats in order to save money on their bills.

SAE style regression models are estimated using Itron's MetrixND software and are based on historical observations of electric sales and the driver variables discussed above. In order to perform a forecast of sales, forecasts of each driver variable must be obtained and run through the model coefficients developed from the historical data. The driver variable forecasts come from a few sources. For economic variables, historical and forecasted observations are provided by the economic consulting firm Economy.com. Economy.com provides county- level economic data, which AmerenUE subsequently aggregates into observations that are applicable specifically within its service territory. End-use saturation and efficiency data, including forecasted data, is obtained from the Energy Information Administration (EIA). This data is for the West North Central region, which is made up of several states, including Missouri. The historical saturation data is checked for consistency with, and may be adjusted based on, more localized conditions based on a comparison to an end-use survey performed in the State of Missouri. Heating and cooling degree days over the forecast horizon are based on the expectation of normal weather for AmerenUE's service territory, which is defined as the average degree days experienced by month from the years 1971 to 2000 in the St. Louis metropolitan area.

8.2.1.1.3 SAE Model Detailed Description

The SAE models are able to capture the interactive effects of the variables employed through mathematical relationships that are established between them. An SAE modeling approach entails constructing end-use variables that include end-use saturation and efficiency trends as well as economic, price, and weather impacts. The SAE specification allows direct capture of the

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impact of improving end-use efficiency and end-use saturation trends on class sales. The process entails constructing end-use variables (i.e., XHeat, XCool, and XOther) and using these variables in estimated average use regression models as shown below:

$$AvgUse_m = a + b_1 \times XHeat_m + b_2 \times XCool_m + b_3 \times XOther_m + \varepsilon_m$$

The objective is to construct generalized end-use variables that approximate monthly end-use kWh requirements. The constructed end-use variables have two components – an index variable that captures change in end-use saturation, stock efficiency, and improvements in thermal shell integrity (e.g., HeatIndex), and a variable that reflects short-term utilization of this stock (e.g., HeatUse). The end-use variable (e.g., XHeat) is constructed as the product of these two components. XHeat, for example, is calculated as:

$$XHeat_{y,m} = HeatIndex_{y,m} \times HeatUse_{y,m}$$

where:

$$\mathrm{HeatIndex}_y = \sum_{\mathrm{Type}} \mathrm{Weight}^{\mathrm{Type}} \times \frac{\left(\mathrm{HeatShare}_y^{\mathrm{Type}} \big/ \mathrm{Eff}_y^{\mathrm{Type}} \right)}{\left(\mathrm{HeatShare}_{\mathrm{base}}^{\mathrm{Type}} \big/ \mathrm{Eff}_{\mathrm{base}}^{\mathrm{Type}} \right)}$$

The heat index is a variable that captures heating end-use efficiency and saturation trends, thermal shell improvement trends, and housing square footage trends. The index is constructed from the EIA annual end-use residential forecast for the West North Central census region. In this expression, *base* corresponds to a base year for normalizing the index. The ratio on the right of the equation is equal to 1.0 in the base year. In other years, it will be greater than 1.0 if equipment saturation levels are above their base year level. This will be counteracted by higher efficiency levels, which will drive the index downward.

The weights are defined by the estimated heating energy use per household for each equipment type in the base year.

$$Weight^{Type} = \frac{HeatingEnergyUse_{base}^{Type}}{Households_{base}}$$

With these weights, the HeatIndex value in the base year will be equal to the estimated annual heating energy use per household in that year. Variations from this value in other years will be proportional to saturation and efficiency variations around their base year values.

$$HeatUse_{y,m} = \left(\frac{HDD_{y,m}}{NormHDD} \right) \times \left(\frac{HHSize_y}{HHSize_{base}} \right)^{.20} \times \left(\frac{Income_y}{Income_{base}} \right)^{.15} \times \left(\frac{Price_{y,m}}{Price_{base}} \right)^{-.15}$$

The economic and price drivers are incorporated into the HeatUse variable. This index value changes through time and across months in response to changes in weather conditions, prices, household size, and household income.

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The heat index (HeatIndex) and heat use variable (HeatUse) are combined to generate the monthly heating variable XHeat. The constructed XHeat variable is an estimate of monthly heating requirement (kWh). Similar variables are constructed for cooling (XCool) and other end-uses (XOther). The monthly variation in the XOther variable is driven by variation in the number of billing days, lighting requirements, and electricity usage for water heating and other miscellaneous electric equipment.

The above model specification describes the Residential average use model. Because average use per customer is the variable being forecasted, the ultimate energy forecast is derived by multiplying by a customer forecast. Therefore, this methodology directly includes the impact of customer growth. The Commercial class variation on this model is very similar to the Residential model specification. However, the dependent variable is total class sales instead of usage per customer. The changing customer base is captured by inclusion of GDP in the HeatUse variable (as well as CoolUse and OtherUse) in place of Household Size and Income in the Residential model.

8.2.1.1.4 Energy Forecasting Methodology – Econometric (Industrial, some Commercial, and Other Classes)

Total Industrial class sales and some sub-classes of Commercial sales are forecasted using traditional econometric models. In these models, sales are described as a function of weather (degree day) variables as well as certain economic drivers. For the industrial class, the economic drivers utilized were Manufacturing Employment and Manufacturing GDP. The Commercial sub-classes that were modeled with a strictly econometric approach included GDP or Employment from the Retail Trade sector. All forecasts of economic driver variables that were used in the econometric models were provided to AmerenUE by Economy.com.

8.2.1.1.5 Energy Forecast – Conclusions

The energy forecast performed by AmerenUE for the 2008 IRP followed a very rigorous and detailed process. In 2007, AmerenUE's electric sales totaled nearly 39,000 GWh. Over the years between 2008 and 2020, electricity sales are expected to grow annually by 1.4% to a level of approximately 45,500 GWh, as shown in Table 8.2-3. Historical data and forecasts of the economic and end-use variables used to create the forecast along with growth rates for the economic variables are shown in Table 8.2-7 through Table 8.2-12.

8.2.1.2 Peak Forecast

8.2.1.2.1 Introduction

The primary inputs to the peak load forecast are the energy load forecast by customer class and class profiles that shape the energy forecast. By using the energy forecast to generate the peak load, AmerenUE implicitly draws all of the factors that it uses in the energy sales forecast into the process for peak forecasts. Under this modeling framework, growth in the peak load can be driven either by the economic and other factors that result in a higher energy sales, or by changes in class load factors that are introduced through the changing mix of end-uses. Changes in the end-use mix are accounted for through class-level end-use load shapes that are calibrated to the energy forecast. The class-level end-use load shapes are developed in conjunction with Itron.

Because of the structure of the SAE model as described above, it is possible to discern that portion of the forecasted energy that is attributable to different major end-use categories (heating, cooling, and other). When the cooling end-use portion of the energy forecast increases, the peak forecast will increase more than when the other end-use forecast increases.

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This is because cooling as an end-use application tends to run more at times of system peak than other end-uses. This effect is captured through the process utilized to generate the peak forecast.

The energy forecast is done at the customer meter level. Because energy is lost on the transmission and distribution systems, there is a loss percentage applied to the sales forecast. When the forecast for each customer class and end-use where applicable has been shaped with the profiles, losses are added and the results are aggregated to the system level. This aggregation goes through some additional calibrations and checks, and then the peak hour of the system aggregation is identified as the forecast for the system peak.

8.2.1.2.2 Detailed Peak Forecast Methodology

The peak forecast was built with a bottom-up approach. The SAE and econometric class level energy forecasts are shaped using hourly profile models, adjusted for line losses, and aggregated to form system level loads. This is done using a software product from Itron called MetrixLT. The maximum hourly load of each month becomes the peak load forecast for that month.

The first step in this process is modeling the class hourly load profiles. Use per customer class hourly load profile models are estimated for each of the subclasses using three years of hourly load data spanning the period July 2003 to June 2006. MetrixLT is then used to combine class and end-use energy forecasts with hourly load profile forecasts and to adjust these profiles for line losses.

Residential profiles are estimated for cooling, heating, and other use. Profiles are constructed using end-use weather response functions developed as part of Itron's EShapes database, which is an end-use library of shapes constructed by U.S. region. The shapes were developed from engineering simulation runs for typical households with air conditioning and electric space heating.

Heating and cooling weather response functions are simulated using St. Louis actual daily weather data over the same period for which residential load research data was available- July 2003 to June 2006. This generates an initial use per customer hourly heating and cooling load for this period. A base-use profile model is used to generate an initial hourly load profile for residential base load. The end-use results from the simulation are calibrated to actual residential class load research data.

The profiles are extended through the forecast period using the forecast calendar and normal daily weather. The profile forecasts are combined with end-use energy forecasts and aggregated to generate the residential class profile forecast. The residential class profile forecast is added with the other class hourly profiles resulting in an initial long-term system hourly load forecast.

The build-up forecast model will tend to under estimate the system peak. This is an outcome of the shape estimation process that is based on hourly load regression models. The regression models minimize the sum of the squared residuals for all hours – this includes low load hours as well as the peak hour. As the model gives equal weight to all hours, the regression line will tend to under predict the extreme or peak hours though on average will generate a reasonable profile. To correct this bias, the peak demand from the build-up model is calibrated to the 2006 weather normalized peak (excluding Noranda, a large industrial customer that joined the AmerenUE system in 2005). The July 2006 peak demand from the build-up model is 7,857 MW. The weather-normalized July 2006 peak excluding Noranda is 7,969 MW. The calculated peak

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adjustment factor is 1.014 (July 2006 Weather Normal Peak divided by Build-up 2006 Peak Forecast). This adjustment factor is applied to the July peak forecasts from the build-up model forecast. Build-up peak demand forecast for the other months are also evaluated against expected peak demand and adjusted accordingly.

8.2.1.2.3 Peak Forecast Conclusion

The methodology employed in executing the peak load forecast utilized the energy forecast as a primary driver. Therefore, the same factors that the energy forecast considered are being accounted for in the growth in peak demand.

The residential and commercial classes are responsible for most of the growth in system peak demand. On the other hand, industrial coincident peaks decline steadily through the forecast period and the "Other" (Noranda, wholesale, and lighting) category remains stagnant after the drop in 2009 due to the expiration of certain wholesale contracts. While AmerenUE experienced a weather normalized peak load of 8,553 MWe (not including wholesale customers' contribution to the peak) in 2007, the peak is expected to grow at an average annual rate of 1.3% to 9,833 MWe in 2020, as shown in Table 8.2-3.

8.2.1.3 Forecasting Uncertainty Sensitivity

8.2.1.3.1 Introduction

The analysis of forecast uncertainty was primarily performed as a part of a comprehensive Risk Analysis section in AmerenUE's 2008 IRP. The Missouri IRP rules call for a high and low load forecast case. AmerenUE filed for and received a waiver from this requirement because of the comprehensive nature of the integrated risk analysis that was performed. This risk analysis included, as will be discussed more fully below, variations in demand that are associated with alternate sets of future conditions that may affect energy consumption patterns over the forecast horizon. In addition to the integrated risk analysis, however, AmerenUE has also calculated a high and low forecast case based on a 95% confidence interval around the expected case to ascertain the statistical uncertainty around the modeled results. This confidence interval is not the result of varying the driver variables used in the forecast, but it does measure the statistical uncertainty inherent in the model itself. The confidence interval produced a low forecast growth rate (2007-2020) of 0.75% and a high forecast growth rate of 1.76% against the expected growth rate of 1.4%.

A complete analysis of sensitivity of load to a variety of unknown factors was included as a part of the comprehensive risk analysis in the IRP. As a part of this analysis, different future conditions that would be expected to influence future electricity demand in AmerenUE's service territory were specifically identified as scenarios and modeled explicitly. AmerenUE engaged the consulting firm CRA International (CRA) to assist with this analysis. CRA developed the scenarios based on possible future conditions around greenhouse gas policy, high natural gas prices, and breakthroughs in the rate of improvement in energy efficiency.

8.2.1.3.2 Forecasting Uncertainty Methodology

The IRP's comprehensive risk analysis used a probability tree to evaluate the sensitivity of the performance of the candidate resource plans in the context of a variety of future states of several key uncertain variables. Preliminary sensitivity analysis winnowed out three uncertain factors critical to the performance of AmerenUE's candidate resource plans: (1) greenhouse gas policy outcomes, (2) natural gas prices, and (3) load growth paths. The various combinations of these three key uncertain variables, and their associated likelihoods, formed the scenarios represented in the final probability tree. These scenarios are analyzed as a set of model runs,

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whose outputs then constitute the key inputs to the standard risk analysis and strategy selection phases of the IRP process. One of the essential model outputs is the projection of future loads in AmerenUE's service territory. Accordingly, a distinction needs to be made between these demand outputs and the load growth forecasts that are exogenous inputs into the model of the national energy and environment system.

The final probability tree represents the set of scenarios that the AmerenUE IRP process explicitly considers. AmerenUE developed mutually consistent sets of input assumptions for each scenario through the application of CRA's Multi-Regional National – North American Electricity & Environment Model (MRN-NEEM) of the energy and environmental system. This integrated model is able to simultaneously simulate interactions in fuel markets, energy demands, electricity generation system operation, non-electricity sector outcomes, macroeconomic activity levels, and responses to emissions limits that may be applied to sources throughout the economy and not just to electricity generators. Thus, the scenarios in the probability tree were in fact analyzed as a set of model runs using MRN-NEEM with the above capabilities. The output of each model run (i.e., for each scenario in the tree) is an integrated set of projections of key inputs to a standard analysis to select a resource plan. Each integrated set includes projections through the planning horizon of electricity load growth as well as changes in wholesale electricity prices, emissions allowance prices (for SO_2, NO_X, Hg, and CO_2), natural gas prices, coal prices, and AmerenUE's optimal emissions control retrofits (and their timing).

Two sets of load growth input assumptions were included in the final probability tree. These were a "base load" growth case and a "transformed demand" case. The "base load" case represents business-as-usual ("BAU") assumptions in CRA's MRN-NEEM. From 2007 through 2014, CRA obtains forecasts for both energy (in megawatt-hours (MWh)) and peak demand (in megawatts (MW)) from the NERC ES&D 10-Year Forecast. These forecasts incorporate historically observed rates of the Autonomous Energy Efficiency Improvement (AEEI) index, which represents general efficiency trends in technology innovation within the entire stock of energy-using goods and services. Thus, the "base load" growth trajectory, in terawatt-hours (TWh) reflects some level of energy efficiency improvement. For each year after 2014, CRA uses the compound average growth rate of annual energy demand from 2009 to 2014.

The "transformed demand" case anticipated breakthroughs in the rate of energy efficiency improvement which achieve a 20% reduction in energy demand by 2030. This results from an AEEI rate significantly above the historical levels embodied in the base case load forecast. For the electric sector, CRA calculated an implied base case AEEI by deriving an electricity intensity figure (in kilowatt-hours (kWh)) of generation per dollar of GDP. The "transformed demand" case assumes that this measure of the AEEI will increase gradually.

An integral component of a risk analysis of an alternative resource plan is the assignment of subjective probabilities to each of the critical uncertainties. That is, the following uncertainties encompassed in the probability tree need to be stated as a probability distribution function (pdf):

- Greenhouse gas (GHG) policy outcomes, especially in terms of CO_2 price levels;
- Natural gas prices; and
- Load growth paths, especially in terms of breakthroughs in energy efficiency and distributed generation.

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Having assigned a probability to each of the three forks in a tree branch, the likelihood of an integrated scenario (i.e., of the endpoint in a tree branch) is simply the product of the probabilities of each fork. As an illustrative example, consider a scenario consisting of the following branches (with subjective probabilities in parentheses): (1) High CO_2 Prices (66%), (2) Base Case Gas Prices (50%), and (3) Base Load (93%). The likelihood of this hypothetical scenario, then, is simply the product of 66%, 50%, and 93%, or roughly 31%.

The elicitation of these subjective probabilities conformed to the formal guidelines of the decision-analytic protocol. One, the appropriate individual to allocate probabilities for a private sector decision is the decision-maker or the person(s) that the decision-maker designates as the best expert(s). If the latter, then the decision-maker still retains the right to accept or modify the conclusions of the designated expert. As such, AmerenUE management identified and directed CRA to work with several specific AmerenUE in-house experts to obtain probability distributions for each critical uncertain variable. Where multiple experts were interviewed, consensus values were obtained. Senior AmerenUE management (the decision-maker) reviewed the so-determined subjective probabilities and their basis and approved them for use in the IRP risk analysis. Two, the term "subjective probability" conveys a much more rigid definition in decision analysis than in colloquial conversation. It summarizes the information an individual has of a one-time event or outcome that is not deterministically "known" yet. By definition, then, subjective probabilities of "zero" or "one" are invalid. As mentioned before, these probabilities can naturally vary with the individual, since each expert has different information. Moreover, probabilities can change over time, if and when better information becomes available. Lastly, the term "subjective" does not imply that whatever an expert wants to say is unconditionally relevant. Probability encoding techniques have been designed to elicit an individual's true beliefs about an uncertainty.

CRA structured each probability elicitation session around certain key elements of probability encoding techniques. First, the purpose of the elicitation exercise and process was expressly explained and reinforced interactively throughout the interview. This interactive approach minimizes the potential for "self-encoding" by experts well-versed in probabilistic thinking. Second, the variable to be encoded was clearly defined, and if the uncertainty was too complex to analyze as a whole, it was broken down into simpler constituent parts. These more digestible variables were then combined to inform estimates of the more complex outcome. Third, CRA incorporated a "conditioning" phase of the interview to lessen some common sources of cognitive limitations. Visual devices like pie charts and event trees often served as visual and/or mental points of reference on probabilities. Finally, the general philosophy of guiding the thought process, restructuring the investigation, revisiting the thought process, and then verifying results produced probabilities that were robust and truly representative of the experts' beliefs. In the end, the expert agreed that a probability of seven percent was justified for the "transformed demand" case, with the remaining 93% slotted for the "base load" growth case.

The model outputs for Eastern Missouri load forecasts for each scenario in the probability tree are given in Figure 8.2-1. The Eastern Missouri load was the proxy for AmerenUE's load selected by CRA in the modeling process. AmerenUE's service territory load makes up over half of the Eastern Missouri load. Of note is the lack of a scenario projecting Eastern Missouri demand levels greater than those in the BAU case through the majority of the planning horizon. Indeed, in developing the scenario tree, AmerenUE cultivated a world view with demand growing at rates slower than BAU forecasts over the IRP modeling horizon. Given this particular scenario tree, the principal objective that still drives the creation of build plans is how to best assure adequate reliability. In turn, the risk-averse stance would be to determine, out of all of the scenarios one surmises might evolve in the next 20 to 25 years, the scenario that features the

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highest load growth in AmerenUE's service territory. It is around this highest-demand scenario that AmerenUE should develop candidate resource plans, and, in this context, this happens to be the BAU case. Having ensured sufficient capacity reserves, AmerenUE can then turn to secondary (but also important) financial considerations in selecting the top resource plans for risk analysis.

Building around the BAU provides additional benefits, particularly in managing the risk asymmetry inherent to any resource planning process. Given the objectives of a public utility, the risks to reliability of a capacity shortage are considered a dominant concern, compared to the consequences of a temporary overbuild. Further, the mitigation of a capacity shortage situation is a slow process, given lead times to build new capacity. In contrast, if it becomes apparent that load may be growing less rapidly than planned for, new capacity projects may be more quickly slowed. The question then arises as to how AmerenUE can effectively manage the risks of building excess capacity. The range of integrated scenarios demonstrating lower demand growth rates provides a context in which to answer this question. Especially when considering that AmerenUE is not projecting an urgent need for new capacity, it is much easier to delay than to speed up construction plans, if loads in AmerenUE's service territory indeed fall below the BAU projections used for capacity planning. Furthermore, if AmerenUE is vigilant in developing contingency plans that account for these lower demand levels, then the costs of postponing or suspending new builds can be minimized up front.

Thus, building alternative resource plans upon BAU demand forecasts most adequately addresses the foremost concern of reliability. The construction of a probability tree whose scenarios all featured lower demand growth rates obviated the need for a "high-growth" case to bracket the base case load forecast. With the reliability concern addressed through building to the BAU case, the primary evaluation criteria becomes the cost-effectiveness of the candidate resource plans. So the risk associated with over-building will be thoroughly tested by evaluating the candidate resource plans against the identified scenarios of reduced demand based on the economic merit of the plan.

8.2.1.4 Historical Electric Demand

The historical loads reported are based on the customer mix that prevailed at AmerenUE at the time, as shown in Table 8.2-1. There are a few significant changes that have taken place that affect the make-up of the AmerenUE load over the years. In June 2005, Noranda, a large aluminum smelter that was previously not a part of the AmerenUE system, initiated retail service with AmerenUE. Noranda has a peak load just under 500 MWe at a very high load factor. Historical sales and peak loads do not include energy and demand associated with this customer, while it is included in all forecasted loads and peak demands.

Additionally, AmerenUE has had a changing group of wholesale customers over the period of review. Historically, AmerenUE has had as many as 17 wholesale customers. Over time, many of these customers have opted to take service from other energy suppliers. Since 2004, there have been 6 wholesale customers that have continued to take supply from AmerenUE. At the time that AmerenUE prepared its IRP forecast, those six contracts were expected to expire at the end of 2008. Three of the contracts have subsequently been renewed for terms of three to five years. However, the forecast has not been updated to include these contract extensions. The contract extensions do not run long enough to effect AmerenUE's load obligations in the years where the proposed plant would become commercially operational. Therefore, no wholesale customers are included in the forecast for the AmerenUE service territory beyond the 2008 timeframe.

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Historical energy by customer class is included in Table 8.2-2. Because of the changing group of wholesale customers over the historical time frame and the fact that no wholesale customers were included in the forecast, the historical table does not show wholesale sales.

8.2.1.5 Evaluation of the Forecast

For comparison purposes, the AmerenUE forecasted energy growth rate was compared to the most recent Energy Information Administration (EIA) (EIA, 2006) forecast in Table 8.2-6. The EIA prepares an annual independent regional forecast of electric use by sector. The AmerenUE forecast is compared against the EIA forecast for the West North Central region. This region includes the states of Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota. As this table indicates, the AmerenUE forecasts, both by sector and overall, are quite comparable to the EIA's. For example, AmerenUE's residential energy load growth is projected to be 1.58% per year as compared to the EIA's 1.37%. AmerenUE's overall energy load growth is projected to be 1.4% per year, slightly higher than the EIA's projection of 1.31%. The slightly larger differences in the AmerenUE forecast of the commercial and industrial classes from the EIA forecasts of the same classes can be explained by a review of the economic conditions in the AmerenUE service territory. As will be discussed further in Section 8.2.2, the industrial base in Missouri and the St. Louis region have been declining steadily for over the last ten years while service sectors have seen fairly robust growth. This explains the higher growth AmerenUE is projecting for the commercial class and the lower growth projected for industrial sales.

In addition to reasonableness checks on the current forecast against an independent and authoritative source, AmerenUE has also evaluated the performance of past forecasts against actual sales levels in order to verify the historical accuracy of its forecasting process, as shown in Table 8.2-5. Over the years 1993 to 2007, the average of the absolute value of the error in annual forecasted energy sales on the system has been 1.8%. When the effect of unusual weather is corrected in the actual sales, the historical accuracy falls to 1.3%. This demonstrates that AmerenUE has consistently produced reasonable forecasts and should lend additional credence to the current forecast.

8.2.1.6 Conclusion

The load forecasts conducted for the IRP are consistent with the NRC's guidance for accepting a need-for-power analysis that is systematic, comprehensive, subject to confirmation, and responsive to forecasting uncertainty. Through its 2008 IRP process, AmerenUE has executed a forecasting process that meets these guidelines. The above discussion details the very systematic forecasting process that considers historical usage patterns and employs a rigorous forecasting methodology that explicitly considers the impact of price and elasticity, energy efficiency, income, economic activity, the number of customers, weather, and saturation of electricity using devices. Uncertainty in the forecast was considered through a detailed review which considers the most significant risks in the resource planning process in an integrated and systematic fashion.

8.2.2 FACTORS AFFECTING GROWTH OF DEMAND

Section 8.2.2 considers the factors that affect the historic and future electric loads. There are numerous factors that contribute to changes in electric demand. Among the most prominent factors are economic and demographic trends, energy efficiency and substitution, and price and rate structures. AmerenUE's 2008 IRP, consistent with NUREG-1555, accounted for factors affecting the growth of demand in its forecast.

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8.2.2.1 Economic and Demographic Trends

The Statistically Adjusted End-Use ("SAE") and econometric energy forecasting models discussed in Section 8.2.1 require the input of key economic driver variables that cause much of the change in load patterns over time. The residential energy forecast model includes household size and real personal income in the equations that explain energy usage. Also, because the energy modeling is done on a use per customer basis and the customer forecast includes consideration of population, population is implicitly a driver of the residential sales forecast. For each of the driver variables described above, Economy.com, a reputable economic consulting firm, provides a forecast for the counties in Missouri. AmerenUE aggregates the forecasts for the counties in its service territory in order to develop economic indices relevant specifically to its customer base. The population forecast by Economy.com calls for a compound annual growth rate in the counties in which AmerenUE provides electric service of 0.4% over the years from 2000 to 2030. By way of comparison, the U.S. Census Bureau projects a population growth rate for the State of Missouri over the same time period of 0.5% (USCB, 2007). The growth rate in population over the historical period of 1993 through 2007 in the AmerenUE service territory had been 0.7%. The slight decline in population growth forecasted over the coming years as compared to the historical population growth rate contributes to the fact that the forecasted electric sales growth rate is modestly lower than the historical growth rate as reported in Table 8.2-4.

The Commercial SAE models and all of the econometric models that are used to forecast the other customer classes also make use of economic projections by Economy.com. As noted in Section 8.2.1, AmerenUE's forecasted growth rate of Commercial electric sales is slightly above the EIA's forecasted growth rate for the same class, while AmerenUE's Industrial forecast calls for lower growth than the EIA forecast. This forecast is supported by the specific economic conditions in the AmerenUE service territory.

According to the U.S. Bureau of Labor Statistics, manufacturing employment in the State of Missouri has declined every year since 1999; falling by 20%, from 377,600 to 299,600, between 1998 and 2007 (USDOL, 2007a). In the St. Louis metropolitan area, manufacturing employment fell by 23%, from 177,300 to 135,000, over the same period (USDOL, 2007b).

Particularly affected industries include computer & electronic equipment manufacturing, down 35% statewide, electrical equipment manufacturing, down 33% statewide, and transportation equipment, down 27% statewide.

AmerenUE's estimate of employment in its territory based on projections by Economy.com is consistent with the performance of the State of Missouri and the St. Louis Metropolitan Statistical Area ("MSA"). In the AmerenUE service territory, manufacturing employment fell by 26%, from 101,600 to 75,040, between 1998 and 2007. The inclusion of Ford's assembly plant in Hazelwood, MO, which shut down in 2002, and eliminated 2,600 jobs, in the AmerenUE service territory contributes to the disproportionate decline in the territory's manufacturing employment.

The extended period of decline is noteworthy, as it includes periods when the broader economy both expanded and contracted. This suggests that the decline in manufacturing employment in these areas is a structural rather than cyclical phenomenon. Therefore, the flat to slightly declining Industrial sales forecast is reasonable.

The decline in manufacturing employment that occurred in Missouri, the St. Louis MSA, and the AmerenUE service territory was partially offset by employment growth in the service producing sectors. Relevant to the Commercial sales growth rate, between 1998 and 2007, the financial

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activities, professional and business services, education and health, and leisure and hospitality services sectors all expanded. Total employment in all four of those sectors grew from 1,003,700 to 1,170,300 (13%) in Missouri, 554,800 to 624,100 (12%) in St. Louis, and 649,000 to 745,900 (15%) in our estimation of the AmerenUE service territory employment.

8.2.2.1.1 Economic and Demographic Trend Conclusions

AmerenUE has evaluated significant economic variables that contribute to growth in demand for power. Overall, the economy of the AmerenUE service territory is exhibiting moderate growth. Expected population growth of 0.4% per year will continue to drive overall energy demand higher during the coming years. More robust growth will be seen in the commercial sector sales, while flat to slightly declining sales should prevail in the industrial sector. This fits with the historical trend of the economy in AmerenUE's territory. The transition to a more service oriented economy should continue to drive commercial sales as the leading source of increased demand.

8.2.2.2 Demand-side Initiatives, Energy Efficiency, and Fuel Substitution

8.2.2.2.1 Introduction

One of the key factors in determining the need for power in the future is the rate at which energy efficiency of end-use appliances changes and the availability of demand response resources. As appliances using energy grow more efficient, they offset some of the need for power that is introduced by a growing economy and increasing appliance stocks. Regardless of a utility's efforts to promote energy efficiency and conservation in its service territory, some increases in efficiency will be realized. This occurs due to federal efficiency standards and technological improvements that require or allow manufacturers to improve the energy efficiency of their products. As customers acquire newer devices that are subjected to higher efficiency standards, the service territory will have a natural offset to some of the load growth that would otherwise occur. This natural gain in energy efficiency is already accounted for through the forecasting process utilized by AmerenUE. One of the inputs to the SAE models described in Section 8.2.1 is EIA's forecast of end-use appliance efficiencies. The EIA incorporates all known efficiency standards enacted by the federal government and other known or observable trends in the efficiency of appliances in its forecast of end-use appliance efficiency. So there is already implicit in the base forecast a certain amount of reduction in demand attributable to gains in energy efficiency and conservation. Additional utility efforts to bring more demand side management will be evaluated for potential impact and treated as on-the-top-adjustments to the forecast.

8.2.2.2.2 AmerenUE Energy Efficiency and Demand Side Management Efforts

The Missouri PSC requires electric utilities to "consider and analyze demand-side efficiency and energy management measures on an equivalent basis with supply-side alternatives in the resource planning process." AmerenUE has promoted DSM programs since the 1970s. Currently, AmerenUE has a broad offering of residential, commercial, and industrial programs designed to reduce both peak demands and daily energy consumption. Program components include the following:

- Load shifting programs - Use time-of-use rates to encourage shifting loads from peak to off-peak periods.

- Conservation programs - Promoting use of high-efficiency heating, ventilating, and air conditioning; encouraging construction of energy-efficient homes and commercial

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buildings; improving energy efficiency in existing homes; providing incentives for use of energy-efficient lighting, motors, and compressors.

In addition, AmerenUE has offered a range of programs to encourage energy conservation:

- In 2003, AmerenUE contributed $2 million to the Low Income Weatherization Assistance Program administered by the Missouri Department of Natural Resources (MDNR) Energy Center. The contribution is earmarked to help low-income AmerenUE Missouri electric residential customers reduce their bills by conserving energy. This ranks as the single largest private contribution ever made to this program.

  Also in 2003, AmerenUE contributed a total of nearly $700,000 to energy-saving programs.

8.2.2.2.2.1 Detailed description of existing programs

Change-A-Light Rebate

The Change-A-Light Rebate Program is to encourage energy efficiency in lighting by providing a $2.00 rebate or discount for a portion of the costs of Energy Star® compact fluorescent light (CFL) bulbs. CFL bulbs are initially more expensive than incandescent bulbs but have a longer life and use less electricity to produce equivalent light. AmerenUE is partnering with the Midwest Energy Efficiency Alliance to administer this program.

Refrigerator Rebate & Recycling

The Refrigerator Rebate and Recycling Program was designed to increase market share of energy-efficient refrigerators in use within the markets served by AmerenUE. The program's energy savings are produced by accelerating the pace at which Energy Star® qualified models gain market share by offering a rebate on the purchase of a new Energy Star® refrigerator and by providing an incentive to recycle through an environmentally sound process that permanently removes older, energy-inefficient units from the market well in advance of reaching their expected years of use. AmerenUE is partnering with the Midwest Energy Efficiency Alliance to administer this program.

Online Energy Information and Analysis

The online energy information and analysis program allows all residential customers with internet access to view their billing information and comparisons of their usage on a daily, weekly, monthly or annual basis. This tool will analyze what end uses make up what percent of their usage, and provide information on ways to save energy by end use through a searchable resource center. This tool also allows the user to analyze why their bill may have changed from one month to another. A home comparison also displays a comparison of the customer's home versus an average similar home via an Energy guide label concept. AmerenUE is partnering with Nexus Energy Software to provide this functionality.

Commercial Energy Audit and Incentive

This program is designed to encourage more effective utilization of electric energy through energy efficiency improvements in the building shell or though the replacement of inefficient electrical equipment with efficient electrical equipment. AmerenUE provides a rebate for a portion of the costs of an energy audit and related upgrades that improve the efficient use of electricity. The rebates to commercial customers may cover 50% of the cost of an initial energy

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audit and follow-up energy audit up to $500. Upon implementation of some or all of the measures identified in the audit, the customer may receive a rebate up to 33% of the cost of implementing the measures. The total rebate for audits and measures can not exceed $5,000.

Building Operator Certification

The Building Operator Certification (BOC) Program is a market transformation effort to train facility operators in efficient building operations and management (O&M), establish recognition of and value for certified operators, support the adoption of resource-efficient O&M as the standard in building operations, and create a self-sustaining entity for administering and marketing the training. This program is being implemented by partnering with the Missouri Department of Natural Resources and the Midwest Energy Efficiency Alliance. The program includes funds to license the BOC curriculum from the Northwest Energy Efficiency Council, its developer.

Schools Going Solar

Schools Going Solar program exists to educate students, teachers, and communities about the importance of electricity as an energy form, the importance of energy efficiency and energy efficiency technologies, the value of renewable solar energy in meeting current and future energy needs, and solar energy technologies. This project serves K-12 schools that have an interest in solar electric energy and the initiative to create a partnership with their local community to generate a match of $2,500. While the interconnected 1 kilowatt (kW) photovoltaic array will bear a small amount of electrical load for a school building, the program offers an even greater opportunity for students, parents, teachers, government agencies, utilities, and communities to increase their awareness and familiarity with solar electric energy technologies that are successfully in use throughout the world. AmerenUE is working with the Missouri Department of Natural Resources to manage the program.

Leadership in Energy and Environmental Design (LEED) Grant

Grants will be awarded to encourage the construction of green buildings that will serve as examples for future projects to emulate. Eligible building projects, which are seeking LEED certification, must be within the AmerenUE electric service territory. AmerenUE has contracted with the U.S. Green Building Council – St. Louis Regional Chapter to administer the program. Green building grants will be awarded to successful applicants as follows:

- LEED™ Certified: $15,000
- LEED™ Silver $20,000
- LEED™ Gold $25,000
- LEED™ Platinum $30,000

Abacus

Abacus, the meter information management system from AmerenUE, combines state-of-the-art wireless or phone-based meter technology with the power of the Internet, to provide AmerenUE employees or customers with a new way to monitor, track and record energy demand and usage.

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Airborne Ultrasonic Inspection

Ultrasonic Inspection uses a hand-held instrument that converts ultrasonic sound, 20 kHz to 100 kHz, into a sound that can be heard by the human ear. Problems with mechanical and electrical equipment can be detected long before a person could detect the problem without the instrument. Early detection can prevent unpredictable and dangerous outages along with saving energy dollars.

Infrared Thermography

Infrared Thermography uses an infrared camera to analyze the variation in temperature of different surfaces to within 0.8 degrees Fahrenheit. This non-destructive testing is used most often to monitor the condition of electrical and mechanical equipment and to identify heating and cooling losses. It also is used to pinpoint electrical hot spots, roof leaks, steam system problems, and insulation failures. This system will bring both increased reliability and reduced energy costs.

Machinery Laser Alignment

Laser Alignment uses a computer and laser to match up the position of two rotating shafts. Our technicians then align the shaft on a motor with the shaft on a pump, fan, compressor, or gearbox, allowing the two shafts to rotate as one, reducing wear on bearings, seals and couplings. It takes only about 40 minutes to check alignment, and corrections can be made the same day or during a scheduled maintenance period. This system will bring both increased reliability and reduced energy costs.

8.2.2.2.2.2 Proposed AmerenUE energy efficiency and demand response programs

AmerenUE is taking a very serious look at the potential benefits of energy efficiency programs. These programs help customers reduce their utility bills and help the environment by reducing the number of kilowatt hours AmerenUE must generate. Less power use reduces emissions and the stress on AmerenUE delivery and generation systems. In mid-2008, AmerenUE is expecting to launch over a dozen programs that will help Missouri customers conserve and manage energy consumption. The goal is to reduce electricity consumption growth through a combination of customer efficiency initiatives, consumer education programs, and equipment upgrades and replacement over the next 20 years.

In 2009, AmerenUE will be spending $24 million on energy efficiency programs, a number that will grow to nearly $56 million for the year 2015. That level of spending from AmerenUE should place Missouri among the nation's top 10 states in per capita investment in energy efficiency programs. The entire demand-side analysis process is detailed in Section 8.4.

The following is a summary of the Residential Energy Solutions programs.

Home Energy Performance

Incentives will be provided for a bundle of electricity -saving measures that will be promoted to owners of single family all-electric homes. Home Energy Performance is a home diagnostic and improvement program that, as it establishes itself, can evolve into a more comprehensive Home Performance with Energy Star® program focused on developing a local home performance industry. This initial implementation phase focuses on resource acquisition. An implementation contractor will be retained to market energy home improvement services, based on provision of a range of specific measure incentives, including a number of direct

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install measures (e.g., CFLs and faucet aerators). The contractor will provide an energy audit, and will arrange for installation of insulation measures as warranted by the audit. In addition, as warranted, the contractor will coordinate with the HVAC Diagnostics and Tune-Up, and Demand Response program to deliver those program services as warranted. During the initial implementation period, the implementation contractor will work to identify and train local firms that can provide comprehensive diagnostic and improvement services. Close coordination with the Earthways Center's St. Louis Home Performance with Energy Star® initiative, which is under the sponsorship of the Missouri Department of Natural Resources, will be key.

Residential HVAC Diagnostics and Tune-Up

The program will train HVAC technicians in proper refrigerant charge and airflow, and will offer rebates to these technicians for application of these techniques. This program will take advantage of the in-home HVAC technician visit to install air conditioner control switches and possibly smart thermostats. Some estimates show that as many as 78% of central AC units are improperly charged and up to 70% have improper airflow, both of which can lead to significant performance degradation. In concept the program is simple; HVAC contractors are trained to use one of several tools used to check refrigerant charge and airflow over the system's coils. Based on a quick analysis of the inputs provided by the technician, the tool provides recommended charge and airflow. The technician then makes the necessary modifications.

Typically, incentives are paid to the HVAC contractor per job. The contractor has the option of passing the incentive through to the consumer in the form of a lower fee for the service or retaining the incentive; the choice depends on the contractor's marketing strategy. The key to the program is HVAC technical training and access to the tools used to diagnose system performance.

Residential Lighting and Appliances

The initial focus will be on buying down the cost of compact fluorescent light (CFL) bulbs at the retail level. The program will function very much like the U.S. EPA's Change-a-Light campaign. Over time, consumer appliances and electronics may be added to the program. Due to the expected increase in CFLs requiring disposal, AmerenUE will also evaluate long-term recycling solutions for the bulb. The program will work primarily through retail outlets to offer financial incentives to consumers for the purchase of efficient lighting and consumer appliances. The specific strategy employed will vary by product and retailer, given different promotional opportunities and different retailer approaches to handing incentives. The lighting program element will generally follow the Change-a-Light model. A regional contractor arranges either product price buy-downs or point-of-sale rebates for products during an October promotion. Given the larger volume of CFL that the Company will need to move, it is likely that more than one promotion per year may be needed. The specific strategy will be developed based on consultation with program implementers and response to the initial 2008 Change-a-Light campaign. The strategies for appliances will be developed in conjunction with the implementation contractor but likely will be time-limited promotions during the first three years with either mail-in or instant rebates.

Residential Multi-Family

The program will engage customers as well as recruit trade allies, i.e., private contractors, to promote the installation of energy efficient lighting in common areas as well as provide energy audits for the installation of measures in tenant spaces related to central AC unit diagnostics

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and tune-up. Incentives would be paid to individuals that implemented the measure. The program would provide installation of measures in tenant spaces related to central AC unit diagnostics and tune-up. It would also provide significant incentives for replacement of standard efficiency common area lighting and incandescent and fluorescent exit signs with LED exit signs. More expensive or complex measures (windows, replacement of roof-top AC units) would be subject to an energy analysis to validate cost-effectiveness and set incentive levels. The incentives for these measures would be calculated in a fashion similar to the C&I Custom Incentive program, although the threshold payment period would be set at 1 year, recognizing that this is a market that is harder to reach than the C&I market. The program would include limited technical services such as walk-through audits to determine approximate measure of cost effectiveness.

Residential New HVAC

Incentives will be provided to either homeowners or HVAC dealers for the sale and proper installation of new central air conditioning systems. This program will take advantage of the in-home HVAC technician visit to install air conditioner control switches and possibly smart thermostats. There are substantial energy efficiency and peak demand reduction opportunities associated with the proper sizing and installation of new central AC systems, as well as with the installation of premium efficiency equipment. Many new central AC units are under- or, more commonly, over-sized resulting in frequent cycling and inefficient operation of the unit. Proper sizing of the units typically is accomplished using Manual J, the residential central AC sizing protocol developed by the Air Conditioning Contractors of America (ACCA) that uses detailed heat load calculations. Even when HVAC contractors use Manual J they can improperly apply the protocol. Quality installation of central AC units also requires calibration of the refrigerant charge and airflow, and may include duct sealing to further improve operating efficiency. Quality HVAC installations will be delivered through a network of HVAC contractors operating in the service territory that have been trained in program protocols and participation processes. The New HVAC Program will promote efficiency for new residential central AC systems through the following program components:

> **Quality installation:** HVAC contractors will be trained to meet a quality installation protocol that requires the proper use of Manual J for equipment sizing, as well as calibration of refrigerant charge and airflow. Contractor incentives will be provided for documented quality installations that meet the protocol.

> **Premium efficiency equipment:** The program will also offer a standard incentive for all equipment that exceeds 13 SEER. By promoting proper sizing and quality installation practices, the program will build capacity among HVAC contractors to address these issues and provide a value-added service to their customers. Program marketing efforts will promote the value of these services to customers and the energy-saving benefits. Incentives will be paid to the HVAC contractor on a per job basis. The contractor has the option of passing the incentive through to the consumer in the form of a lower fee for the service/equipment, or retaining the incentive, depending on their marketing strategy. A coordinated recruitment and training strategy will be used to inform contractors of opportunities and incentives available through the Residential New HVAC Program and the Residential HVAC Diagnostics and Tune-Up Program.

Energy Star® Homes

The objective of this program is to increase consumer awareness of and demand for Energy Star® homes while increasing the building industry's willingness and ability to construct Energy

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Star® homes. Additionally, the objective is to achieve energy savings through sales of Energy Star® homes. The program would target builders with a package of training, technical and marketing assistance and incentives for construction of Energy Star® homes (homes with a HERS Index of 85 or lower). The incentive would be designed to defray the cost of the required home energy rating. In addition, the program would provide cooperative marketing support for builders. To the extent that gas utilities offer similar programs in the service territory, close coordination/harmonization of program design and delivery is critical to avoid market confusion.

Low Income

The program is designed to deliver long-term energy savings and bill reductions to low-income customers through a variety of cost-effective lighting and appliance measures, and other building and shell improvements. The Company estimates a total of 247,000 low-income customers in its service territory. Initially, the target market would be low-income owners of single family homes. The program could also be expanded to low-income multifamily homes, multi-unit buildings, and non-profit commercial buildings. The Company would work with participating partners or agencies to qualify low-income customers for the program and/or delivery of services. The program would consist of the following measures:

- Window replacement;
- Outside and storm door installation or replacement;
- Attic and wall insulation;
- Energy Star® refrigerator and freezer replacement;
- CFL installations; and
- Programmable thermostat installation.

Residential Demand Response- Direct Load Control

This program is designed to acquire peak demand reduction through fully-automated Direct Load Control demand response systems for the residential sector. Residential single family homes with Central Air Conditioners (AC) are the main target for implementation of this program. Residential multifamily homes could also be eligible if they singularly have control of and pay for electric service. Other electric appliances, such as hot water heaters and pool pumps could also be incorporated into the program. The majority of the Company's residential customers have a Central AC system. These systems typically account for half of a home's summer peak demand. Under this program, the Company provides for free equipment and installation of a smart thermostat that uses a one-way paging strategy. During summer peak periods, the Company activates the thermostats resulting in cycling of the Central AC unit. Customers can be paid an incentive in return for giving the Company the option to cycle their air conditioner. This program resembles the CPP program with Smart Control.

Residential Demand Response- Critical Peak Pricing with Smart Thermostat

This program is intended to offer residential customers an opportunity to curtail load voluntarily in response to a critical peak pricing tariff, but with the assistance of a control regime that can be programmed to respond to the pricing structure. This program combines a

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critical peak pricing tariff with a customer control architecture that enables customers to select control regimes in response to prices and/or enables the Company to control devices based on customers' specified control regimes. The specific technology employed may be similar to that used for the Company's pilot residential CPP program, or a more sophisticated system offered by demand response vendors. Customers choose to enroll in a CPP tariff. The contractor provides for installation of the customer control equipment at no cost to the customer. Depending on the nature of the system, the customer will then set an equipment control regime based on the tariff's pricing periods. Again, depending on the specific structure of the system, during summer critical peak periods, the Company will activate control of specific equipment with limited customer override options.

The following is a summary of the Business Energy Solutions programs.

C&I Prescriptive

The program will provide rebates for energy-efficient products that are readily available in the marketplace and with savings opportunities for a large number of customers. The program will target measures for which energy savings can be reliably deemed or calculated using simple threshold criteria. Rebates will be fixed per measure. Examples of measures in the first category are premium efficiency motors, vending machine sensors, and many lighting measures. Variable frequency drives, air compressors, and basic refrigeration measures are examples of measures where a simple calculation may be required. In either case, the rebate is pre-set rather than calculated based on the specific project. A principal objective of this program element is to provide an expedited, simple solution for customers interested in purchasing efficient technologies that can produce verifiable savings.

C&I Custom Program

The Program will provide financial assistance to customers to support implementation of high efficiency opportunities which are available at the time of new equipment purchases, facility modernization, and industrial process improvement. The incentives will be customized based on estimated energy savings subject to a cap. The cap can be single tier (e.g., $/kWh of first year savings) or can be multi-tiered with caps based on maximum incentive per kWh, minimum payback (e.g., buy-down to a 2 year payback), and maximum share of project cost. The advantage of a single tier cap is that customers and allies are better able to estimate the level of incentive in project evaluations. This is typically how standard offer programs operate. A multi-tiered cap is appropriate if there are concerns that the program would be overpaying for projects or attracting too high a level of free riders. It is often assumed that C&I customers typically will make an investment without incentive if the payback is below two years. This is not the case consistently, particularly with projects that entail significant perceived risk.

Initially, the program will be offered without extensive technical support (detailed audits, cofounding of studies, etc). The program logic model assumes that most projects will be initiated by trade allies and more sophisticated customers with in-house energy management who, as part of the project assessment, will prepare such studies. Should program volume lag expectations, the Company reserves the right to provide financial support for project studies or independent review of projects to confirm savings, recognizing that extensive technical support can significantly impact program cost-effectiveness. The program will include internal review of all custom incentive applications to verify savings calculations and the program will reserve the right to site-verify data prior to approval. The primary delivery channel for custom projects will be trade allies/energy service companies, and Company account representatives. Outreach to trade allies to explain project eligibility and the incentive structure is critical. Again, depending on project volume, the Company will consider a supplemental ally incentive to stimulate project development. The key to the success of a custom incentive program is

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minimizing program application complexity and a straightforward incentive structure. If the final program design is too complex, allies will by-pass the program in favor of the prescriptive incentive program.

C&I Retro-Commissioning

This program is intended to help building owners and managers determine the energy performance of buildings, to identify major opportunities for improving that performance through re-optimization of existing systems and replacement of under-performing equipment, and to provide financial support in some cases for taking recommended actions. The program would provide several related sets of services including initial qualification based on benchmarking or quick facility assessments, more detailed facility assessments intended to identify opportunities for systems improvements, development of a retro-commissioning plan, training, direct installation of low-cost measures and verification of plan implementation and incentive fulfillment. Retro-commissioning (RCx) services will be delivered through a network of commissioning providers operating in the Company service territory that have been trained in program protocols and participation processes. For smaller facilities, commissioning providers will conduct a targeted assessment of areas with substantial energy savings opportunities such as packaged HVAC units. Larger facilities will be eligible to receive a more comprehensive assessment of building systems and controls. To motivate participation, but also ensure that customers are invested in the process, the Company will provide cost sharing for the cost of the RCx study. Financial incentives will also be provided to assist in overcoming first cost barriers implementing RCx study recommendations.

Commercial New Construction

The New Construction Program will promote energy efficiency through a comprehensive effort to influence building design practices. To secure these opportunities, it is necessary to overcome barriers such as resistance in the design community to adopt new ideas, increased first cost for efficient options and tendency to design for worst-case conditions rather than efficiency over the range of expected operating conditions. The program will endeavor to overcome these and other barriers through education and outreach to building owners, design professionals, building contractors and other trade allies to introduce efficiency concepts, design facilitation, technical assistance, support for the LEED rating system, and incentives for efficient designs and measure implementation. The program will work with building owners/managers, design professionals, trade allies, and contractors to design and construct high performance buildings that provide improved energy efficiency, strong environmental performance, systems performance, and comfort. This will be accomplished through an integrated design process that results in improved efficiency in the building envelope, lighting, HVAC, and other energy and resource consuming systems.

At this stage in the program design process, the program is envisioned as having two tracks:

> **Systems track:** Technical assistance and incentives are provided for construction that incorporates efficient systems (lighting, day lighting, HVAC, etc). This track could be based on an approach such as the Advanced Buildings concept developed by the New Buildings Institute. Advanced Buildings is a suite of design manuals, performance guidelines, and training designed to increase marketplace knowledge and improve design and construction practices.
>
> **Comprehensive or whole building track:** Technical assistance and incentives are provided for buildings constructed based on whole-building energy simulation and achievement of whole-building performance targets. A key element for success in a new construction program is securing the involvement of the professional design

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community. This will be a major activity in both program approaches. The program will employ targeted marketing, training and education offerings, lunch and learn presentations, and individual contact and outreach through professional organizations to engage design professionals. The program will also offer design and implementation incentives to encourage program participation. To encourage participation of the design community and to offset the costs of considering multiple design options, a multi-tier incentive will be offered to the project design teams. An implementation incentive based on the incremental costs of the efficiency measures will be offered to the building owner to help overcome the first cost barrier.

C&I Demand Credit

Commercial and industrial customers willing to curtail their service by the Company at times of peak demand, or in support of AmerenUE's participation in the Midwest Independent System Operator (MISO) demand response programs, enroll in the program by signing a curtailment service contract and providing an action plan for complying with the rider. The preliminary program design, subject to revision based on potential new program designs from the selected contractors and AmerenUE approval, is that the contract will specify that during curtailment events in which the customer participates, the customer must reduce demand to level specified by the customer or incur a penalty for not reducing demand. The Company will provide participating customers with an automated fax and email on the day prior to or the day of a curtailment event. Customers will receive a per-event incentive payment in the form of a bill credit for reducing demand to the contractually-specified level during a curtailment event.

Commercial DR-CPP with Smart Thermostat

This program is intended to offer small to medium commercial customers an opportunity to curtail load voluntarily in response to a critical peak pricing tariff, but with the assistance of a control regime that can be programmed to respond to the pricing structure. Based on initial pilot implementation, the program is expected to yield an approximately 10% reduction in demand. The maximum demand reduction over the three-year initial implementation period is expected to be 2 MW. It is unlikely that the Company will implement both a CPP with Smart Technology and a CPP-only program given that the markets overlap almost entirely. The Company will continue to evaluate its options and will propose the most cost-effective option for implementation. This program combines a critical peak pricing tariff with a customer control architecture that enables customers to select control regimes in response to prices and/or enables the Company to control devices based on customers' specified control regimes. The specific technology employed may be similar to that used for the Company's pilot residential CPP program, or a more sophisticated system offered by demand response vendors. Customers choose to enroll in a CPP tariff. The Company or its contractor provides for installation of the customer control equipment at no cost to the customer. Depending on the nature of the system, the customer will then set an equipment control regime based on the tariff's pricing periods. Again, depending on the specific structure of the system, during summer critical peak periods the Company will activate control of specific equipment with limited customer override options. The Company benefits through reduced peak power purchases and increased electric system reliability. Customers can benefit by shifting use from on-peak and critical peak periods to off and mid-peak periods; however they do not receive an additional incentive beyond whatever equipment is provided.

Industrial Interruptible Tariff

Industrial customers willing to have their service interrupted by the Company at times of peak demand enroll in the program by signing an interruptible service contract with a fixed term (e.g., one, three and/or five years). Curtailment/interruption can be for either reliability or economic reasons. Customers will be allowed to buy-through a curtailment called for economic

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reasons. The customer incentive will be graduated based on the contract length, with higher incentives under longer contracts. The contract will specify that during program "events" (which could be defined by reliability or economic conditions), the customer must have their service interrupted or reduce demand to a specified level, or incur a penalty for not reducing demand. The Company will provide participating customers with an automated phone call or email, with at least four hours advance notice prior to an event. Interruptions will be limited to one event per day for duration of between two and eight hours, and 10 events in total per season, with a maximum of 80 interruptible hours per season. The season is defined as the months June through September.

8.2.2.3 Fuel Substitution

AmerenUE's IRP forecast implicitly accounts for fuel switching through its application of SAE forecasting models. The SAE models, as discussed in Section 8.2.1, utilize end-use appliance stock forecasts developed by the EIA. The end-uses that are considered by the EIA forecasts include those appliances that are most prone to Residential and Commercial customers switching fuels. The appliances include space heating, water heating, cooking, and clothes drying, among others. The EIA considers price forecasts for various fuels in order to develop expected stocks of these appliances. By incorporating these EIA forecasts into the assumptions used to generate AmerenUE's forecast, the impact of fuel switching has been accounted for.

8.2.2.4 Price and Rate Structure

AmerenUE's IRP, through application of SAE forecasting models, accounts for the impact of future prices on its customers' usage. The formula used to calculate the variables that determine the energy usage by end-use application includes price and a parameter estimate of the elasticity of demand with respect to price.

Elasticity is a measure of consumers' change in purchasing behavior with respect to changes in price. As the price of power goes up, consumers may take steps to conserve energy and thereby limit the impact of higher prices on their budgets. This can happen through short-term changes, such as customers changing their thermostat settings and exhibiting generally increased consciousness about turning off lights and other electronic devices. It can also happen though long-term changes, such as investment in more energy efficient appliances, building insulation, or insulated windows. This effect is captured in the structure of the forecasting models used by AmerenUE.

The models require an elasticity parameter as an input. AmerenUE performed a study of its historical price elasticity to support development of the parameter estimate. In addition, dialogue with others in the industry and review of surveys of the energy forecasting community were used to validate the parameter estimates.

For the residential and small commercial classes, -0.15 was used as the elasticity parameter, indicating that an increase in price of 100% would be expected to result in a decrease in load of 15%.

8.2.3 THE NEED FOR POWER: OVERALL EVALUATION OF FINDINGS

Section 8.2.1 and 8.2.2 discussed the forecasting of energy and power requirements and the factors that could have an impact on the growth in demand for electric service.

Taking these factors into account, over the years from 2008 through 2020, The AmerenUE energy requirements are expected to grow at an average annual rate of 1.4% while peak demand is expected to grow at an average rate of 1.3% per year.

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Table 8.2-1—AmerenUE Retail Customers

Year	Residential	Commercial	Industrial	Other	Total
1993	918,641	104,832	7,385	13,936	1,044,804
1994	924,592	106,214	7,042	14,007	1,051,866
1995	933,589	108,880	5,932	14,145	1,062,545
1996	939,004	111,447	5,859	14,059	1,070,367
1997	945,607	114,707	5,822	13,926	1,080,069
1998	953,120	118,359	5,672	20,376	1,100,870
1999	961,048	121,958	5,366	53,287	1,141,804
2000	969,485	127,589	5,311	53,642	1,156,056
2001	975,924	130,134	5,174	53,923	1,165,136
2002	983,792	132,041	5,195	14,251	1,175,747
2003	994,669	135,928	5,094	33,409	1,188,230
2004	1,001,424	138,998	4,979	54,533	1,199,851
2005	1,010,857	141,445	4,905	55,154	1,212,233
2006	1,020,482	143,589	4,837	55,544	1,224,452
2007	1,027,667	145,506	4,770	55,768	1,233,712

Customer counts are averages of monthly bills rendered.

Source: For the years between 1995 and June of 2006, data is summary of AmerenUE 2008 IRP tables. The remaining years are sourced from the same corporate database from which the IRP data was retrieved.

Other category includes Lighting, Public Authorities, and the six wholesale customers that are currently served by AmerenUE.

The discontinuity in the Other category is a result of changes in the way that Dusk-to-Dawn Lighting accounts were counted. Prior to October 1998 and for a period in 2002-2003 Lighting accounts that were associated with a General Service account were not separately counted.

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Table 8.2-2—AmerenUE Electricity Sales by Customer Class (GWh)

Year	Residential	Commercial	Industrial (w/o Noranda)	Noranda	Other	Total
1993	10,214	10,257	5,727	0	214	26,411
1994	10,141	10,664	5,857	0	212	26,874
1995	10,557	10,939	5,503	0	665	27,664
1996	11,026	11,362	5,659	0	681	28,729
1997	10,939	11,456	5,769	0	723	28,887
1998	11,443	11,604	5,807	0	738	29,592
1999	11,329	12,654	6,033	0	733	30,750
2000	11,669	12,771	6,191	0	745	31,376
2001	12,148	12,933	6,217	0	734	32,032
2002	12,812	13,251	5,990	0	802	32,854
2003	12,300	13,260	5,864	0	818	32,242
2004	12,354	13,512	5,875	0	822	32,563
2005	13,548	14,128	5,822	2,001	885	36,383
2006	13,230	14,144	5,587	4,086	853	37,900
2007	14,100	14,813	5,615	4,097	876	39,501

Source: For 1995 through June 2006, data are summarized from AmerenUE 2008 IRP. Other data are from same corporate database from which IRP data was retrieved.

Other columns include Lighting, Public Authorities and the 6 Wholesale customers currently served by AmerenUE. Wholesale data are not available in a form consistent with the IRP for 1993 and 1994 and are therefore not included in those years' totals.

Noranda is a large industrial customer that joined AmerenUE's system in June 2005.

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Table 8.2-3—AmerenUE Peak Load and Energy Annual Forecasts

Year	Summer (MW)	Winter (MW)	Annual Energy Sales (GWh)
2008*	8,643	6,725	39,165
2009	8,619	6,744	39,059
2010	8,724	6,850	39,623
2011	8,831	6,957	40,192
2012	8,932	7,050	40,821
2013	9,043	7,168	41,332
2014	9,149	7,271	41,899
2015	9,258	7,373	42,467
2016	9,360	7,459	43,085
2017	9,483	7,578	43,618
2018	9,602	7,682	44,211
2019	9,722	7,786	44,805
2020	9,833	7,875	45,465
2021	9,959	7,992	45,996
2022	10,080	8,102	46,593
2023	10,203	8,214	47,202
2024	10,320	8,315	47,873
2025	10,461	8,445	48,450
2026	10,595	8,562	49,088
2027	10,731	8,680	49,732
2028	10,863	8,790	50,471
2029	11,015	8,932	51,095
2030	11,150	9,051	51,744

Source: AmerenUE 2008 IRP

* 2008 energy and peak forecast includes 6 wholesale customers that are not included in subsequent years due to the expectation that the contracts would end at the time of the preparation of the 2008 AmerenUE IRP.

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Table 8.2-4—Electric Energy Retail Load Growth

Time Period	Residential	Commercial	Industrial (w/o Noranda)	Total Retail (w/o Noranda)
1993-2007	2.3%	2.7%	-0.1%	2.0%
1993-2001	2.2%	2.9%	1.0%	2.2%
2001-2007	2.5%	2.3%	-1.7%	1.7%
2007-2018	1.6%	2.1%	-0.1%	1.4%

Source: AmerenUE 2008 IRP

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Table 8.2-5—AmerenUE Energy Historical Forecast Accuracy

Year	Actual Absolute Error	Weather Normalized Absolute Forecast Error
1993	2.1%	1.4%
1994	0.2%	1.1%
1995	1.0%	0.4%
1996	1.6%	0.8%
1997	1.6%	2.3%
1998	3.0%	0.9%
1999	1.0%	1.8%
2000	2.5%	0.9%
2001	1.3%	2.6%
2002	1.0%	2.5%
2003	1.1%	1.3%
2004	5.3%	0.5%
2005	1.4%	0.4%
2006	1.7%	1.9%
2007	2.2%	0.9%
Average	1.8%	1.3%

Source: AmerenUE Accounting records

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Table 8.2-6—AmerenUE Forecast of Energy Growth Rate Compared to EIA Forecast Growth Rate (2007-2018)

Customer Class	AmerenUE	EIA West North Central Region
Residential	1.58%	1.37%
Commercial	2.13%	1.66%
Industrial	-0.07%	0.81%
Total	1.40%	1.31%

Source of EIA Forecast Data: http://www.eia.doe.gov/oiaf/aeo/supplement/pdf/suptab_4.pdf

Source of AmerenUE Forecast Data: 2008 AmerenUE IRP

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Table 8.2-7—AmerenUE Service Territory Historical and Forecasted Economic Conditions
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Year	Employment	Manufacturing Employment	Non-Manufacturing Employment	Retail Employment	GDP	Manufacturing GDP	Non-Manufacturing GDP	Retail Trade GDP	Personal Income	Population	House holds	House hold Size	HH Inc
1995	1,571.2	240.0	1,331.2	177.4	1,106,080.5	224,268.0	881,812.5	68,071.4	893,815.3	3,235.7	1,244.3	2.6	718.3
1996	1,595.1	240.0	1,355.1	181.7	1,144,904.4	222,907.3	921,997.2	73,293.4	942,006.3	3,261.7	1,257.4	2.6	749.1
1997	1,644.5	240.3	1,404.2	184.3	1,256,825.5	250,681.0	1,006,144.6	82,495.7	1,000,426.2	3,286.4	1,270.2	2.6	787.6
1998	1,677.2	241.0	1,436.2	187.0	1,273,153.2	237,940.7	1,035,212.5	85,417.4	1,057,632.7	3,304.6	1,280.7	2.6	825.8
1999	1,703.9	237.7	1,466.2	191.7	1,290,347.2	226,436.3	1,063,910.9	89,255.5	1,095,765.7	3,327.7	1,293.0	2.6	847.4
2000	1,714.5	230.7	1,483.8	192.3	1,314,188.1	225,516.6	1,088,671.5	89,715.0	1,173,440.1	3,349.5	1,305.0	2.6	899.2
2001	1,705.5	219.4	1,486.1	190.6	1,324,364.7	212,502.5	1,111,862.2	96,886.7	1,197,263.1	3,371.4	1,313.5	2.6	911.5
2002	1,685.4	205.2	1,480.2	191.5	1,337,888.5	219,246.2	1,118,642.3	103,078.3	1,236,433.0	3,391.5	1,321.2	2.6	935.8
2003	1,670.3	194.7	1,475.5	190.7	1,355,066.8	221,668.0	1,133,398.8	108,185.9	1,285,209.1	3,411.1	1,328.7	2.6	967.2
2004	1,671.0	194.2	1,476.9	191.1	1,382,328.6	227,959.9	1,154,368.8	111,502.8	1,345,228.4	3,433.8	1,337.5	2.6	1,005.7
2005	1,692.0	190.8	1,501.2	193.6	1,417,406.7	229,021.9	1,188,384.8	110,707.1	1,404,128.5	3,453.5	1,345.0	2.6	1,044.0
2006	1,710.2	190.1	1,520.1	194.2	1,449,947.6	235,520.3	1,214,427.3	113,364.1	1,477,589.2	3,474.7	1,357.0	2.6	1,088.8
2007	1,729.4	188.8	1,540.5	195.6	1,485,517.4	241,534.6	1,243,982.8	118,179.0	1,545,614.2	3,493.9	1,368.8	2.6	1,129.1
2008	1,745.3	187.1	1,558.1	196.4	1,520,754.7	247,195.8	1,273,559.0	122,750.3	1,612,692.3	3,511.0	1,380.1	2.5	1,168.5
2009	1,764.4	186.7	1,577.7	197.1	1,555,882.1	252,787.8	1,303,094.3	127,339.7	1,684,212.4	3,525.1	1,390.7	2.5	1,211.0
2010	1,781.1	186.2	1,594.9	197.6	1,588,791.7	257,767.9	1,331,023.8	131,907.4	1,756,218.1	3,537.1	1,401.0	2.5	1,253.5
2011	1,797.4	185.6	1,611.9	198.4	1,621,642.9	262,549.6	1,359,093.3	136,563.6	1,829,308.3	3,547.3	1,410.9	2.5	1,296.5
2012	1,814.9	184.9	1,630.0	199.0	1,655,390.0	267,291.8	1,388,098.2	141,429.7	1,906,297.7	3,558.7	1,421.6	2.5	1,340.9
2013	1,830.8	184.0	1,646.8	199.4	1,686,897.3	271,497.0	1,415,400.3	146,266.0	1,984,333.0	3,569.8	1,432.4	2.5	1,385.3
2014	1,846.6	183.2	1,663.3	199.9	1,718,042.1	275,514.6	1,442,527.5	151,158.7	2,064,060.7	3,581.0	1,442.7	2.5	1,430.7
2015	1,860.2	182.4	1,677.7	200.3	1,747,541.3	279,213.6	1,468,327.7	156,000.2	2,144,616.6	3,592.2	1,452.3	2.5	1,476.7
2016	1,871.4	181.8	1,689.6	200.9	1,774,627.8	282,515.2	1,492,112.6	160,728.3	2,225,863.3	3,601.4	1,460.3	2.5	1,524.3
2017	1,883.8	181.2	1,702.6	201.1	1,803,332.5	286,054.6	1,517,277.9	165,685.7	2,309,715.0	3,610.6	1,467.8	2.5	1,573.6
2018	1,896.4	180.5	1,715.8	201.5	1,832,210.0	289,468.5	1,542,741.5	170,771.0	2,396,407.9	3,620.9	1,475.3	2.5	1,624.4
2019	1,907.3	179.9	1,727.4	202.0	1,859,731.5	292,535.0	1,567,196.6	175,837.3	2,484,607.0	3,631.3	1,482.6	2.4	1,675.8
2020	1,919.4	179.1	1,740.3	202.4	1,889,007.0	295,675.5	1,593,331.5	181,141.4	2,576,771.9	3,642.3	1,489.7	2.4	1,729.7
2021	1,928.5	178.2	1,750.2	203.0	1,916,127.4	298,376.6	1,617,750.8	186,344.8	2,671,455.7	3,652.5	1,495.7	2.4	1,786.0
2022	1,937.2	177.2	1,760.0	203.5	1,944,394.2	301,000.4	1,643,393.8	191,771.9	2,769,628.2	3,662.4	1,500.8	2.4	1,845.4
2023	1,945.2	176.1	1,769.1	203.9	1,973,517.9	303,627.9	1,669,890.0	197,404.9	2,871,199.2	3,672.5	1,505.2	2.4	1,907.5
2024	1,951.8	174.9	1,776.9	204.4	2,002,761.6	306,114.9	1,696,646.8	203,161.9	2,976,283.2	3,682.2	1,508.8	2.4	1,972.7
2025	1,958.6	173.6	1,785.0	204.9	2,034,123.0	308,842.5	1,725,280.6	209,193.6	3,085,241.1	3,692.5	1,512.1	2.4	2,040.3
2026	1,963.6	172.3	1,791.3	205.2	2,065,048.9	311,395.6	1,753,653.2	215,264.8	3,195,939.7	3,701.6	1,515.0	2.4	2,109.6

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Table 8.2-7—AmerenUE Service Territory Historical and Forecasted Economic Conditions
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Year	Employment	Manufacturing Employment	Non-Manufacturing Employment	Retail Employment	GDP	Manufacturing GDP	Non-Manufacturing GDP	Retail Trade GDP	Personal Income	Population	House holds	House hold Size	HH Inc
2027	1,966.7	170.8	1,795.9	205.6	2,095,770.3	313,813.7	1,781,956.6	221,395.3	3,309,265.3	3,710.1	1,517.4	2.4	2,180.8
2028	1,973.4	169.2	1,804.1	205.9	2,131,889.5	316,773.0	1,815,116.5	228,168.6	3,428,140.0	3,718.8	1,519.8	2.4	2,255.6
2029	1,979.8	167.4	1,812.4	206.2	2,169,590.9	319,748.0	1,849,842.9	235,114.4	3,551,185.3	3,728.1	1,522.4	2.4	2,332.7
2030	1,981.5	165.5	1,816.0	206.8	2,203,797.2	322,228.0	1,881,569.2	241,779.1	3,675,075.6	3,737.3	1,524.6	2.5	2,410.5

Source: 2008 AmerenUE IRP as provided by Economy.com

Units may be indexed and therefore may not equate to actual counts of the typical unit for the category being measured.

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Table 8.2-8—AmerenUE Service Territory Historical and Forecasted Economic Growth Rates
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Year	Employment	Manufacturing Employment	Non-Manufacturing Employment	Retail Employment	GDP	Manufacturing GDP	Non-Manufacturing GDP	Retail Trade GDP	Personal Income	Population	Households	Household Size	HH Inc
1995													
1996	1.5%	0.0%	1.8%	2.4%	3.5%	-0.6%	4.6%	7.7%	5.4%	0.8%	1.1%	-0.2%	4.3%
1997	3.1%	0.1%	3.6%	1.4%	9.8%	12.5%	9.1%	12.6%	6.2%	0.8%	1.0%	-0.3%	5.1%
1998	2.0%	0.3%	2.3%	1.5%	1.3%	-5.1%	2.9%	3.5%	5.7%	0.6%	0.8%	-0.3%	4.9%
1999	1.6%	-1.4%	2.1%	2.5%	1.4%	-4.8%	2.8%	4.5%	3.6%	0.7%	1.0%	-0.3%	2.6%
2000	0.6%	-2.9%	1.2%	0.3%	1.8%	-0.4%	2.3%	0.5%	7.1%	0.7%	0.9%	-0.3%	6.1%
2001	-0.5%	-4.9%	0.2%	-0.9%	0.8%	-5.8%	2.1%	8.0%	2.0%	0.7%	0.7%	0.0%	1.4%
2002	-1.2%	-6.4%	-0.4%	0.4%	1.0%	3.2%	0.6%	6.4%	3.3%	0.6%	0.6%	0.0%	2.7%
2003	-0.9%	-5.1%	-0.3%	-0.4%	1.3%	1.1%	1.3%	5.0%	3.9%	0.6%	0.6%	0.0%	3.4%
2004	0.0%	-0.3%	0.1%	0.2%	2.0%	2.8%	1.9%	3.1%	4.7%	0.7%	0.7%	0.0%	4.0%
2005	1.3%	-1.7%	1.6%	1.3%	2.5%	0.5%	2.9%	-0.7%	4.4%	0.6%	0.6%	0.0%	3.8%
2006	1.1%	-0.4%	1.3%	0.3%	2.3%	2.8%	2.2%	2.4%	5.2%	0.6%	0.9%	-0.3%	4.3%
2007	1.1%	-0.7%	1.3%	0.7%	2.5%	2.6%	2.4%	4.2%	4.6%	0.6%	0.9%	-0.3%	3.7%
2008	0.9%	-0.9%	1.1%	0.4%	2.4%	2.3%	2.4%	3.9%	4.3%	0.5%	0.8%	-0.3%	3.5%
2009	1.1%	-0.2%	1.3%	0.4%	2.3%	2.3%	2.3%	3.7%	4.4%	0.4%	0.8%	-0.4%	3.6%
2010	0.9%	-0.3%	1.1%	0.2%	2.1%	2.0%	2.1%	3.6%	4.3%	0.3%	0.7%	-0.4%	3.5%
2011	0.9%	-0.3%	1.1%	0.4%	2.1%	1.9%	2.1%	3.5%	4.2%	0.3%	0.7%	-0.4%	3.4%
2012	1.0%	-0.4%	1.1%	0.3%	2.1%	1.8%	2.1%	3.6%	4.2%	0.3%	0.8%	-0.4%	3.4%
2013	0.9%	-0.5%	1.0%	0.2%	1.9%	1.6%	2.0%	3.4%	4.1%	0.3%	0.8%	-0.4%	3.3%
2014	0.9%	-0.4%	1.0%	0.3%	1.8%	1.5%	1.9%	3.3%	4.0%	0.3%	0.7%	-0.4%	3.3%
2015	0.7%	-0.4%	0.9%	0.2%	1.7%	1.3%	1.8%	3.2%	3.9%	0.3%	0.7%	-0.3%	3.2%
2016	0.6%	-0.3%	0.7%	0.3%	1.5%	1.2%	1.6%	3.0%	3.8%	0.3%	0.5%	-0.3%	3.2%
2017	0.7%	-0.3%	0.8%	0.1%	1.6%	1.3%	1.7%	3.1%	3.8%	0.3%	0.5%	-0.3%	3.2%
2018	0.7%	-0.4%	0.8%	0.2%	1.6%	1.2%	1.7%	3.1%	3.8%	0.3%	0.5%	-0.2%	3.2%
2019	0.6%	-0.4%	0.7%	0.3%	1.5%	1.1%	1.6%	3.0%	3.7%	0.3%	0.5%	-0.2%	3.2%
2020	0.6%	-0.5%	0.7%	0.2%	1.6%	1.1%	1.7%	3.0%	3.7%	0.3%	0.5%	-0.2%	3.2%
2021	0.5%	-0.5%	0.6%	0.3%	1.4%	0.9%	1.5%	2.9%	3.7%	0.3%	0.4%	-0.1%	3.3%
2022	0.5%	-0.6%	0.6%	0.2%	1.5%	0.9%	1.6%	2.9%	3.7%	0.3%	0.3%	-0.1%	3.3%
2023	0.4%	-0.6%	0.5%	0.2%	1.5%	0.9%	1.6%	2.9%	3.7%	0.3%	0.3%	0.0%	3.4%
2024	0.3%	-0.7%	0.4%	0.2%	1.5%	0.8%	1.6%	2.9%	3.7%	0.3%	0.2%	0.0%	3.4%
2025	0.3%	-0.7%	0.5%	0.2%	1.6%	0.9%	1.7%	3.0%	3.7%	0.3%	0.2%	0.1%	3.4%
2026	0.3%	-0.8%	0.4%	0.1%	1.5%	0.8%	1.6%	2.9%	3.6%	0.2%	0.2%	0.1%	3.4%

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Table 8.2-8—AmerenUE Service Territory Historical and Forecasted Economic Growth Rates
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Year	Employment	Manufacturing Employment	Non-Manufacturing Employment	Retail Employment	GDP	Manufacturing GDP	Non-Manufacturing GDP	Retail Trade GDP	Personal Income	Population	Households	Household Size	HH Inc
2027	0.2%	-0.8%	0.3%	0.2%	1.5%	0.8%	1.6%	2.8%	3.5%	0.2%	0.2%	0.1%	3.4%
2028	0.3%	-0.9%	0.5%	0.1%	1.7%	0.9%	1.9%	3.1%	3.6%	0.2%	0.2%	0.1%	3.4%
2029	0.3%	-1.1%	0.5%	0.2%	1.8%	0.9%	1.9%	3.0%	3.6%	0.3%	0.2%	0.1%	3.4%
2030	0.1%	-1.1%	0.2%	0.3%	1.6%	0.8%	1.7%	2.8%	3.5%	0.2%	0.1%	0.1%	3.3%
1995-2006 CAGR	0.8%	-2.1%	1.2%	0.8%	2.5%	0.4%	3.0%	4.7%	4.7%	0.6%	0.8%	-0.1%	3.9%
2007-2020 CAGR	0.8%	-0.4%	0.9%	0.3%	1.9%	1.6%	1.9%	3.3%	4.0%	0.3%	0.7%	-0.3%	3.3%

Source: 2008 AmerenUE IRP as provided by Economy.com

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Table 8.2-9—AmerenUE Service Territory Estimated Historical and Forecasted Residential Appliance Saturation Rates
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Year	EFurn	HPHeat	CAC	HPCool	RAC	EWHeat	ECook	Ref1	Ref2	Frz	Dish	CWash	EDry	TV	Light	Misc
1993	11%	3%	69%	3%	9%	26%	62%	100%	23%	51%	60%	89%	83%	403%	100%	100%
1994	11%	3%	70%	3%	9%	26%	63%	100%	24%	51%	61%	89%	83%	408%	100%	100%
1995	11%	4%	71%	4%	9%	26%	63%	100%	24%	51%	62%	89%	83%	413%	100%	100%
1996	11%	4%	72%	4%	9%	26%	63%	100%	24%	51%	64%	89%	83%	418%	100%	100%
1997	11%	4%	73%	4%	9%	26%	63%	100%	25%	52%	65%	89%	84%	424%	100%	100%
1998	11%	4%	75%	4%	9%	26%	63%	100%	25%	52%	66%	89%	84%	429%	100%	100%
1999	11%	4%	76%	4%	9%	26%	63%	100%	26%	52%	67%	89%	84%	434%	100%	100%
2000	11%	4%	77%	4%	9%	26%	63%	100%	26%	52%	69%	89%	84%	439%	100%	100%
2001	12%	4%	78%	4%	9%	26%	63%	100%	26%	52%	70%	90%	84%	445%	100%	100%
2002	12%	4%	79%	4%	9%	26%	63%	100%	27%	52%	71%	90%	84%	448%	100%	100%
2003	12%	4%	81%	4%	8%	26%	63%	100%	27%	53%	72%	90%	84%	452%	100%	100%
2004	12%	4%	82%	4%	8%	26%	63%	100%	28%	53%	74%	90%	84%	455%	100%	100%
2005	12%	5%	83%	5%	8%	26%	64%	100%	28%	53%	75%	90%	85%	459%	100%	100%
2006	12%	5%	84%	5%	8%	26%	64%	100%	29%	53%	76%	90%	85%	463%	100%	100%
2007	12%	5%	85%	5%	8%	26%	64%	100%	29%	53%	77%	90%	85%	466%	100%	100%
2008	12%	5%	86%	5%	8%	26%	64%	100%	29%	53%	77%	90%	85%	470%	100%	100%
2009	12%	5%	87%	5%	8%	26%	64%	100%	29%	53%	78%	90%	85%	474%	100%	100%
2010	12%	5%	88%	5%	8%	25%	64%	100%	29%	53%	79%	90%	85%	478%	100%	100%
2011	12%	5%	89%	5%	8%	25%	64%	100%	29%	53%	80%	90%	85%	481%	100%	100%
2012	12%	5%	90%	5%	8%	25%	64%	100%	29%	53%	81%	91%	85%	485%	100%	100%
2013	12%	5%	90%	5%	8%	25%	64%	100%	29%	53%	81%	91%	86%	489%	100%	100%
2014	12%	5%	91%	5%	7%	25%	64%	100%	29%	53%	82%	91%	86%	493%	100%	100%
2015	12%	6%	92%	6%	7%	25%	64%	100%	29%	53%	82%	91%	86%	497%	100%	100%
2016	12%	6%	92%	6%	7%	25%	64%	100%	29%	53%	83%	91%	86%	501%	100%	100%
2017	12%	6%	93%	6%	7%	25%	64%	100%	29%	53%	83%	91%	86%	505%	100%	100%
2018	12%	6%	93%	6%	7%	25%	65%	100%	29%	53%	84%	91%	86%	509%	100%	100%
2019	12%	6%	94%	6%	7%	25%	65%	100%	28%	53%	84%	91%	86%	513%	100%	100%
2020	12%	6%	94%	6%	7%	25%	65%	100%	28%	53%	84%	91%	86%	517%	100%	100%
2021	12%	6%	94%	6%	7%	25%	65%	100%	28%	53%	85%	91%	87%	521%	100%	100%
2022	12%	6%	95%	6%	7%	25%	65%	100%	27%	53%	85%	92%	87%	525%	100%	100%
2023	12%	6%	95%	6%	7%	24%	65%	100%	27%	52%	85%	92%	87%	529%	100%	100%
2024	12%	6%	95%	6%	7%	24%	65%	100%	26%	52%	85%	92%	87%	534%	100%	100%
2025	12%	6%	95%	6%	6%	24%	65%	100%	26%	52%	85%	92%	87%	538%	100%	100%
2026	12%	6%	95%	6%	6%	24%	65%	100%	25%	52%	85%	92%	87%	542%	100%	100%

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Table 8.2-9—AmerenUE Service Territory Estimated Historical and Forecasted Residential Appliance Saturation Rates
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Year	EFurn	HPHeat	CAC	HPCool	RAC	EWHeat	ECook	Ref1	Ref2	Frz	Dish	CWash	EDry	TV	Light	Misc
2027	12%	6%	95%	6%	6%	24%	65%	100%	25%	52%	85%	92%	87%	547%	100%	100%
2028	12%	6%	95%	6%	6%	24%	65%	100%	24%	51%	85%	92%	88%	551%	100%	100%
2029	12%	6%	95%	6%	6%	24%	65%	100%	24%	51%	85%	92%	88%	555%	100%	100%
2030	12%	6%	95%	6%	6%	24%	66%	100%	23%	51%	85%	92%	88%	560%	100%	100%

Source: AmerenUE 2008 IRP Workpapers developed from EIA and Missouri Statewide Residential Lighting and Appliance Satruration and Efficiency Study

Appliance Definitions:

EFurn	Electric furnace and resistant room space heaters
HPHeat	Heat pump space heating
CAC	Central air conditioning
HPCool	Heat pump space cooling
RAC	Room air conditioners
EWHeat	Electric water heating
ECook	Electric cooking
Ref1	Refrigerator
Ref2	Second refrigerator
Frz	Freezer
Dish	Dishwasher
CWash	Electric clothes washer
EDry	Electric clothes dryer
TV	TV sets
Light	Lighting
Misc	Miscellaneous electric appliances

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Table 8.2-10—AmerenUE Service Territory Estimated Historical and Forecasted Residential Appliance Efficiency Indices

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Year	EFurn	HPHeat	CAC	HPCool	RAC	EWHeat	ECook	Ref1	Ref2	Frz	Dish	CWash	EDry	TV	Light	Misc
1993	3.41	6.48	8.28	8.45	8.04	0.84	458.3	940.5	846.5	705.4	125.2	120.3	1,221.4	151.1	2,074.0	2,217.0
1994	3.41	6.57	8.47	8.64	8.16	0.84	458.3	920.8	828.7	690.6	124.7	118.8	1,213.9	152.0	2,071.9	2,349.1
1995	3.41	6.65	8.66	8.83	8.28	0.85	458.3	901.0	810.9	675.7	124.2	117.2	1,206.4	152.9	2,069.7	2,481.2
1996	3.41	6.74	8.85	9.01	8.40	0.85	458.2	881.2	793.1	660.9	123.6	115.7	1,198.9	153.9	2,067.6	2,613.3
1997	3.41	6.82	9.04	9.20	8.51	0.85	458.2	861.4	775.3	646.1	123.1	114.1	1,191.4	154.8	2,065.4	2,745.5
1998	3.41	6.91	9.23	9.39	8.63	0.86	458.2	841.7	757.5	631.2	122.6	112.6	1,183.8	155.7	2,063.3	2,877.6
1999	3.41	6.99	9.42	9.58	8.75	0.86	458.2	821.9	739.7	616.4	122.1	111.1	1,176.3	156.6	2,061.1	3,009.7
2000	3.41	7.08	9.61	9.77	8.87	0.86	458.2	802.1	721.9	601.6	121.5	109.5	1,168.8	157.6	2,059.0	3,141.9
2001	3.41	7.16	9.80	9.96	8.99	0.87	458.2	782.3	704.1	586.7	121.0	108.0	1,161.3	158.5	2,056.8	3,274.0
2002	3.41	7.21	10.02	10.17	9.11	0.87	458.2	757.2	681.5	567.9	119.5	106.4	1,148.1	159.1	2,054.7	3,459.3
2003	3.41	7.26	10.24	10.39	9.19	0.88	458.2	733.7	660.4	550.3	118.1	104.7	1,140.5	159.6	2,052.5	3,632.9
2004	3.41	7.31	10.58	10.77	9.35	0.88	458.2	711.5	640.3	515.7	117.1	103.2	1,139.6	160.2	2,050.4	3,795.0
2005	3.41	7.36	10.64	10.82	9.44	0.88	458.2	691.0	621.9	499.1	115.6	101.6	1,133.8	160.8	2,048.2	3,945.8
2006	3.41	7.41	10.89	11.12	9.52	0.89	458.2	671.3	604.2	485.9	114.7	100.1	1,127.7	161.3	2,046.1	4,085.7
2007	3.41	7.49	11.10	11.34	9.60	0.89	458.2	654.1	588.7	475.3	114.1	98.5	1,117.7	161.9	2,044.0	4,214.9
2008	3.41	7.56	11.30	11.54	9.69	0.89	458.2	637.8	574.0	466.1	113.9	97.0	1,110.1	162.5	2,041.8	4,333.8
2009	3.41	7.61	11.50	11.74	9.78	0.89	458.2	622.7	560.5	458.4	113.4	95.6	1,095.7	163.1	2,039.7	4,442.9
2010	3.41	7.67	11.69	11.92	9.87	0.90	458.2	607.7	546.9	451.9	112.7	94.1	1,083.7	163.7	2,037.6	4,542.7
2011	3.41	7.72	11.88	12.10	9.95	0.90	458.2	594.2	534.7	446.8	112.2	92.7	1,072.8	164.3	2,035.4	4,644.6
2012	3.41	7.77	12.06	12.27	10.02	0.90	458.2	582.0	523.8	442.8	112.1	91.3	1,067.0	164.8	2,033.3	4,748.9
2013	3.41	7.82	12.24	12.44	10.07	0.90	458.2	571.1	514.0	439.5	111.5	89.9	1,055.8	165.4	2,031.2	4,855.5
2014	3.41	7.86	12.40	12.60	10.12	0.90	458.2	561.6	505.4	436.9	111.1	88.5	1,048.2	166.0	2,029.0	4,964.5
2015	3.41	7.90	12.55	12.74	10.16	0.91	458.2	553.1	497.8	435.0	110.7	87.2	1,041.5	166.6	2,026.9	5,076.0
2016	3.41	7.94	12.69	12.87	10.18	0.91	458.2	545.7	491.2	433.5	110.6	85.9	1,037.7	167.2	2,024.8	5,189.9
2017	3.41	7.97	12.81	12.99	10.19	0.91	458.2	539.3	485.4	432.6	109.8	84.6	1,028.0	167.8	2,022.7	5,306.5
2018	3.41	8.01	12.92	13.10	10.19	0.91	458.2	533.8	480.4	432.1	109.3	83.3	1,021.4	168.4	2,020.6	5,425.6
2019	3.41	8.03	13.02	13.19	10.20	0.91	458.2	529.1	476.2	431.8	108.8	82.0	1,016.4	169.0	2,018.5	5,547.4
2020	3.41	8.06	13.12	13.28	10.21	0.91	458.2	524.9	472.4	431.9	108.6	80.8	1,015.5	169.6	2,016.3	5,671.9
2021	3.41	8.09	13.20	13.36	10.22	0.91	458.2	521.1	469.0	432.1	107.7	79.5	1,010.0	170.2	2,014.2	5,799.3
2022	3.41	8.11	13.28	13.43	10.23	0.91	458.2	517.9	466.1	432.5	107.3	78.3	1,008.3	170.8	2,012.1	5,929.4
2023	3.41	8.14	13.35	13.50	10.24	0.91	458.2	515.1	463.6	433.0	106.9	77.1	1,007.1	171.4	2,010.0	6,062.6
2024	3.41	8.16	13.40	13.55	10.25	0.91	458.2	512.9	461.6	433.6	106.9	76.0	1,009.0	172.0	2,007.9	6,198.7
2025	3.41	8.17	13.44	13.58	10.27	0.91	458.2	511.1	460.0	434.3	106.4	74.8	1,005.6	172.7	2,005.8	6,337.8
2026	3.41	8.18	13.47	13.61	10.28	0.91	458.2	510.0	459.0	434.8	106.2	73.7	1,005.5	173.3	2,003.7	6,480.1

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Table 8.2-10—AmerenUE Service Territory Estimated Historical and Forecasted Residential Appliance Efficiency Indices

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Year	EFurn	HPHeat	CAC	HPCool	RAC	EWHeat	ECook	Ref1	Ref2	Frz	Dish	CWash	EDry	TV	Light	Misc
2027	3.41	8.19	13.49	13.62	10.29	0.92	458.2	509.4	458.4	435.3	106.1	72.6	1,005.6	173.9	2,001.6	6,625.6
2028	3.41	8.20	13.50	13.63	10.30	0.92	458.2	508.9	458.0	435.7	106.3	71.5	1,008.3	174.5	1,999.5	6,774.3
2029	3.41	8.21	13.52	13.64	10.30	0.92	458.2	508.5	457.7	436.1	106.0	70.4	1,005.3	175.1	1,997.4	6,926.4
2030	3.41	8.21	13.53	13.65	10.31	0.92	458.2	508.2	457.4	436.4	106.0	69.3	1,005.2	175.8	1,995.4	7,081.9

Source: AmerenUE 2008 IRP Workpapers developed from EIA data and Missouri Statewide Residential Lighting and Appliance Satruration and Efficiency Study

Appliance Definitions:

EFurn	Electric furnace and resistant room space heaters
HPHeat	Heat pump space heating
CAC	Central air conditioning
HPCool	Heat pump space cooling
RAC	Room air conditioners
EWHeat	Electric water heating
ECook	Electric cooking
Ref1	Refrigerator
Ref2	Second refrigerator
Frz	Freezer
Dish	Dishwasher
CWash	Electric clothes washer
EDry	Electric clothes dryer
TV	TV sets
Light	Lighting
Misc	Miscellaneous electric appliances

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Table 8.2-11—AmerenUE Service Territory Estimated Historical and Forecasted Commercial Appliance Saturation Rates

Year	Heat	Cool	Vent	WtrHeat	Cooking	Refrig	O. Light	I.Light	Office	Misc
1993	14%	78%	100%	31%	12%	48%	75%	99%	195%	113%
1994	14%	79%	100%	31%	12%	48%	75%	99%	200%	114%
1995	14%	80%	100%	32%	13%	48%	75%	98%	205%	115%
1996	14%	80%	100%	32%	13%	48%	75%	98%	206%	116%
1997	14%	81%	100%	33%	13%	48%	75%	97%	208%	116%
1998	14%	81%	100%	33%	13%	48%	75%	96%	210%	117%
1999	14%	82%	100%	33%	14%	48%	75%	95%	211%	117%
2000	14%	82%	100%	32%	14%	48%	75%	95%	213%	118%
2001	14%	83%	100%	32%	14%	48%	75%	94%	214%	118%
2002	15%	83%	100%	32%	15%	48%	75%	93%	216%	119%
2003	15%	83%	100%	32%	15%	48%	75%	93%	217%	119%
2004	15%	83%	100%	32%	15%	48%	75%	92%	219%	119%
2005	15%	83%	100%	32%	15%	48%	75%	92%	220%	120%
2006	15%	84%	100%	32%	15%	48%	75%	91%	222%	121%
2007	15%	84%	100%	32%	15%	48%	75%	91%	223%	121%
2008	15%	84%	100%	31%	15%	48%	75%	91%	225%	122%
2009	15%	85%	100%	31%	15%	48%	75%	91%	226%	123%
2010	15%	85%	100%	31%	15%	48%	75%	91%	228%	124%
2011	15%	86%	100%	30%	14%	48%	75%	91%	229%	125%
2012	15%	87%	100%	30%	14%	48%	75%	91%	231%	126%
2013	15%	87%	100%	30%	14%	48%	75%	91%	232%	127%
2014	15%	87%	100%	30%	14%	48%	75%	91%	234%	127%
2015	15%	88%	100%	30%	14%	48%	74%	91%	235%	128%
2016	15%	88%	100%	29%	14%	48%	74%	91%	237%	129%
2017	15%	88%	100%	29%	14%	48%	74%	91%	238%	130%
2018	15%	88%	100%	29%	14%	48%	74%	91%	239%	131%
2019	15%	88%	100%	29%	14%	48%	74%	91%	241%	132%
2020	15%	89%	100%	29%	14%	48%	74%	91%	242%	133%
2021	15%	89%	100%	29%	14%	48%	74%	91%	243%	134%
2022	15%	89%	100%	29%	14%	48%	74%	91%	245%	135%
2023	15%	90%	100%	28%	14%	48%	74%	91%	246%	136%
2024	15%	90%	100%	28%	14%	48%	74%	91%	247%	137%
2025	15%	91%	100%	28%	14%	47%	74%	91%	248%	138%
2026	15%	91%	100%	28%	14%	47%	74%	91%	249%	139%
2027	15%	92%	100%	28%	14%	47%	74%	91%	251%	140%
2028	15%	92%	100%	28%	14%	47%	74%	91%	252%	140%
2029	15%	93%	100%	28%	14%	47%	74%	91%	253%	141%
2030	15%	93%	100%	28%	14%	47%	74%	91%	254%	142%

Source: AmerenUE 2008 IRP Workpapers developed from EIA projections

Appliance Definitions:

Heat	Electric space heating
Cool	Electric air conditioning
Vent	Room air conditioners
EWHeat	Electric water heating
Cooking	Electric cooking
Refrig	Refrigeration
O. Light	Exterior lighting
ILight	Interior Lighting
Office	Office equipment
Misc	Miscellaneous electric appliances

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Table 8.2-12—AmerenUE Service Territory Estimated Historical and Forecasted Residential Appliance Efficiency Indices

Year	Heat	Cool	Vent	EWHeat	Cooking	Refrig	O. Light	I.Light	Office	Misc
1993	1.06	2.32	0.39	0.94	0.70	1.30	47.2	47.2	5.18	1.70
1994	1.06	2.32	0.39	0.94	0.70	1.30	47.6	47.6	5.20	1.70
1995	1.07	2.32	0.39	0.94	0.70	1.31	47.9	47.9	5.22	1.71
1996	1.07	2.32	0.39	0.94	0.70	1.31	48.0	48.0	5.24	1.71
1997	1.08	2.32	0.40	0.94	0.70	1.31	48.1	48.1	5.27	1.71
1998	1.09	2.35	0.41	0.94	0.71	1.32	48.4	48.4	5.31	1.71
1999	1.10	2.38	0.41	0.94	0.71	1.32	48.6	48.6	5.36	1.72
2000	1.12	2.41	0.42	0.95	0.72	1.33	48.8	48.8	5.41	1.73
2001	1.13	2.44	0.43	0.95	0.72	1.34	48.9	48.9	5.47	1.74
2002	1.14	2.47	0.44	0.95	0.73	1.34	49.1	49.1	5.54	1.74
2003	1.15	2.49	0.45	0.95	0.73	1.35	49.8	49.8	5.61	1.75
2004	1.16	2.51	0.45	0.95	0.73	1.35	50.1	50.1	5.68	1.76
2005	1.18	2.53	0.46	0.95	0.74	1.36	50.9	50.9	5.75	1.77
2006	1.19	2.56	0.46	0.96	0.74	1.37	51.6	51.6	5.82	1.77
2007	1.20	2.58	0.47	0.96	0.74	1.37	51.9	51.9	5.90	1.78
2008	1.21	2.60	0.48	0.96	0.75	1.38	52.2	52.2	5.98	1.78
2009	1.22	2.61	0.48	0.96	0.75	1.38	52.3	52.3	6.06	1.78
2010	1.22	2.66	0.49	0.96	0.75	1.39	52.4	52.4	6.15	1.79
2011	1.23	2.70	0.49	0.96	0.75	1.39	52.4	52.4	6.23	1.79
2012	1.24	2.74	0.50	0.96	0.75	1.40	52.5	52.5	6.32	1.79
2013	1.25	2.77	0.51	0.96	0.75	1.40	52.6	52.6	6.41	1.80
2014	1.25	2.81	0.51	0.96	0.75	1.40	52.6	52.6	6.50	1.80
2015	1.26	2.84	0.52	0.96	0.76	1.41	52.7	52.7	6.59	1.80
2016	1.26	2.87	0.52	0.96	0.76	1.41	52.8	52.8	6.68	1.81
2017	1.27	2.90	0.53	0.96	0.76	1.41	52.9	52.9	6.78	1.81
2018	1.27	2.92	0.53	0.96	0.76	1.41	52.9	52.9	6.87	1.81
2019	1.28	2.95	0.53	0.96	0.76	1.42	53.1	53.1	6.97	1.82
2020	1.29	2.97	0.54	0.96	0.76	1.42	53.2	53.2	7.06	1.82
2021	1.29	3.00	0.54	0.96	0.76	1.42	53.4	53.4	7.06	1.82
2022	1.30	3.02	0.55	0.96	0.76	1.42	53.6	53.6	7.06	1.82
2023	1.31	3.04	0.55	0.96	0.76	1.42	53.7	53.7	7.06	1.82
2024	1.31	3.06	0.55	0.96	0.76	1.43	54.0	54.0	7.06	1.82
2025	1.32	3.08	0.56	0.96	0.76	1.43	54.2	54.2	7.06	1.82
2026	1.33	3.09	0.56	0.96	0.76	1.43	54.3	54.3	7.06	1.82
2027	1.33	3.11	0.56	0.96	0.76	1.43	54.5	54.5	7.06	1.82
2028	1.34	3.13	0.56	0.96	0.76	1.43	54.7	54.7	7.06	1.82
2029	1.35	3.14	0.56	0.96	0.76	1.43	54.8	54.8	7.06	1.82
2030	1.35	3.15	0.57	0.96	0.76	1.43	55.2	55.2	7.06	1.82

Source: AmerenUE 2008 IRP Workpapers developed from EIA projections

Appliance Definitions:

Heat	Electric space heating
Cool	Electric air conditioning
Vent	Room air conditioners
EWHeat	Electric water heating
Cooking	Electric cooking
Refrig	Refrigeration
O. Light	Exterior lighting
ILight	Interior Lighting
Office	Office equipment
Misc	Miscellaneous electric appliances

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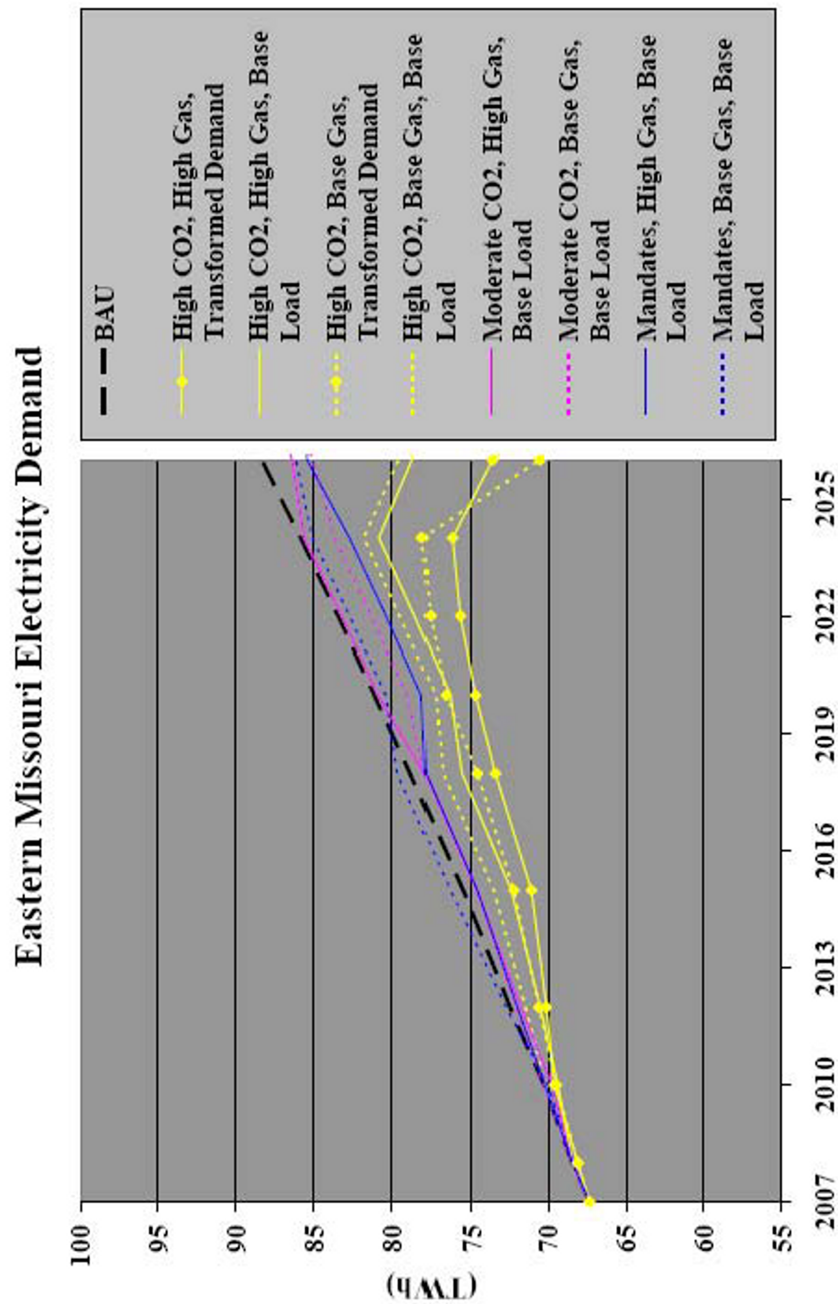
Figure 8.2-1—Eastern Missouri Electricity Demand



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8.3 POWER SUPPLY

8.3.1 INTRODUCTION

The purpose of this subsection, as specified in NUREG-1555, is to identify the present and planned generating capability in the AmerenUE service territory and the present and planned purchases and sales of power and energy. As noted in NUREG-1555, the scope of this review "will include consideration of the type (e.g., coal-fired) and function (e.g., baseload) of the relevant region's plants, the nature of purchases and sales (firm and nonfirm) of power and energy, and any proposed additions, retirements, redesignations, deratings, or upratings of the relevant region's plants."

Based on the fact that the proposed plant will be operated strictly as baseload generation serving the AmerenUE service territory, this analysis will focus on resources currently serving the defined AmerenUE service territory.

The AmerenUE IRP will serve as the primary reference, supported by MISO, SERC, and EIA reports and information (AUE, 2008). NUREG-1555 allows for the power supply review and evaluation to be based on acceptable state or regional reports if the evaluation meets these four criteria; that the methodology be (1) developed in a systematic fashion, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. As discussed and demonstrated in Section 8.1.2 and 8.2, the AmerenUE IRP process meets these criteria.

Baseload plants are generally defined as those plants operating nearly full cycle, or 24 hours a day, seven days a week, and typically operate more than 5,000 hours annually. Baseload facilities are usually either nuclear or coal-fired.

Intermediate facilities cycle when load increases or decreases, and typically these are smaller or older coal-fired facilities and oil/gas plants that typically operate between 1,000 and 5,000 hours per year.

Peaking facilities operate infrequently to meet system peak demand. These are usually combustion turbines and pumped storage, hydro electric, or other smaller units that typically operate less than 1,000 hours per year.

The power supply data are presented in the following categories:

- existing and planned generation in Section 8.3.2,
- purchases and sales in Section 8.3.3,
- distributed and self-generation in Section 8.3.4, and
- total capability in Section 8.3.5.

8.3.2 EXISTING AND PLANNED GENERATING CAPABILITY IN THE AMERENUE SERVICE TERRITORY

8.3.2.1 Existing Generation

The AmerenUE system relies on a diverse mix of generating technologies to supply electrical power. The vintage of the plants ranges from 1913 for the Keokuk Hydroelectric Plant to 2005 for the most recent addition (Unit 5) at the Venice Power Plant. AmerenUE currently has 9,909 MWe of Net Summer Capacity and 10,168 MWe of Net Winter Capacity. At the present time,

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base load generation is approximately 68% of the summer capacity. AmerenUE's existing generating capacity is shown on Table 8.3-1. Table 8.3-2 shows AmerenUE's Total Generating Capacity for 2007 while Table 8.3-3 shows AmerenUE's Total Generating Capacity position through 2025. Table 8.3-4 shows the capacity factors for 2002 through 2006 for its existing generating facilities.

8.3.2.2 Existing Resources

The following sections provide a brief description of AmerenUE's existing resources. Each generating technology has unique attributes that enhance the reliability and the flexibility of its operation. Power plants are generally categorized by the type of load they serve: base, intermediate or peaking. Table 8.3-1 lists AmerenUE's existing units and summarizes their characteristics.

8.3.2.2.1 Base Capacity

Base capacity for the AmerenUE system is provided by the Callaway, Keokuk, Labadie, Rush Island, Sioux, and Meramec power plants. Approximately 68% of the company's total capacity is considered base capacity.

Callaway Plant Unit 1 – Callaway Plant Unit 1, located in central Missouri, was placed in service in 1984. Callaway Plant Unit 1 is a pressurized water reactor nuclear power unit. Refueling of the unit occurs approximately every 18 months.

Rush Island – The Rush Island Plant is located on the Mississippi River near Festus, Missouri. The plant is composed of two pulverized-coal-fired units. These units were placed in service in 1976 and 1977. Low sulfur Powder River Basin (PRB) coal is delivered by rail and barge to the plant. Low NOx burners have been installed on all of the units. AmerenUE has plans to install environmental retrofits on Callaway Plant Units 1 and 2 in 2015. The environmental retrofits include the installation of a Halogenated Activated Carbon Injection System which is designed to control mercury (Hg) emissions.

Labadie – The Labadie Plant, located on the Missouri River in eastern Franklin County, Missouri, consists of four pulverized-coal-fired units placed in service from 1970 to 1973. Low sulfur PRB coal for the plant is delivered by two rail lines. Low NOx burners have been installed on all of the units. AmerenUE has plans to install environmental retrofits on all four units in 2015. The environmental retrofits include the installation of a Halogenated Activated Carbon Injection System which is designed to control Hg emissions.

Sioux – The Sioux Plant is located on the Mississippi River in eastern St. Charles County, Missouri. The plant consists of two units, both using cyclone boilers. Full capacity requires a mixture of 40% high-Btu Eastern coal and 60% PRB coal. The units are limited when burning 100% low sulfur PRB coal. The units were placed into service during 1966 and 1968. Coal is delivered to the plant by rail and barge. A rich reagent injection/selective non-catalytic reduction (RRI/SNCR) NOx control system has been installed on both units. AmerenUE has plans to install environmental retrofits on Callaway Plant Units 1 and 2 by 2010. The environmental retrofits include the installation of a Wet FGD (flue gas desulfurization) system which is designed to control SO^2 emissions.

Meramec – The four-unit Meramec Plant is located in southern St. Louis County, Missouri, on the Mississippi River. Units 1 and 2 were placed in service in 1953 and 1954, respectively. Unit 3 was placed in service in 1959 and Unit 4 was placed in service in 1961. Unit 4 was upgraded in 2005 with new HP and LP turbine components.

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The primary fuel for all four units is low sulfur PRB coal, which is delivered by rail or barge. Meramec Units 1 and 2 have the ability to achieve full rated capacity on either coal or natural gas. Up to 30% of Unit 3's output can be fueled by natural gas. Low NOx burners have been installed on all of the units. AmerenUE has plans to install environmental retrofits on Units 3 and 4 in 2015. The environmental retrofits include the installation of a Halogenated Activated Carbon Injection System, which is designed to control Hg emissions.

Keokuk – The Keokuk Hydroelectric Plant, located on the Mississippi River near Keokuk, Iowa, was placed in service in 1913. The facility includes fifteen run-of-river hydroelectric generators. Since 2001, seven of the 15 units have been upgraded with more efficient turbine runners and components to increase the nominal unit capacities by 2 MWe per unit. The plant is not subject to license renewal requirements under the Federal Power Act.

8.3.2.2.2 Intermediate Capacity

Intermediate capacity is supplied by hydroelectric units at the Osage facility. Approximately 2% of the company's total capacity is considered intermediate capacity.

Osage – The Osage Hydroelectric Plant is located at Bagnell Dam on the Lake of the Ozarks in central Missouri. The first six units were placed in service in 1931, and Units 7 and 8 were placed in service in 1953. The eight hydroelectric generators result in a total plant capability of 226 MW.

8.3.2.2.3 Peaking Capacity

Peaking capacity is supplied by a variety of technologies that utilize oil, natural gas, hydroelectric and pumped storage. Approximately 30% of the company's total capacity is considered peaking capacity.

Taum Sauk – Note: This facility is not currently available due to a breach in the upper reservoir that occurred on December 14, 2005. See additional information concerning the future of this facility under the heading "Life Extensions" below.

The Taum Sauk Plant is a pumped-storage facility located 90 miles (145 km) southwest of St. Louis, Missouri. The plant has two reversible pump-turbine units and upper and lower reservoirs. Both units were placed in service in 1963 and were upgraded in 1999 with high-efficiency turbine runners. The plant operates by pumping water from the lower reservoir to the upper reservoir during times of low system load and low energy cost. During peak demand periods, the water is released from the upper reservoir for generation by the two water turbines.

Combustion Turbine Generators – The Company's 46 combustion turbine generators (CTGs) are located at 15 sites throughout most of AmerenUE's service territory. The units were installed from 1967 through 2005. Many of AmerenUE's CTGs are located in Illinois.

Planned Additions, Life Extensions, or Upratings

AmerenUE's Integrated Resource Plan looked at the upratings to existing facilities, possible plant life extensions, previously committed planned additions, known commitments such as the recently passed requirement for renewable generation, and achievable Demand-Side Management opportunities before considering the addition of any future supply-side resources. The planned additions are discussed in greater detail under the heading of "Planned Additions."

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AmerenUE conducted an analysis to determine if any of the company's existing units could be relicensed. The economic benefit of relicensing a unit is that it delays the need for additional generating capacity. The Callaway Plant Unit 1 facility was considered and an analysis was completed in January 2008. The Callaway relicensing is discussed in greater detail below under the heading of "Life Extensions." The Taum Sauk facility is also covered under the same heading as this facility is not currently available due to a breach in the upper reservoir that occurred on December 14, 2005.

AmerenUE's Integrated Resource Plan completed a thorough review of the company's existing units to determine, if possible, where additional capacity could be achieved. The list of possible upratings to existing units was screened to determine the most cost effective and reasonably achievable projects. The final list of projects is discussed in greater detail below under the heading of "Upratings."

8.3.2.3 Planned Additions

The following information outlines the currently planned additions to the AmerenUE system; however, some of these additions are proposed but do not have final approval.

Wind - In response to the need to expand renewable resources in our region, AmerenUE signed a letter of intent in 2007 to add at least 100 MWe of wind power to its generating portfolio by 2010. Since AmerenUE has already committed to adding this 100 MW, it was considered as an existing resource in the IRP planning.

Wind is considered an intermittent generator since the output is controlled by the natural variability of the energy resource rather than dispatched based on system requirements. In addition, MISO Generation Deliverability guidelines state that a wind farm's maximum output should be reduced to 20% because only 20% of a wind farm's maximum output can be counted for capacity purposes unless demonstrated otherwise. Thus, AmerenUE counts 20% of all wind resources for capacity purposes.

Expansion of Existing Renewable Generation –AmerenUE's current plan is to serve an additional 3% of retail electric sales through new renewable resources by 2020. The plan calls for expanding the role of renewable energy sources in AmerenUE's overall power generation mix, which includes not only the development of renewable energy sources, but also increased hydroelectric generation capacity through upgrades at the Osage and Keokuk plants. AmerenUE is exploring the feasibility of other renewable energy sources, including solar power, biomass, landfill gas, and wind power. Going forward, AmerenUE plans to even more fully analyze the technical and economic potential for development of renewable resources in the region.

8.3.2.4 Life Extensions

The following information outlines the currently analyzed life extensions for AmerenUE's generating facilities:

Callaway Plant Unit 1 -– The current Callaway Plant Unit 1 40-year operating license expires in 2024. AmerenUE conducted an analysis to determine whether it should extend the Callaway Plant Unit 1 license for another 20 years. The analysis examined two options. The first option was to retire the plant in year 2024 and the second option was to extend the Callaway Plant Unit 1 license for another 20 years through the year 2044. The analysis showed that the estimated costs to maintain and operate the plant for another 20 years was more economical

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than the estimated replacement costs. Based on that analysis, AmerenUE has decided to seek re-licensing of Callaway Plant with the NRC.

Taum Sauk (Rebuild) - Taum Sauk's upper reservoir was destroyed by a breach on December 14, 2005.

AmerenUE intends to rebuild the upper reservoir and make this an operable plant. In August 2007, AmerenUE received approval from the Federal Energy Regulatory Commission to rebuild the upper reservoir, and in early November 2007 the company announced it had engaged Ozark Constructors, LLC, to rebuild the reservoir. Ozark Constructors is a venture partnership formed by Colorado-based ASI Constructors, Inc., and St. Louis-based Fred Weber, Inc. AmerenUE also announced that Pennsylvania based Paul C. Rizzo Associates, Inc., was selected engineer of record and project manager. Rizzo is a world-recognized engineering and construction management firm for dams. The rebuilt reservoir is expected to be completed by the fall of 2009.

8.3.2.5 Upratings

The following information outlines the currently planned capacity upratings at AmerenUE generating facilities; however, some of these upratings are proposed but do not have final approval. The total capacity from all these upgrades is 161 MWe by 2013 (Table 8.3-3 page 2). The facilities affected are:

- Labadie (20 MWe)
- Rush (30 MWe)
- Meramec (20 MWe)
- Callaway (70 MWe)
- Keokuk (16 MWe)

Electrostatic Precipitator Upgrades at several plants (total of 5 MWe)

8.3.2.5.1 LP Turbine Replacements

This project involves capital upgrades to the Low Pressure steam turbines at several of AmerenUE's large fossil plants, identified below. The total steam turbine upgrade is approximately 70 MWe.

In progress: Labadie Unit 1. LP turbine #1 and LP turbine #2 provide an increase in output of 20 MWe. This project is scheduled to begin in the spring of 2008. The 20 MWe associated with this project are accounted for in the current system capacity.

The remaining items are future planned projects representing approximately 70 MWe and are included in AmerenUE's long term capacity position:

- Rush Island Unit 2. LP turbine #1 and LP turbine #2. Increase/restore in output of 15 MWe. Most likely timeframe for upgrade installation is 2009.
- Rush Island Unit 1. LP turbine #1 and LP turbine #2. Increase/restore in output of 15 MWe. Most likely timeframe for this upgrade installation is 2012.

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- Labadie Unit 2. LP turbine #1 and LP turbine #2. Increase/restore in output of 20 MWe. Most likely timeframe for this upgrade is 2011.
- Meramec Unit 3. LP turbine and HP turbine. Increase/restore in output of 20 MWe. Most likely timeframe for this upgrade is 2010.

8.3.2.5.2 Osage and Keokuk Turbine Upgrades

In progress: Osage Unit 1 for an additional 7.5 MWe and Osage Unit 7 for an additional 7.5 MWe. These projects are currently underway and are scheduled for completion during the second quarter of 2008. The 15 MWe associated with these two projects are accounted for in the existing system capacity.

The remaining items are future planned projects representing approximately 16 MWe:

- Keokuk Unit 1 - 2 MWe. Scheduled for completion - 2nd quarter of 2009.
- Keokuk Unit 2 - 2 MWe. Scheduled for completion - 2nd quarter of 2010.
- Keokuk Unit 3 - 2 MWe. Scheduled for completion - 2nd quarter of 2009.
- Keokuk Unit 4 - 2 MWe. Scheduled for completion - 2nd quarter of 2010.
- Keokuk Unit 5 - 2 MWe. Scheduled for completion - 2nd quarter of 2011.
- Keokuk Unit 6 - 2 MWe. Scheduled for completion - 2nd quarter of 2011.
- Keokuk Unit 14 - 2 MWe. Scheduled for completion - 2nd quarter of 2012.
- Keokuk Unit 15 - 2 MWe. Scheduled for completion - 2nd quarter of 2012.

8.3.2.5.3 Electrostatic Precipitator Upgrades

This project involves installation of new power supplies and transformer/rectifier sets on the precipitator controls at the fossil plants. Installation of new power supplies and transformer/rectifier sets on the precipitator controls has started at Rush Island and Labadie. Procurement and installation of equipment as well as software procurement will continue at Meramec and Sioux plants throughout 2008 and 2009.

The addition of the controls should reduce the auxiliary power required to operate the precipitators (5 MWe):

- Labadie Units 1, 2, 3 and 4. Power Savings of 2 MWe @ full load with all 4 units.
- Rush Island units 1 and 2. Power savings of 700 KWe @ full load with both units.
- Sioux Units 1 and 2. Power savings of 900 KWe @ full load with both units.
- Meramec Units 3 and 4. Power savings of 1 MWe @ full load with 4 units.

8.3.2.5.4 Callaway Plant Unit 1 Uprating

In addition to the fossil and hydro plant opportunities identified above, a potential upgrade for Callaway Plant Unit 1 was identified. An upgrade to Callaway Plant Unit 1 is being considered

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and will be studied in greater detail. The upgrade is expected to result in an additional 70 MWe. The extent of the modifications necessary to complete the upgrade is not fully known but is expected to involve the changes listed below.

- Main Electric Generator - The generator is loaded to its maximum capacity. A re-wind cannot add enough bars for the expected power increase. The generator will be replaced with a larger frame size to accommodate the added load.
- Main Step Up Transformers - The main step up transformers are also operating at their maximum capacity. A larger transformer is required to accommodate the added load.
- HP Turbine - It is anticipated the HP turbine will need to replace the nozzle plates to allow for the steam flow increase associated with the proposed power up rate. The existing nozzle plates have approximately 5% excess flow capacity. The expected steam flow increase for the proposed uprate is approximately 9%.

A feasibility study needs to be completed before a final determination is made for this upgrade. The study is expected to be completed in September 2008. If the decision is made to proceed with the upgrade, the current plans call for implementation of the upgrade during Refuel 19, which is scheduled for spring 2013.

8.3.2.6 Planned Generation Unit Retirements

Because AmerenUE's base load power plants range in age from 24 to 55 years, the company must consider the possibility of unit retirements or mothballing for some units, like those at the Meramec Plant, because they may be too inefficient to operate in a carbon-constrained environment. AmerenUE plans to continue to review the economics for the existing generating units that, depending on the scenario for reducing air emissions, particularly CO2, would require upgrades that are so costly it would be difficult to justify their continued operation. The current assumption for the Meramec plant is that all four units will be retired in 2021. Table 8.3-5 states estimated retirement dates for all AmerenUE coal units.

8.3.2.7 Planned New Plants

All new plants being considered, with the exception of a new nuclear plant, were discussed under Planned Additions in Section 8.3.2 above.

8.3.3 PURCHASES AND SALES

8.3.3.1 Wholesale Power Sales

AmerenUE currently provides full requirements power sales to six Missouri municipal electrical systems. As noted in the AmerenUE IRP, data for wholesale sales to six Missouri municipalities was included in the load forecast data. These sales represent a total of 1.25% of AmerenUE's total MWH sales in 2007 and approximately 0.2% of AmerenUE's total capacity needs. Two of these agreements terminate in 2011, one in 2013, and the balance in 2008. Of those expiring beyond 2008, total peak demand is approximately 16 MWe.

AmerenUE also currently has one contract for the sale of ancillary services to the Ameren Illinois Utilities. This agreement will expire upon the start of the MISO Ancillary Services Market, which is currently projected to be September 9, 2008.

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8.3.3.2 Wholesale Power Purchases

AmerenUE currently has in place one long-term power purchase agreement with Arkansas Power and Light Company for 165 MWe of around the clock power and energy; however, this agreement terminates prior to the end of 2009 and no assumption has been made in the modeling regarding its renewal or extension.

No purchases were identified as economic options.

8.3.4 DISTRIBUTED AND SELF GENERATION

AmerenUE does not currently own or operate any company distributed generation. Two wholesale customers own generation located in AmerenUE's service territory. These plants have the capability of operating in parallel with AmerenUE's system and are currently available, under contract, to AmerenUE during peak periods. These two customers provide a total of approximately 14 MWe. These wholesale contracts expire in 2011. This available capacity is considered in AmerenUE's capacity position.

8.3.5 TOTAL CAPABILITY

AmerenUE's total capability consists of existing resources (base, intermediate and peaking), additional capacity available via future plant upgrades and planned new resources. That information is discussed above and outlined in the capacity position - in Table 8.3-3.

8.3.6 REFERENCES

AUE, 2008. Integrated Resource Plan Report, AmerenUE, February 2008.

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Table 8.3-1—AmerenUE's Existing Generation

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Station Unit	Type	Net Capability (MWe)		Fuel Type	Transportation Method
		Summer[a]	Winter [b]		
Callaway	Base	1,190	1,240	Uranium	Truck
Rush Island 1	Base	580	595	Coal	Rail, Barge
Rush Island 2	Base	580	595	Coal	Rail, Barge
Labadie 1	Base	594	598	Coal	Rail
Labadie 2	Base	594	598	Coal	Rail
Labadie 3	Base	605	617	Coal	Rail
Labadie 4	Base	603	614	Coal	Rail
Sioux 1	Base	497	504	Coal	Rail, Barge
Sioux 2	Base	497	504	Coal	Rail, Barge
Meramec 1	Base	120	127	Coal/NG	Rail, Barge/PL
Meramec 2	Base	120	127	Coal/NG	Rail, Barge/PL
Meramec 3	Base	267	276	Coal/NG	Rail, Barge/PL
Meramec 4	Base	347	363	Coal	Rail, Barge
Total Steam Turbine		6,594	6,758		
Keokuk (15 Units)	Base	134	127	Hydro	
Osage (8 Units)	Interim.	226	219	Hydro	
Total Hydro		360	348		
Taum Sauk (2 Units)	Peak	-	-	Hydro	
Total Pumped Storage		-	-		
Venice (Unit 1)	Peak	-	-	#2 Oil	Truck
Howard Bend	Peak	43	46	#2 Oil	Truck
Meramec CTG-1	Peak	55	61	#2 Oil	Truck
Fairgrounds	Peak	55	61	#2 Oil	Truck
Mexico	Peak	55	61	#2 Oil	Truck
Moberly	Peak	55	61	#2 Oil	Truck
Moreau	Peak	55	61	#2 Oil	Truck
Meramec CTG-2	Peak	52	55	NG/#2 Oil	PL/Truck
Venice (Unit 2)	Peak	48	52	NG/#2 Oil	PL/Truck
Peno Creek (Units 1-4)	Peak	188	192	NG/#2 Oil	PL/Truck
Kinmundy (Units 1-2)	Peak	230	222	NG/#2 Oil	PL/Truck
Venice (Units 3 & 4)	Peak	336	356	Nat Gas	Pipeline
Venice (Unit 5)	Peak	115	111	Nat Gas	Pipeline
Pinckneyville (Units 1-4)	Peak	176	152	Nat Gas	Pipeline
Pinckneyville (Units 5-8)	Peak	144	160	Nat Gas	Pipeline
Kirksville	Peak	13	14	Nat Gas	Pipeline
Viaduct	Peak	25	29	Nat Gas	Pipeline
Audrain (Units 1-8)	Peak	578	578	Nat Gas	Pipeline
Raccoon Creek (Units 1-4)	Peak	300	316	Nat Gas	Pipeline

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Table 8.3-1—AmerenUE's Existing Generation
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Station Unit	Type	Net Capability (MWe) Summer[a]	Winter [b]	Fuel Type	Transportation Method
Goose Creek (Units 1-6)	Peak	432	474	Nat Gas	Pipeline
Total Combustion Turbine		2,995	3,062		
Base Load		6,728	6,887	68%	68%
Intermediate		226	219	2%	2%
Peaking		2955	3062	30%	30%
Total Company		**9,909**	**10,168**	**100%**	**100%**

[a] Developed from AmerenUE's 2008 IRP Filing

[b] Developed from AmerenUE's 2007 Plant Capabilities Table

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Table 8.3-2—AmerenUE's Total Generating Capacity

Type	Net Capability (MWe)	
	Summer [a]	Winter [b]
Base Load	6728	6887
Intermediate Load	226	219
Peaking	2955	3062
Total AmerenUE Generating Capability	**9,909**	**10,168**

[a] Developed from AmerenUE's 2008 IRP Filing

[b] Developed From AmerenUE's 2007 Plant Capabilities Table

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Table 8.3-3—AmerenUE's Total Generating Capacity – 20 Year Projection
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System Generation Capacity		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Generation Capacity																				
Callaway	Nuclear	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190
Keokuk	Hydro	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134
Labadie	Coal	2396	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416	2416
Rush Island	Coal	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160
Sioux	Coal	994	994	994	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972
Meramec	Coal	854	854	854	854	854	854	854	854	854	854	854	854	854	854	854	0	0	0	0
Total Base Capacity		**6728**	**6748**	**6748**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**6726**	**5872**	**5872**	**5872**	**5872**
Osage	Hydro	226	241	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256
Taum Sauk	Hydro	0	0	0	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440
Audrain	Gas	578	578	578	578	578	578	578	578	578	578	578	578	578	578	578	578	578	578	578
Fairgrounds	Oil	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Goose Creek	Gas	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432
Howard Bend	Oil	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Kinmundy	Gas/Oil	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230
Kirksville	Gas	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Meramec CTG	Gas/Oil	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107
Mexico	Oil	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Moberly	Oil	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Moreau	Oil	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Peno Creek	Gas/Oil	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188
Rickneyville	Gas	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320
Raccoon Creek	Gas	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Venice	Gas/Oil	499	499	499	499	499	499	524	524	524	524	524	524	524	524	524	524	524	524	524
Viaduct	Gas	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Total Intermediate/ Peaking Capacity		**3181**	**3196**	**3211**	**3651**	**3651**	**3651**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**	**3676**
New Resources																				
Wind		0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

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Table 8.3-3—AmerenUE's Total Generating Capacity – 20 Year Projection
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System Generation Capacity		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Intermittent Capacity		**0**	**0**	**0**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Existing Plant Upgrades	Mix	0	0	19	48	72	91	161	161	161	161	161	161	161	161	161	161	161	161	161
Renewables	Mix	0	0	0	30	30	83	83	86	161	164	164	167	205	243	243	281	284	284	287
Total New Generation		-	-	**19**	**78**	**102**	**174**	**244**	**247**	**322**	**325**	**325**	**328**	**366**	**404**	**404**	**442**	**445**	**445**	**448**
Total Generation Capacity		**9,909**	**9,994**	**9,978**	**10,475**	**10,499**	**10,571**	**10,666**	**10,669**	**10,744**	**10,747**	**10,747**	**10,750**	**10,788**	**10,826**	**10,826**	**10,010**	**10,013**	**10,013**	**10,016**
Firm Purchase		174	174	160																
Total Capability		**10,083**	**10,118**	**10,138**	**10,475**	**10,499**	**10,571**	**10,666**	**10,669**	**10,744**	**10,747**	**10,747**	**10,750**	**10,788**	**10,826**	**10,826**	**10,010**	**10,013**	**10,013**	**10,016**

Developed from AmerenUE's 2008 IRP Filing

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Table 8.3-4—AmerenUE's Historical Capacity Factor Information

Stations	2006	2005	2004	2003	2002
Steam Turbine					
Callaway	94.52	78.22	76.85	95.76	82.39
Rush Island 1	83.65	79.39	70.19	81.41	78.94
Rush Island 2	84.67	88.26	71.81	70.8	64.29
Labadie 1	90.1	87.92	85.76	86.55	64.03
Labadie 2	89.64	85.64	70.37	84.96	87.72
Labadie 3	82.31	88.15	90.63	66.02	83.23
Labadie 4	89.08	88.22	87.94	77.08	45.17
Sioux 1	79.22	68.01	80.02	65.05	78.52
Sioux 2	66.38	83.91	65.37	84.21	70.11
Meramec 1	82.25	85.83	70.44	75.1	61.92
Meramec 2	82.78	89.9	70.71	82.33	65.84
Meramec 3	65.11	79.08	78.09	60.3	49.02
Meramec 4	74.16	64.52	76.01	68.4	57.45
Hydro					
Keokuk (15 Units)	78.72	81.67	78.54	67.36	71.36 Note 1
Osage (8 Units)	3.69	27.86	36.17	9.75	22.15 Note 1
Pumped Storage					
Taum Sauk (2 Units)	0	15.65	17.71	19.15	15.61
Combustion Turbine					
Venice (Unit 1-5)	2.78	6.16 Note 2	0.46 Note 3	0.73 Note 3	0 Note 3
Howard Bend	0.03	0.05	0.04	0.09	0.35
Meramec (CTG-1 + CTG-2)	0.83	0.06	0.06	0.15	0.9
Fairgrounds	0.01	0.18	0.3	0.26	0.24
Mexico	0	0.06	0.26	0.23	0.09
Moberly	0.47	0.02	0.15	0.49	0.11
Moreau	0	0.05	0.24	0.22	0.22
Meramec CTG-2 (incl. w/CTG-1)					
Venice (Unit 2) (incl. w Venice 1)					
Peno Creek (Units 1-4)	5.68	9.11	1.73	2.48	3.73 Note 1
Kinmundy (Units 1-2) – Note 1	0.38	2.23	0.11	1.15	1.55
Venice (Units 3 & 4) (incl. w Venice 1)					
Venice (Unit 5) (incl. w Venice 1)					
Pinckneyville (Units 1-4)+((Units 5-8) – Note 1	3.22	4.4	1.75	2.19	4.57
Pinckneyville (Units 5-8) (incl. above)					
Kirksville	0.12	0	0	0	0
Viaduct	0	0	0	0	0
Audrain (Units 1-8) – Note 1	0.49	0.5	0	0	0.54
Raccoon Creek (Units 1-4) – Note 1	0.45	1.41	0	0.03	0.97
Goose Creek (Units 1-6) – Note 1	0.9	1.34	0.01	0.01	0

All data from MicroGads Gold- Performance Summary Reports (NCF) except where noted.

Note:

(1)Source: SNL

(2)Source: MicorGads Gold-Performance Summary Reports (NCF); Ven 1 & 2 all months; Ven 3 & 4 June – Dec; Ven 5 Oct – Dec

(3)Source: MicroGads Gold-Performance Summary Reports (NCF); Ven 1 & 2 Dec only

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Table 8.3-5—AmerenUE's Projected Unit Retirements

Station Unit	Net Capability (MW)		Fuel Type	Location	Next Retirement Study [(a)]	Decision Date	Estimated Retirement Date [(b)]
	Summer	Winter					
Meramec 1	120	127	Coal/NG	St. Louis County, MO	2009	Unknown	2021
Meramec 2	120	127	Coal/NG	St. Louis County, MO	2009	Unknown	2021
Meramec 3	267	276	Coal/NG	St. Louis County, MO	2009	Unknown	2021
Meramec 4	347	363	Coal	St. Louis County, MO	2009	Unknown	2021
Sioux 1	497	504	Coal	St. Charles County, MO		Unknown	2027
Sioux 2	497	504	Coal	St. Charles County, MO		Unknown	2027
Labadie 1	594	598	Coal	Franklin County, MO		Unknown	2033
Labadie 2	594	598	Coal	Franklin County, MO		Unknown	2033
Labadie 3	605	617	Coal	Franklin County, MO		Unknown	2033
Labadie 4	603	614	Coal	Franklin County, MO		Unknown	2033
Rush Island 1	580	595	Coal	Jefferson County, MO		Unknown	2037
Rush Island 2	580	595	Coal	Jefferson County, MO		Unknown	2037
Total	**5404**	**5518**					

Note:

[(a)]AmerenUE's 2008 IRP Filing – Section 4 CSR 240-22.070 (6)

[(b)]Mark C. Birk's Rebuttal Testimony January 31, 2007. MPSC Case No.: ER-2007-0002

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8.4 ASSESSMENT OF NEED FOR POWER

8.4.1 INTRODUCTION

This Section identifies the need for power within AmerenUE's service territory. The demand forecasts used in this assessment are discussed in more detail in Section 8.1 and 8.2. Section 8.4.3 provides an overview of the process AmerenUE utilized in the preparation of the IRP. Section 8.4.5 demonstrates the need for new baseload capacity.

8.4.2 RESERVE MARGIN CRITERIA

8.4.2.1 Background

Utilities require a margin of generating capacity reserve available to the system in order to ensure reliable service. Periodic scheduled outages are required to perform maintenance and inspections of generating plant equipment and to refuel nuclear plants. Unanticipated mechanical failures may occur at any given time that may require shutdown of equipment to repair failed components. Adequate reserve capacity must be available to accommodate these unplanned outages and to compensate for higher than projected peak demand due to forecast uncertainty and weather extremes. In addition, some capacity must also be available as operating reserve to maintain the balance between supply and demand on a real-time basis.

The amount of generating reserve needed to maintain a reliable power supply is a function of the unique characteristics of a utility system including load shape, unit sizes, capacity mix, fuel supply, maintenance scheduling, unit availabilities, and the strength of the transmission interconnections with other utilities. There is no one reserve margin that is appropriate for all systems since these characteristics are particular to each individual utility. However, many utilities and reserve sharing groups use the generally accepted industry standard of 0.1 day per year to the criteria applied using a Loss of Load Probability (LOLP) method. LOLP is not a probability, but an expected value, as indicated by its dimension – days per year. It is the summation of all the individual daily probabilities of having less capacity than load.

8.4.2.2 Mid-American Interconnected Network

Because of the interconnected and interdependent nature of the electric utility systems, reliability studies are usually conducted on an area-wide basis. Beginning in 1979, Mid-American Interconnected Network (MAIN) adopted the LOLP technique to perform reserve requirements analysis. In MAIN, reserve margin levels were set annually based on MAIN Guide 6 engineering studies.

The MAIN Guide 6 studies were based on calculations of Loss of Load Probability (LOLP) and Loss of Load Expectation (LOLE). The LOLE for a study year was the sum of daily LOLP values for each workday during the year. The adequacy criterion used by MAIN was an annual LOLE of no more than 0.1 day per year. A composite system size of MAIN times four (MAIN x 4) was used to represent MAIN and the neighboring interconnected systems. The studies assume that no transmission limitations to deliverability exist, either within MAIN or from neighboring systems. Transmission assessments were performed by MAIN in other studies.

The calculations considered the population of existing and future generation units, both those owned by utilities and those owned by independent power producers (IPPs), expected generator availability, firm and non-firm net scheduled imports, and the emergency support anticipated being available from other regions. They also consider load forecast uncertainty (LFU) at two levels: uncertainty attributable to weather conditions only and uncertainty due to all factors. The latter includes uncertainty due to economic conditions and random variability in

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addition to weather uncertainty. An LFU multiplier reflected some independence of load forecast uncertainties among regions.

Partial and complete forced outage data for the studies was generated by the North American Electric Reliability Council (NERC) Generation Availability Report (pc-GAR) program, which accesses the NERC Generator Availability Data System (NERC-GADS). The NERC-GADS database is populated with information from generating companies throughout the United States and Canada. The NERC-GADS program is recognized as the standard for the power generation industry with respect to unit availability and outage data reporting and tracking.

The LOLE program utilized for these studies considered forced outages of each generating unit to occur randomly, independent of the forced outages of all other units, and at a uniform rate through the year. Common mode outages, whether due to incidents such as tornadoes and floods affecting multiple units at a given site, failures of fuel supply affecting units at various sites, or even terrorism, were not considered. This is because (1) they occurred infrequently, and (2) the capacity at a single site is a small fraction of total regional reserves. Furthermore, the NERC-GADS data collection does not provide a basis for estimating the frequency and duration of such events for any site or class of generating units.

The most recent MAIN Guide 6 study was completed in September 2005 and covers the years 2005 through 2009 and 2014. (MAIN, 2005) The Guide 6 Working Group recommended that the planning reserve margin remain at a minimum of 14.16% for the short-term (up to one year ahead). The Working Group further recommended that the planning reserve margin be reduced to a range of 15% to 18% for long-term resource planning and assessment.

8.4.2.3 Midwest Planning Reserve Sharing Group

In 2005, members dissolved MAIN and AmerenUE joined SERC Reliability Council (SERC). SERC does not perform Long-Term Reliability Studies. Instead, SERC defers to states and the utilities to determine and set the appropriate reserve margin. The Midwest Planning Reserve Sharing Group (Midwest PRSG) is a group of Load Serving Entities (LSE) which are located within or directly interconnected to the Midwest ISO Reliability Authority Footprint. Officially formed in May of 2007, the group set out to study the collective resources of the Midwest PRSG participants to determine the minimum level of reserve requirements based upon reliability principles and standards.

The Midwest PRSG contracted the Midwest ISO to act as the Group Administrator in May of 2007. At the direction of the Midwest PRSG, the Midwest ISO conducted the Loss of Load Expectation (LOLE) Study for the Midwest PRSG, determined each participant's Forecast Participant Requirement, and gathered any applicable data from each participant.

The adequacy criterion used by the Midwest PRSG is an annual LOLE of no more than 0.1 day per year. The first Midwest PRSG LOLE study was completed in March 2008 and covers the years 2008 through 2009. (MIDWEST PRSG, 2008) The Midwest PRSG LOLE study group recommended that the planning reserve margin for the central area be set at 14.3% for short-term resource planning and assessment. Since the Midwest PRSG long-term LOLE analysis is under study, the planning reserve margin for the long-term will be provided later after the long-term study is done.

AmerenUE's short term reserve margin is set based on the Midwest Planning Reserve Sharing Group (Midwest PRSG) short-term LOLE study. As approved by the Midwest PRSG, AmerenUE uses a 14.3% short-term planning reserve margin to meet any system contingencies related to either extreme weather or forced outages of generating plants. As a member of the Midwest

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PRSG, AmerenUE is obligated secure resources and demonstrate compliance in satisfying the 14.3% planning to reserve. Since the Midwest PRSG long-term (2 to 9 years) LOLE analysis has not been completed, AmerenUE bases its long-term planning reserve margin on the results of the MAIN Guide 6 LOLE studies, which is 17%. Table 8.4-5 details AmerenUE's historical reserve margins during the summer and winter peak demand for the years 1993 through 2007.

8.4.3 AMERENUE'S PLANNING PROCESS

AmerenUE is required to follow the state of Missouri's "Electric Utility Resource Planning" Code of State Regulation (CSR 240-22). The Missouri Public Services Commission's policy goal in promulgating this chapter is to set minimum standards to govern the scope and objectives of the resource planning process that is required of electric utilities subject to its jurisdiction in order to ensure that the public interest is adequately served.

The code requires that the fundamental objective of the resource planning process shall be to provide the public with energy services that are safe, reliable and efficient, at just and reasonable rates, in a manner that serves the public interest. This objective requires that the utility shall:

1. Consider and analyze demand-side efficiency and energy management measures on an equivalent basis with supply-side alternatives in the resource planning process;

2. Use minimization of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan; and

3. Explicitly identify and, where possible, quantitatively analyze any other considerations which are critical to meeting the fundamental objective of the resource planning process, but which may constrain or limit the minimization of the present worth of expected utility costs. The utility shall document the process and rationale used by decision makers to assess the tradeoffs and determine the appropriate balance between minimization of expected utility costs and these other considerations in selecting the preferred resource plan and developing contingency options. These considerations shall include, but are not necessarily limited to, mitigation of:

    a. Risks associated with critical uncertain factors that will affect the actual costs associated with alternative resource plans;

    b. Risks associated with new or more stringent environmental laws or regulations that may be imposed at some point within the planning horizon; and

    c. Rate increases associated with alternative resource plans.

8.4.3.1 Overview of Planning Process

The integrated resource planning process AmerenUE follows is derived from MO CSR 240-22. The basic steps are:

1. Develop an econometric-based load forecast;

2. Develop an inventory or database of costs and operating characteristics of existing supply-side and demand-side resources, as well as assumptions regarding inputs such as capital and operating costs and operating characteristics of new supply-side and

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demand-side resource options, including fuel and emission allowance price projections;

3. Use screening curves to identify the most cost effective, technologically available, supply-side options;

4. Screen demand-side options based on their cost, availability, expected saturation levels, and expected energy savings;

5. Use the screening results to develop potential resource portfolios to test in the detailed analyses;

6. Perform detailed analyses on the portfolios with a variety of sensitivity analyses around varying inputs such as expected future fuel prices, capital costs, future environmental regulations, load sensitivities, and other variables; and

7. Use appropriate combinations of candidate demand-side and supply-side resources to develop a set of alternative resource plans, each designed to meet objectives in terms of cost, reliability, safety, regulatory constraints, risks, and uncertainties.

In summary, the Missouri CSR 240-22 integrated resource planning process provides a framework for AmerenUE to assess, analyze, and implement a cost-effective plan to reliably meet customers' growing energy needs.

8.4.3.2 Planning Assumptions

Customer load growth, the expiration of a purchased power contract, and aging coal units results in significant resource needs to meet energy and peak demands, based on the following assumptions:

- 1.4% average summer peak system demand growth over the next 20 years;
- Generation reductions of more than 160 MWe due to purchased power contract expirations by 2011;
- Generation retirements of approximately 850 MWe of older coal units;
- Approximately 20 MWe reductions due to application of new environmental equipment;
- Continued operational reliability of existing generation portfolio; and
- Using a 17% target planning reserve margin for the planning horizon.

8.4.3.3 Identify and Screen Resource Options for Further Consideration

Resource options to meet power demand reflect a diverse mix of technologies and fuel sources (gas, coal, nuclear, and renewable) as well as near-term and long-term timing and availability. Supply-side and DSM options are initially screened based on the following attributes:

- Technically feasible and commercially available in the marketplace;
- Compliant with all federal and state requirements;

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- Long-run reliability; and
- Cost parameters.

Capacity options were compared within their respective fuel types and operational capabilities, with the most cost-effective options being selected for inclusion in the portfolio analysis phase. DSM options should also cover multiple customer segments including residential, commercial, and industrial.

8.4.3.4 Resource Options

8.4.3.4.1 Supply-Side

AmerenUE conducted an exhaustive supply-side analysis. A two-step, iterative process was used for identification and data collection. The first pass identified the "universe" of potential supply-side resource options followed by high-level data gathering. The "universe" of options and the associated data were passed to a qualitative screening process to narrow the list. The qualitative screening was based on each option's technical feasibility, resource maturity, reliability, and cost. The second pass collected detailed data on the options passing the qualitative screening. Using the detailed data, the resources were screened again using the calculated levelized costs of ownership (LCOE), sometimes referred to as "busbar cost." The result of the LCOE screening was a ranking of options and list of candidate resource options. The resulting list of candidate resources options were passed to the "Integration Analysis" to be evaluated with demand-side portfolios. Below is the list of candidate resource options from AmerenUE's 2008 IRP.

Fossil Fuels:

- Advanced Supercritical Pulverized coal;
- Natural gas combined-cycle with duct firing and inlet cooling;
- Natural gas simple-cycle combustion turbines; and
- Integrated Coal Gasification Combined Cycle (IGCC).

Nuclear:

- Evolutionary Power Reactor (EPR)

Renewable:

- Wind;
- Biomass Combustion – Standalone;
- Biomass Combustion – Co-firing;
- Land Fill Gas (LFG) – Reciprocating Engine; and
- LFG – Combustion Turbine.
- Hydroelectric – Run of River

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Recent legislative action in Missouri encourages development of renewable energy resources. Missouri Senate Bill 54 (SB 54) "Green Power Initiative," which was signed in June 2007 by the governor of Missouri, sets "Green Power" energy "targets" of 4% of total retail electric sales from certain renewable energy technologies by 2012; 8% of total retail electric sales by 2015; and 11% of total retail electric sales by 2020. Gains from energy efficiency programs can be used to meet these targets. In addition, electricity generation from renewable sources prior to August 28, 2007, may be counted toward the targets, provided they continue to be used.

The renewable resources that passed the LCOE screening were bundled into portfolios using various combinations and levels. The Low and the Moderate Renewable Portfolios were designed to meet Missouri Senate Bill 54 (SBSH) requirements. The High and All Wind Renewable Portfolios were designed to significantly exceed the SB 54 targets. The High Renewable Portfolio was designed to achieve 20% of total retail electric sales from renewable technologies by 2020. Below is the list of renewable portfolios used in the "Integration Analysis." Table 8.4-3 details the resources, MW, and MWH for each renewable portfolio by year.

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- High Renewable Portfolio;
- All Wind Renewable Portfolio;
- Moderate Renewable Portfolio;
- Low Renewable Portfolio with Wind (including consideration of DSM);
- Low Renewable Portfolio without Wind (including consideration of DSM); and
- No additional Renewable Resources.

Power Purchase Agreements (PPA)

During the Integrated Resource Planning process, AmerenUE initiated a solicitation of proposed resource options from outside parties who have or could be developing supply side resources that would be of benefit to AmerenUE. The Request For Interest (Request) was issued to solicit information on capacity and energy sources that can be used by AmerenUE to satisfy its reserve and load serving obligations starting in approximately 2014. Options were solicited for providing peaking, intermediate, and base load type operations.

In order to achieve a solicitation process that was both transparent and independent, AmerenUE engaged Burns & McDonnell (B&Mc) to develop the Request and administer the process. On behalf of AmerenUE, B&Mc posted announcements on various industry web pages and emailed the Request directly to the bidders that expressed interest. B&Mc received, opened, and screened the proposals. The solicitation and evaluation was done in private without input from AmerenUE. After confirming proposals, B&Mc performed a busbar analysis using levelized cost comparisons of the various offers.

The Request was developed to solicit brief descriptions of proposed resource options and information from parties who may have developed or might be developing supply-side resources that would be of benefit to AmerenUE. The Request sought only indicative offers and pricing terms and it was issued on June 1, 2007. Information submittals were due on July 13, 2007.

No proposals were received for peaking and intermediate plants. Two responses were received for traditional pulverized coal plants being developed in the area. During the analysis,

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additional information was requested from one of the bidders about emissions, inflation, and other factors. In addition, information was requested about additional capacity that might be available from the plant. The response from inquiry indicated the offer was withdrawn.

> "Equity participation in the project is sold out. Regarding potential PPA sales, we do not desire to negotiate for such services in a quasi-public forum. Therefore we do not intend to submit any additional information."

The second offer was for a greenfield advanced supercritical coal plant. Below were the major issues associated with the project:

1. Due to the early status of development for this project, the cost values were considered subject to change as the plant is developed. Contingency expected due to construction cost escalation and other financing assumptions were included in the offer.

2. The project site is controlled under an exclusive option to purchase with the local landowners for the entire 500 acre (202 hectare) project site. Burns & McDonnell considers the 500 acres (202 hectares) to be small for a coal plant of this size. Typical site area allocations by Burns & McDonnell for a facility of this size are approximately 850 acres (344 hectares). The impacts of a small site could be manifested in smaller coal reserves, less property for ponds and ash disposal areas, and isolation from neighbors, prompting noise and dust emission complaints.

3. The project was in the early stages of development. No permitting or transmission study final results are available. Any costs associated with the transmission system improvements necessary for full delivery to the MISO market could increase the indicative costs.

4. The plant site had rail delivery from two rail companies. The plant is expected to be fired on Powder River Basin fuel. The fuel deliverability and pricing would have typical uncertainties for this fuel as in other plants being considered in the IRP.

AmerenUE decided that evaluating the self-build greenfield advanced supercritical coal costs with full and partial ownership was representative of this second offer as well as the greenfield coal plant. If coal technology was selected as part of the preferred resource plan, AmerenUE would have had further discussions with the bidder before determining the specific approach of building a plant versus a power purchase agreement.

Due to receiving only two offers (one of which was withdrawn), there appears to be minimal interest from independent power producers to supply long-term power at this time. With all the environmental and regulatory uncertainty, it is not anticipated that the situation will change in the foreseeable future.

8.4.3.4.2 Demand-Side Management

AmerenUE's demand-side planning process includes a detailed analysis process that included the economic screening of close to 865 energy efficiency measures, a review of utility program design best practices, and a formal uncertainty and risk analysis. This process is described in more detail in the following steps:

- ♦ Assembly of a list of viable energy efficiency measures for all customer classes and multiple building/industry types. The primary source for the measure list was the Database for Energy Efficiency Resources (DEER) developed and maintained by the

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California Energy Commission. This database is a nationally recognized source for such information.

- Collection of energy savings and cost information from each measure. The primary source for non-weather-sensitive measure data was the DEER database. The energy savings associated with measures that are weather-sensitive were estimated by ICF International using a widely used and accepted freeware building energy analysis program that can predict the energy use and cost for all types of buildings, DOE-2.
- Economic screening of the measures using the Company's avoided electric costs inclusive of an estimate of the cost of carbon (estimated at $15 per ton beginning in 2012 and rising at 7.5% per year). This screening process was based on the probable environmental cost test as defined by the rule.
- Bundling measures that passed the screening process into logical program "elements," such as residential lighting and appliances, commercial prescriptive incentives, etc.
- Expanding these basic program elements into program templates that describe program element structure, recruiting, implementation, incentive, administrative, and evaluation strategies.
- Collection of program element data such as incentive levels; administrative, marketing, and implementation costs; and participation estimates.
- Screening the program elements for cost-effectiveness using the total resource cost test and utility cost test with the ICF International portfolio analysis model.
- Adjusting individual program participation estimates to achieve portfolio balance.

Once program elements were screened, those programs passing the Total Resource Cost (TRC) test were passed to the portfolio construction and screening stage. This stage was designed to allow adjustment in the participation levels and program element budgets, including budgets for cross-cutting activities (such as education, awareness building, training, evaluation and management) such that the total portfolio estimated energy savings, demand reduction and spending targets would be met. In addition, this step was guided by objectives to establish a foundation for subsequent years, create consumer value, and ensure portfolio diversity across end uses and customer classes.

The process of developing the final portfolio was necessarily iterative, as program element participation rates and costs were adjusted to yield a mix of program elements satisfying not only the statutory savings and spending constraints, but AmerenUE's overall portfolio design goals and stakeholder concerns as well. Initially, the portfolio model was run with baseline assumptions regarding the rate of customer participation and energy and demand impacts and costs were calculated accordingly. Participation was then adjusted to yield a variety of alternative portfolios with different trajectories for savings and costs. Following discussions with stakeholders, two final portfolios were agreed to, labeled Moderate and Aggressive. Section 8.2 details the programs, savings, and expenditures for the Aggressive Demand-Side Portfolio.

8.4.3.5 Develop Alternative Resource Plans

AmerenUE developed a set of approximately 110 resource plans from the breadth of candidate generating technology, demand-side management (DSM) portfolios, and renewable portfolio

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options. The primary objective used in designing the alternative plans is to provide the public with energy services that are safe, reliable and efficient, at just and reasonable rates, in a manner that serves the public interest.

Some other objectives given consideration were the following:

- Minimizing risks associated with critical uncertain factors that will affect the actual costs associated with alternative resource plans;
- Minimizing risks associated with new or more stringent environmental laws or regulations that may be imposed at some point within the planning horizon; and
- Minimizing rate increases associated with alternative resource plans.

Some supplemental, but not independent, objectives include:

- Provide customer program choices
    - Provide all customer classes with an array of options to assist them in using electricity more efficiently
    - Promote emerging technologies
- Seek energy efficiency and renewable resources first
    - Exhaust cost effective demand-side and renewable resource options prior to constructing new baseload capacity
    - Lead by example by pursuing efficiency improvements in the generation and energy delivery (ED) business lines
- Strengthen customer service
    - Actively engage hard-to-reach customer groups
    - Act as a partner with customers rather than simply a provider of a commodity
    - An educated consumer is our best customer
- Minimize environmental impact (stewardship)
    - Increasing the efficiency of our system and reducing customer demand lessens the need for new capacity
    - Reduce/recycle combustion by-products
- Balance risk among stakeholders
    - Pursue demand-side options as a way to mitigate long-term risk exposure
    - Demand-side options place some ownership on stakeholders and help send proper price signals to customers

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AmerenUE created a total of 110 different alternative resource plans reflecting various combinations of demand-side resources portfolios, renewable resources portfolios, upgrades to existing plants, and candidate resource options. The alternative resource plans were designed to meet the resource planning objectives outlined above. Recognizing that different generation plans expose customers to different sources and levels of risk, a variety of alternative resource plans were developed to assess the impact of various risk factors on the costs to serve customers. All plans were designed to meet the 17% planning reserve margin. Details are provided in Table 8.4-4 for the 18 plans that ranked the best during the Integration Analysis.

8.4.4 RISK ANALYSIS

AmerenUE used a classic decision-analysis process to analyze critical, uncertain factors affecting potential resource plans. In addressing a range of risks in today's energy environment, AmerenUE explored each risk individually and in relation to each other. A battery of analyses was applied to all risk factors and a decision tree was developed with probabilities for each of these factors—some independent and some dependent.

Market risks and regulatory issues remain high on the list of risk factors – these involve the likelihood that there will be mandated reductions for CO_2 and high fuel costs. In particular, natural gas is subject to the kind of price volatility that makes it high risk.

A range of other key risk factors were also considered:

- Rising capital costs and interest rates;
- Greater outage rates for generating units;
- Variable and fixed operating and maintenance costs;
- The possibility that federal incentives for developing nuclear power or renewable power might not be available in the future impacting the development of renewable energy sources;
- The drop or rise of the market price for electricity which would affect interchange sales; and

Uncertainties related to public acceptance of energy efficiency programs.

<u>Climate Warming</u>

Of all the risks, the need to reduce greenhouse gases from generating plants has the most pervasive impact on long-term resource planning. Because the U.S. economy is based on carbon, reducing greenhouse gases will require completely new thinking, still undiscovered technologies, and massive new levels of investment. From extensive economic modeling, it is evident that reducing CO_2 emissions will have a significant impact on jobs, lifestyles and the economy, as well as the environment. Even with meaningful reductions in energy consumption, consumers will face higher costs for everything from energy to household goods. The economic stakes — particularly for the region AmerenUE serves — are enormous. There is no single answer to this challenge. It will require a portfolio of solutions from new emission technologies to energy-efficiency programs to renewable resources to carbon capture-and-storage initiatives to increased nuclear generation.

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Energy Efficiency Success Depends on Acceptance

In the end, the success and effectiveness of our proposed energy efficiency programs depends upon our customers' willingness to participate. While AmerenUE has worked with stakeholders to design an effective portfolio of programs to reduce energy demand, extensive customer awareness will be required to build broad participation and to attempt to change the behavior of customers who have continued to use more and more electricity each year because the price of electricity in Missouri remains very low compared to the power prices of other regions. AmerenUE seeks to actively demonstrate to our customers the benefits of these various energy efficiency programs to help reduce consumption.

Federal Production Tax Credit Essential

Renewable energy reduces vulnerability to fuel price increases and is, in some cases, non-emitting, but it is still more costly than most other generation options. For these reasons, renewable energy – including hydroelectric power – only accounts for about 8% of the nation's generation—1% of that from wind. However, supporting the development of renewable energy, particularly wind, is a federal production tax credit (PTC), which provides a 1.9-cent per kilowatt-hour (kWh) benefit for the first 10 years of a renewable energy facility's operation.

8.4.5 THE NEED FOR BASELOAD CAPACITY

AmerenUE's planned capacity has to meet the forecast energy and demand load as well as its planning reserve margin of 17% (see Section 8.4.2). Based on current forecasts, in order to meet this projected need, AmerenUE will require the additional energy capacity as detailed in Table 8.2-3, AmerenUE Peak Load and Energy Annual Forecasts. As this table indicates, the load in AmerenUE's service territory grows by 959 MWe by 2018, 1200 MWe by 2020, and 1800 MWe by 2025. As Illustrated by Table 8.4-1 and Table 8.4-2, there is a need for at least 1600 MWe of electric power generation over the planning period (through 2025). This generation needs to be added starting in 2018 in order to maintain Actual Reserve Margin above the Planning Reserve Margin of 17%.

The last baseload plant added to AmerenUE's generation fleet was Callaway Plant Unit 1 which began operating in 1984. It has been over 20 years since AmerenUE has built any base load plants. As discussed in Section 8.3.2, the last coal units to come online were located at Rush Island and these units were placed in service in 1976 and 1977. Because AmerenUE's coal baseload power plants range in age from 31 to 55 years, the company must look at unit retirement or mothballing for units that may be too inefficient to operate in a carbon-constrained environment. The current planning assumption is that the Meramec Plant would be retired in 2021 at the approximate age of 63 years. Our plans call for continued analysis of existing generating units that, depending on the scenario for reducing air emissions, particularly CO_2, would require upgrades that are so costly it would be difficult to justify their continued operation.

Although AmerenUE's IRP process does not break the forecast into baseload, intermediate, and peaking needs, it evaluates approximately 110 alternative resource plans that evaluate the addition of various combinations of generating units. Thus, the IRP seeks to select the best portfolio to serve the total capacity and energy needs. The models analyze the costs of serving the forecasted energy in each hour of the 20-year planning horizon. This method ensures the optimal resource mix is selected to serve customers reliably and at the lowest reasonable cost with consideration of risk associated with critical uncertainties.

In the modeling and sensitivity analysis, the approach to choosing the best plans to meet the projected need was to test a series of alternative resource plans against the various

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combinations of forecast sensitivities. The quantitative and qualitative analyses suggest that a combination of additional energy efficiency, renewable resources, and base load generation is the optimal mix of resources of the next 20 years. New nuclear capacity additions are attractive supply-side options under a variety of sensitivities and scenarios. Both conservation and demand response programs play important roles in the development of a balanced, cost-effective portfolio. Renewable generation alternatives are also necessary now that the Missouri Legislature has passed the "Green Power Initiative." In light of these analyses, as well as the public policy debate on energy and environmental issues, AmerenUE has developed a strategy to ensure that the Company can meet customers' energy needs reliably and economically while maintaining flexibility pertaining to long-term resource decisions.

8.4.5.1 AmerenUE's Preferred Resource Plan

Energy Efficiency – AmerenUE has set a demand reduction goal of 530 MWe by 2025, implemented through energy efficiency programs. Strong support for energy efficiency initiatives will not only benefit the environment but provide an economic boost through the creation of jobs in "green" energy industries, like the development and growth of businesses focused on selling energy efficient appliances, providing highly efficient industrial processing equipment or weatherizing homes and commercial operations.

Expansion of Existing Renewable Generation - In addition, AmerenUE has a target to serve an additional 3% of retail electric sales through new renewable resources by 2020. The plan calls for expanding the role of renewable energy sources in our overall power generation mix, which means not only the development of renewable energy sources, but also increased hydroelectric generation capacity through upgrades at AmerenUE's Osage and Keokuk plants. The company is exploring the viability of other renewable energy sources, including solar power, biomass, landfill gas, and wind power.

Continue To Increase Unit Efficiency - The plan also factors in a continued commitment to increased generating unit efficiency. Over the years, while AmerenUE has focused heavily on making all operations more efficient, continued improvements at existing plants are expected to yield AmerenUE approximately of 90 to 200 MWe of additional capacity. That would bring total AmerenUE capacity, which stands now at 9,957 MWe, above 10,000 MWe (current capacity is at 9,957 MWe).

Unit Retirement Expected - In 2009, the company will complete an analysis that will indicate which generating units in AmerenUE must be retired. The IRP indicates the Meramec plant is a likely candidate for retirement.

Exploring Technologies To Reduce Carbon – AmerenUE's analysis clearly shows that developing reliable electricity supplies for Missouri customers will eventually require development of baseload power plants – the estimated time frame for that is 2018 to 2020. For that reason, AmerenUE will continue researching clean coal and carbon sequestration technologies. In addition, AmerenUE will continue to explore and test innovative new technologies for reducing emissions, particularly CO2.

Commitment to Environmental Stewardship - AmerenUE's preferred retrofit installation plan is as follows:

- Wet Flue Gas Desulfurization (FGD) – Sioux 1 & 2 in 2010
- Halogenated Activated Carbon Injection System – Meramec 3 & 4 in 2015

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- Halogenated Activated Carbon Injection System – Rush Island 1 & 2 in 2015
- Halogenated Activated Carbon Injection System – Labadie 1 – 4 in 2015

Summary of conclusions based on the quantitative and qualitative analyses are:

- The new level of DSM is cost-effective for customers. In every scenario and sensitivity, the alternative resource plans with a very aggressive level of new DSM were lower cost than the portfolios with the existing levels of DSM. AmerenUE's preferred demand-side management is an aggressive portfolio that targets capacity savings of 400 MWe by 2018, 450 MWe by 2020, and 530 MWe by 2025.
- Additional renewable resources will be needed to meet the new Missouri "Green Power Initiative." AmerenUE's preferred renewable resource portfolio adding various types of renewable generation that will contribute 170 MWe by 2018, 240 MWe by 2020, and 290 MWe by 2025.
- Continue to pursue an additional 161 MWe of potential upgrades from existing units.
- The addition of combined-cycle capacity provides additional flexibility and hedging capability
- AmerenUE does not have any combined cycle units (CCs) in its current resource mix
- AmerenUE has a site with Simple Cycle Gas Turbine (SCGT) that were designed and developed to be converted to CC. Continuing to pursue regulatory approval of new nuclear facilities is prudent - under Carbon Case conditions, the portfolios with nuclear capacity perform well.

AmerenUE's 2008 Integrated Resource Planning analysis indicated a resource plan with aggressive demand-side programs, renewable resources, existing plant upgrades, and a nuclear baseload plant in the 2018 to 2020 timeframe is the lowest cost resource combination which meets forecasted load growth. This combination of these resources yielded the overall lowest risk exposure and lowest rate increases for AmerenUE's customers.

8.4.6 SUMMARY AND CONCLUSIONS

AmerenUE IRP process demonstrates the need for the capacity to be provided by Callaway Plant Unit 2.

8.4.7 REFERENCES

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Table 8.4-1—Preferred Resource Plan Capacity Position with Nuclear Plant

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Peak Demand																		
Retail	8511	8619	8724	8831	8932	9043	9149	9258	9360	9483	9602	9722	9833	9959	10080	10203	10320	10461
Wholesale	132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
System Peak Load	8643	8619	8724	8831	8932	9043	9149	9258	9360	9483	9602	9722	9833	9959	10080	10203	10320	10461
DSM	-43	-107	-131	-162	-194	-230	-265	-298	-332	-367	-402	-427	-450	-468	-484	-499	-513	-527
Voltage Reduction	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75
Firm Obligation	8525	8438	8518	8594	8663	8738	8809	8884	8953	9042	9125	9219	9308	9416	9520	9628	9732	9859
Total Supply Resources																		
Existing																		
Callaway	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190
Fossil Steam	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	4550	4550	4550	4550
Combustion Turbine & Diesel Generation	2955	2955	2955	2955	2955	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980
Hydro Plant Generation	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
Pumped Storage Generation	0	0	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440
Approved Generation Upgrades	35	50	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Approved Generation Additions	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Firm Purchase	174	160																
New, Addition, and Plant Upgrades																		
EPR 1600													1600	1600	1600	1600	1600	1600
Renewable Portfolio			30	30	83	83	86	161	164	164	167	205	243	243	281	284	284	287
Existing Plants Upgrades		19	48	72	91	161	161	161	161	161	161	161	161	161	161	161	161	161
Total Capability	10118	10138	10475	10499	10571	10666	10669	10744	10747	10747	10750	10788	12426	12426	11610	11613	11610	11616
Actual Reserve Margin	18.7%	20.2%	23.0%	22.2%	22.0%	22.1%	21.1%	20.9%	20.0%	18.9%	17.8%	17.0%	33.5%	32.0%	22.0%	20.6%	19.3%	17.8%
Planning Reserve Margin	14.3%	14.3%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
New Construction for Required Reserve (+) / Surplus (-)	-374	-494	-510	-444	-436	-443	-363	-350	-272	-169	-74	-2	-1536	-1409	-472	-348	-227	-81

Notes: Reserves = Total Supply Resources – Firm Obligations.

Reserve Margin = Reserves/Firm Obligations *100

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Table 8.4-2—Preferred Resource Plan Capacity Position without Nuclear Plant

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Peak Demand																		
Retail	8511	8619	8724	8831	8932	9043	9149	9258	9360	9483	9602	9722	9833	9959	10080	10203	10320	10461
Wholesale	132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
System Peak Load	8643	8619	8724	8831	8932	9043	9149	9258	9360	9483	9602	9722	9833	9959	10080	10203	10320	10461
DSM	-43	-107	-131	-162	-194	-230	-265	-298	-332	-367	-402	-427	-450	-468	-484	-499	-513	-527
Voltage Reduction	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75
Firm Obligation	8525	8438	8518	8594	8663	8738	8809	8884	8953	9042	9125	9219	9308	9416	9520	9628	9732	9859
Total Supply Resources																		
Existing																		
Callaway	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190
Fossil Steam	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	5404	4550	4550	4550	4550
Combustion Turbine & Diesel Generation	2955	2955	2955	2955	2955	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980	2980
Hydro Plant Generation	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
Pumped Storage Generation	0	0	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440
Approved Generation Upgrades	35	50	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Approved Generation Additions	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Firm Purchase	174	160																
New, Addition, and Plant Upgrades																		
EPR 1600																		
Renewable Portfolio			30	30	83	83	86	161	164	164	167	205	243	243	281	284	284	287
Existing Plants Upgrades		19	48	72	91	161	161	161	161	161	161	161	161	161	161	161	161	161
Total Capability	10118	10138	10475	10499	10571	10666	10669	10744	10747	10747	10750	10788	10826	10826	10010	10013	10013	10016
Actual Reserve Margin	18.7%	20.2%	23.0%	22.2%	22.0%	22.1%	21.1%	20.9%	20.0%	18.9%	17.8%	17.0%	16.3%	15.0%	5.1%	4.0%	2.9%	1.6%
Planning Reserve Margin	14.3%	14.3%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
New Construction for Required Reserve (+) / Surplus (-)	-374	-494	-510	-444	-436	-443	-363	-350	-272	-169	-74	-2	64	191	1128	1252	1373	1519

Notes: Reserves = Total Supply Resources – Firm Obligations.

Reserve Margin = Reserves/Firm Obligations *100

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Table 8.4-3—Renewable Portfolios
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		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Wind Only Case																			
Cumulative Capacity by Technology																			
Landfill Gas	(MW)																		
Wind – Tranche 1	(MW)			100	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Wind – Tranche 2	(MW)							300	300	300	300	300	300	300	300	300	300	300	300
Wind – Tranche 3	(MW)											600	900	1200	1200	1200	1200	1200	1200
Biomass	(MW)																		
Hydro	(MW)																		
Solar	(MW)																		
Existing Renewables and 100 MWe Wind Purchase in 2010	(MW)	391	391	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491
Rated Capacity	**(MW)**			**100**	**300**	**300**	**300**	**600**	**600**	**600**	**600**	**1200**	**1500**	**1800**	**1800**	**1800**	**1800**	**1800**	**1800**
Effective Capacity	**(MW)**			**20**	**60**	**60**	**60**	**120**	**120**	**120**	**120**	**240**	**300**	**360**	**360**	**360**	**360**	**360**	**360**
Estimated New Renewable Generation	**(GWh)**			**289**	**867**	**867**	**867**	**1787**	**1787**	**1787**	**1787**	**3837**	**4862**	**5887**	**5887**	**5887**	**5887**	**5887**	**5887**
Percentage of AmerenUE Retail Sales	**(%)**			**0.7**	**2.2**	**2.1**	**2.1**	**4.3**	**4.2**	**4.1**	**4.1**	**8.7**	**10.9**	**12.9**	**12.8**	**12.6**	**12.5**	**12.3**	**12.2**
New Renewable Generation Required (Low Case)	**(GWh)**			**0**	**0**	**0**	**11**	**33**	**1755**	**1804**	**1847**	**1894**	**1942**	**3359**	**3417**	**3483**	**3550**	**3623**	**3687**
New Renewable Generation Required (High Case)	**(GWh)**			**0**	**0**	**0**	**837**	**1709**	**2604**	**3528**	**4464**	**5431**	**6422**	**7450**	**7557**	**7676**	**7798**	**7932**	**8047**
Existing Renewable + 100 MWe Wind Percentage of UE Retail Sales	**(%)**					**4.0**	**4.0**	**3.9**	**3.9**	**3.8**	**3.8**	**3.7**	**3.7**	**3.6**	**3.6**	**3.5**	**3.5**	**3.4**	**3.4**
Total Renewable Percentage of UE Retail Sales	**(%)**					**6.1**	**6.1**	**8.2**	**8.1**	**8.0**	**7.9**	**12.4**	**14.5**	**16.6**	**16.4**	**16.2**	**16.0**	**15.7**	**15.5**

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Table 8.4-3—Renewable Portfolios
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		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Moderate Case																			
Cumulative Capacity by Technology																			
Landfill Gas	(MW)			30	30	33	33	36	36	39	39	42	45	48	48	51	54	54	57
Wind – Tranche 1	(MW)			100	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Wind – Tranche 2								300	300	300	300	300	300	300	300	300	300	300	300
Wind – Tranche 3																			
Biomass	(MW)												35	70	70	105	105	105	105
Hydro	(MW)					50	50	50	125	125	125	125	125	125	125	125	125	125	125
Solar	(MW)																		
Existing Renewables and 100 MWe Wind Purchase in 2010	(MW)	391	391	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491
Rated Capacity	**(MW)**			**130**	**330**	**383**	**383**	**686**	**761**	**764**	**764**	**767**	**805**	**843**	**843**	**881**	**884**	**884**	**887**
Effective Capacity	**(MW)**			**50**	**90**	**143**	**143**	**206**	**281**	**284**	**284**	**287**	**325**	**363**	**363**	**401**	**404**	**404**	**407**
Estimated Renewable Generation	**(GWh)**			**539**	**1117**	**1470**	**1470**	**2415**	**2908**	**2933**	**2933**	**2958**	**3237**	**3517**	**3517**	**3796**	**3821**	**3821**	**3846**
Percentage of AmerenUE Retail Sales	**(%)**			**1.4**	**2.8**	**3.6**	**3.6**	**5.8**	**6.8**	**6.8**	**6.7**	**6.7**	**7.2**	**7.7**	**7.6**	**8.1**	**8.1**	**8.0**	**7.9**
New Renewable Generation Required (Low Case)	**(GWh)**			**0**	**0**	**0**	**11**	**33**	**1755**	**1804**	**1847**	**1894**	**1942**	**3359**	**3417**	**3483**	**3550**	**3623**	**3687**
Low Case w DSM w Wind																			
Cumulative Capacity by Technology																			
Existing Renewables and 100 MWe Wind Purchase in 2010	(MW)	391	391	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491
Landfill Gas	(MW)																		
Wind – Tranche 1	(MW)								150	150	150	150	150	150	150	150	150	150	150
Wind – Tranche 2														300	300	300	300	300	300
Wind – Tranche 3																			

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Table 8.4-3—Renewable Portfolios
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		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Biomass	(MW)																		
Hydro	(MW)																		
Solar	(MW)																		
Rated Capacity	**(MW)**			**0**	**0**	**0**	**0**	**0**	**150**	**150**	**150**	**150**	**150**	**450**	**450**	**450**	**450**	**450**	**450**
Effective Capacity	**(MW)**			**0**	**0**	**0**	**0**	**0**	**30**	**30**	**30**	**30**	**30**	**90**	**90**	**90**	**90**	**90**	**90**
Estimated Renewable Generation	**(GWh)**			**0**	**0**	**0**	**0**	**0**	**434**	**434**	**434**	**434**	**434**	**1353**	**1353**	**1353**	**1353**	**1353**	**1353**
Percentage of AmerenUE Retail Sales	**(%)**			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**3.0**	**2.9**	**2.9**	**2.9**	**2.8**	**2.8**
New Renewable Generation Required (Low Case W DSM)	**(GWh)**			**0**	**0**	**0**	**0**	**0**	**553**	**408**	**252**	**96**	**0**	**1291**	**1239**	**1208**	**1192**	**1189**	**1177**
High Case																			
Cumulative Capacity by Technology																			
Existing Renewables and 100 MWe Wind Purchase in 2010	(MW)	391	391	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491
Landfill Gas	(MW)			30	30	33	33	36	36	39	39	42	45	48	48	51	54	54	57
Wind – Tranche 1	(MW)			100	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Wind – Tranche 2								300	300	300	300	300	300	300	300	300	300	300	300
Wind – Tranche 3												600	800	1000	1000	1000	1100	1100	1100
Biomass	(MW)							70	70	140	175	175	175	175	175	175	175	175	175
Hydro	(MW)					50	50	50	125	125	125	125	125	125	125	125	125	125	125
Solar	(MW)																		
Rated Capacity	**(MW)**			**130**	**330**	**383**	**383**	**756**	**831**	**904**	**939**	**1542**	**1745**	**1948**	**1948**	**1951**	**2054**	**2054**	**2057**
Effective Capacity	**(MW**			**50**	**90**	**143**	**143**	**276**	**351**	**424**	**459**	**582**	**625**	**668**	**668**	**671**	**694**	**694**	**697**
Estimated Renewable Generation	**(GWh)**			**539**	**1117**	**1470**	**1470**	**2924**	**3417**	**3951**	**4205**	**6280**	**6988**	**7697**	**7697**	**7722**	**8088**	**8088**	**8113**

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Table 8.4-3—Renewable Portfolios
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		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Percentage of AmerenUE Retail Sales	**(%)**			**1.4**	**2.8**	**3.6**	**3.6**	**7.0**	**8.0**	**9.2**	**9.6**	**14.2**	**15.6**	**16.9**	**16.7**	**16.6**	**17.1**	**16.9**	**16.7**
New Renewable Generation Required (High Case)	**(GWh)**			**0**	**0**	**0**	**837**	**1709**	**2604**	**3528**	**4464**	**5431**	**6422**	**7450**	**7557**	**7676**	**7798**	**7932**	**8047**
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Forecasted AmerenUE Retail Sales	(GWh)	39165	39059	39623	40192	40821	41332	41899	42467	43085	43618	44211	44805	45465	45996	46593	47202	47873	48450
Low Case w DSM W/O Wind																			
Cumulative Capacity by Technology																			
Existing Renewables and 100 MWe Wind Purchase in 2010	(MW)	391	391	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491	491
Landfill Gas	(MW)			30	33	36	39	42	45	45	45	48	51	54	54	54	54	54	54
Wind – Tranche 1	(MW)																		
Wind – Tranche 2																			
Wind – Tranche 3																			
Biomass	(MW)													70	70	70	70	70	70
Hydro	(MW)								50	50	50	50	50	100	100	100	100	100	100
Solar	(MW)																		
Rated Capacity	**(MW)**			**30**	**33**	**36**	**39**	**42**	**95**	**95**	**95**	**98**	**101**	**224**	**224**	**224**	**224**	**224**	**224**
Effective Capacity	**(MW)**			**30**	**33**	**36**	**39**	**42**	**95**	**95**	**95**	**98**	**101**	**224**	**224**	**224**	**224**	**224**	**224**
Estimated Renewable Generation	**(GWh)**			**250**	**275**	**300**	**325**	**350**	**550**	**550**	**550**	**575**	**600**	**1309**	**1309**	**1309**	**1309**	**1309**	**1309**
Percentage of AmerenUE Retail Sales	**(%)**			**0.6**	**0.7**	**0.7**	**0.8**	**0.8**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**2.9**	**2.8**	**2.8**	**2.8**	**2.7**	**2.7**
New Renewable Generation Required (SB54 W DSM WO Wind)	**(GWh)**			**0**	**0**	**0**	**0**	**0**	**553**	**408**	**252**	**96**	**0**	**1291**	**1239**	**1208**	**1192**	**1189**	**1177**

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Table 8.4-4—Top 18 Alternative Resource Plans
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			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
All Supply-Side	1	NUC1600 – Agg – Low No Wind														EPR 1600MW					
	2	NUC1600 – Agg - Moderate														EPR 1600MW					
	3	NUC1600 – Agg - No														EPR 1600MW					Venice Upgrade 230MW
	4	NUC1200 – Agg – Moderate														EPR 1200MW					Venice Upgrade 230MW
	5	NUC1200 – Agg – No														EPR 1200MW		Venice Upgrade 230MW			Combine Cycle (Green Field) 470MW
	6	NUC1600 – Agg – Low W/ Wind														EPR 1600MW					Venice Upgrade 230MW
	7	Combine Cycle – Agg – Low No Wind															Venice Upgrade 230MW	Combine Cycle (Green Field) 470MW Aero 6 units 552MW			Frame 4 Units 604MW
	8	NUC1200 – Agg – Low W/ Wind														EPR 1200MW		Venice Upgrade 230MW			Combine Cycle (Green Field) 470MW
All Supply-Side	9	Combine Cycle – Agg – Moderate																Venice Upgrade 230MW Combine Cycle (Green Field) 470MW Aero 6 units 552MW			

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Table 8.4-4—Top 18 Alternative Resource Plans

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			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
All Supply-Side	10	Coal425 – Agg – No														Coal 425MW		Venice Upgrade 230MW Combine Cycle (Green Field) 470MW Aero 6 units 552MW			
	11	Pump storage – Agg – Moderate																Pump Storage 600MW Venice Upgrade 230MW	Combine Cycle (Green Field) 470MW		
	12	Coal850 – Agg – Moderate																Coal 850MW Venice Upgrade 230MW			Combin e Cycle (Green Field) 470MW
	13	Coal425 – Agg – Moderate																Coal 425MW Venice Upgrade 230MW Combine Cycle (Green Field) 470MW			Aero 6 Units 552MW
	14	NUC1200 – Agg – High														EPR 1200MW					
	15	NUC1600 – Agg – Wind														EPR 1600MW					
	16	NUC1200 – Agg – Wind														EPR 1200MW					Venice Upgrade 230MW
	17	NUC1600 – Agg – High														EPR 1600MW					
	18	Simple Cycle – Agg High																Aero 6 Units 552MW		Frame 4 Units 604 MW	

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Table 8.4-4—Top 18 Alternative Resource Plans
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			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
renewables	1	NUC1600 – Agg – Low No Wind				Land Fill Gas 30 MW	Land Fill Gas 3MW	Land Fill Gas 3MW	Land Fill Gas 3 MW	Land Fill Gas 3MW	Land Fill Gas 3MW Hydro 50 MW			Land Fill Gas 3MW	Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 70MW Hydro 50MW					
	2	NUC1600 – Agg - Moderate				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW	Hydro 75 MW	Land Fill Gas 3MW		Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW Biomass 35MW		Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW		Land Fill Gas 3MW
	3	NUC1600 – Agg - No																			
	4	NUC1200 – Agg – Moderate				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW	Hydro 75 MW	Land Fill Gas 3MW		Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW Biomass 35MW		Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW		Land Fill Gas 3MW
Renewables	5	NUC1200 – Agg – No																			
	6	NUC1600 – Agg – Low W/ Wind									Wind 150 MW					Wind 300MW					
	7	Combine Cycle – Agg – Low No Wind				Land Fill Gas 30MW	Land Fill Gas 3MW	Land Fill Gas 3MW	Land Fill Gas 3 MW	Land Fill Gas 3MW	Land Fill Gas 3MW Hydro 50 MW			Land Fill Gas 3MW	Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 70MW Hydro 50MW					
	8	NUC1200 – Agg – Low W/ Wind									Wind 150 MW					Wind 300MW					

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Table 8.4-4—Top 18 Alternative Resource Plans
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			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Renewables	9	Combine Cycle – Agg – Moderate				Land Fill Gas 30MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW	Hydro 75 MW	Land Fill Gas 3MW		Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW Biomass 35MW		Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW		Land Fill Gas 3MW
	10	Coal425 – Agg – No																			
	11	Pump storage – Agg – Moderate				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW	Hydro 75 MW	Land Fill Gas 3MW		Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW Biomass 35MW		Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW		Land Fill Gas 3MW
	12	Coal850 – Agg – Moderate				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW	Hydro 75 MW	Land Fill Gas 3MW		Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW Biomass 35MW		Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3 MW		Land Fill Gas 3MW
	13	Coal425 – Agg – Moderate				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW	Hydro 75 MW	Land Fill Gas 3MW		Land Fill Gas 3MW	Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW Biomass 35MW		Land Fill Gas 3MW Biomass 35MW	Land Fill Gas 3MW		Land Fill Gas 3MW
	14	NUC1200 – Agg – High				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW Biomass 70MW	Hydro 75 MW	Land Fill Gas 3MW Biomass 70MW	Biomass 35MW	Land Fill Gas 3MW Wind 600MW	Land Fill Gas 3MW Wind 200MW	Land Fill Gas 3MW Wind 200MW		Land Fill Gas 3MW	Land Fill Gas 3MW Wind 100MW		Land Fill Gas 3MW

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Table 8.4-4—Top 18 Alternative Resource Plans
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			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Renewables	15	NUC1600 – Agg – Wind				Wind 100MW	Wind 200 MW			Wind 300MW				Wind 600MW	Wind 300MW	Wind 300MW					
Renewables	16	NUC1200 – Agg – Wind				Wind 100MW	Wind 200 MW			Wind 300MW				Wind 600MW	Wind 300MW	Wind 300MW					
Renewables	17	NUC1600 – Agg – High				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW Biomass 70MW	Hydro 75 MW	Land Fill Gas 3MW Biomass 70MW	Biomass 35MW	Land Fill Gas 3MW Wind 600MW	Land Fill Gas 3MW Wind 200MW	Land Fill Gas 3MW Wind 200MW		Land Fill Gas 3MW	Land Fill Gas 3MW Wind 100MW		Land Fill Gas 3MW
Renewables	18	Simple Cycle – Agg High				Land Fill Gas 30 MW Wind 100MW	Wind 200 MW	Land Fill Gas 3MW Hydro 50 MW		Land Fill Gas 3MW Wind 300MW Biomass 70MW	Hydro 75 MW	Land Fill Gas 3MW Biomass 70MW	Biomass 35MW	Land Fill Gas 3MW Wind 600MW	Land Fill Gas 3MW Wind 200MW	Land Fill Gas 3MW Wind 200MW		Land Fill Gas 3MW	Land Fill Gas 3MW Wind 100MW		Land Fill Gas 3MW
	Aggressive DSM	All Plans (MW)			107	131	162	194	230	265	298	332	367	402	427	450	468	484	499	513	527

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Table 8.4-5—Historical Reserve Margins

Year	Adjusted Demand		Adjusted Capacity		Reserve Margin	
	Summer Peak	Winter Peak	Summer	Winter	Summer	Winter
1993	7046	5739	8375	8370	18.9%	45.8%
1994	7078	5664	8233	8229	16.3%	45.3%
1995	7385	6137	8437	8412	14.2%	37.1%
1996	7448	6245	8774	8827	17.8%	41.3%
1997	7449	5547	8560	8597	14.9%	55.0%
1998	7545	6164	8548	8609	13.3%	39.7%
1999	7900	5773	8769	8706	11.0	50.8
2000	7797	6079	8967	8970	15.0	47.6
2001	7825	6530	8999	8828	15.0	35.2
2002	7946	6051	9138	8869	15.0	46.6
2003	8114	6399	9331	9302	15.0	45.4
2004	8243	6371	9479	9505	15.0	49.1
2005	8303	6413	9548	9694	15.0	51.2
2006	8396	6595	9655	9881	15.0	49.8
2007	8435	6384	9700	7342	15.0	15.0

Reference: AmerenUE's Historical records.

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