



SERVICES YOU COUNT ON

**2007-2026 Integrated Resource Plan
for
The Empire District Electric Company**

**Volume I
Executive Summary, Introduction**

September 2007

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Executive Summary

Overview

The Empire District Electric Company (Empire) has conducted its analysis of future loads and resources for this Integrated Resource Plan (IRP) to comply with the requirements of 4 CSR 240-22 based on Empire's interpretations of the Rule. Empire has formally requested variances and clarifications from the Missouri Public Service Commission (MPSC) for those instances in which this IRP does not comply with 4 CSR 240-22. The Commission granted Empire's request for waivers in Case No. EE-2008-0025.

This periodic IRP analysis, in conjunction with Empire's normal planning process, assists Empire in making decisions concerning the exact timing and type of system expansion that should ultimately occur. The results of the IRP analysis documented in this report reflect only current and projected conditions as they are known today. Empire will reexamine its decisions for future system expansions as the need for additional resources, driven by load growth, and the influence of external factors, primarily environmental, become more evident. Specifically, the need for additional supply-side capacity around the ** ____ ** timeframe will be reexamined annually and in the next IRP, currently scheduled for filing in 2010, before a firm decision is made as to the exact timing and type of resource that might be added. The preferred plan and implementation plan presented in this IRP have been approved by a committee of Empire's senior management at the time of this IRP filing. It is subject to the ongoing need to reevaluate modeling assumptions based on changing conditions.

Implementation Plan

Currently, construction is progressing on 200 MW (Empire's approximate share) of new jointly-owned coal-fired capacity (100 MW at Iatan 2 and 100 MW at Plum Point). Each of these units is scheduled to come on line in 2010. In addition, a power purchase agreement (PPA) has been signed for 105 MW of new wind energy (Meridian Way Wind Farm) scheduled to begin operation in 2009. _____

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The demand-side management (DSM) programs currently being implemented include : Low Income Efficiency Program, Low Income – New Home Program, Home Performance with ENERGY STAR® Program, ENERGY STAR® Change a Light, Residential High Efficiency Central Air Conditioning (CAC), ENERGY STAR® Homes, Commercial and Industrial (C&I) Rebate, and Building Operator Certification Program.

Due to the filing requirements associated with an IRP in Missouri, Empire is scheduled to complete another IRP filing (in 2010 – based on a three-year cycle) prior to the initiation

of substantive expenditures related to any uncommitted future capacity additions ** _____
 _____ ** contemplated in this IRP. As a result of its current resource
 commitments in conjunction with the analysis results from this IRP, Empire will:

- ** _____

 _____ **
- ** _____
 _____ **
- Track and evaluate results of the implementation of DSM programs and keep the Customer Programs Collaborative (CPC) informed as to the results.¹
- Monitor federal efforts with regard to imposition of a carbon tax

Empire will also monitor state and federal legislative and regulatory requirements for renewable portfolio standards (RPS) in addition to tracking changes in other environmental regulations. With its current purchase of wind energy from the Elk River Wind Farm and its commitment to purchase wind energy from the Meridian Way Wind Farm, Empire believes that it will be well-positioned to meet the percentages of renewable energy that might be required by state or federal RPS over the entire planning horizon.

Empire will also monitor the future of baseload generation in the region over the planning horizon. This could include nuclear, pulverized coal or new technologies as they emerge. For the base case, Empire has assumed that no nuclear units in which it can participate will be built during the planning horizon. However, Empire will keep current on publicly released plans in the region for new nuclear units. Similarly, Empire will monitor and evaluate opportunities for participation in coal-fired units, integrated gasification combined cycle units (IGCC), or other emerging technologies planned in the region. Empire will be cognizant of and striving for resources that incorporate methods for carbon capture and carbon sequestration, as appropriate, in compliance with any global climate change legislation that might be enacted. Environmental risk is a key uncertainty in this IRP.

Company Situation

Empire is an operating public utility, based in Joplin, Missouri, engaged in the generation, purchase, transmission, distribution and sale of electricity in parts of Missouri, Kansas, Oklahoma and Arkansas. Empire's electric service territory includes an area of about 10,000 square miles with a population of over 450,000, including over 166,000 electric customers. The electric service territory is located principally in southwestern Missouri and also includes smaller areas in southeastern Kansas,

¹ The Customer Programs Collaborative was established as a result of a stipulation and agreement and, in addition to Empire personnel, is comprised of Missouri Public Service Commission staff, Office of Public Counsel, Missouri Department of Natural Resources, and other interested parties. The CPC is charged with making decisions pertaining to the development, implementation, monitoring, and evaluation of Empire's affordability, energy efficiency, and demand response programs.

northeastern Oklahoma and northwestern Arkansas. The principal activities of these areas include light industry, agriculture and tourism. Empire's system had a Net System Input (NSI) of 5,330,214 MWh and a system peak of 1,159 MW in calendar year 2006.

Empire also provides natural gas (through its wholly-owned subsidiary, The Empire District Gas Company), water service, and fiber optics.

Integrated Resource Planning

Integrated resource planning for electric utilities has evolved considerably over the past twenty years and can no longer solely identify the least cost resources; such a plan must explicitly consider risks and uncertainties. Empire's objectives in preparing its 2007 IRP reflect its commitment to provide cost-effective, safe, and reliable electric service to its customers:

- to generate and provide reliable electricity service while complying with all environmental requirements
- to minimize rate impacts for customers
- to achieve and/or maintain investment grade ratings on its debt; thus providing for corporate financial stability and minimizing the financing costs included in the rates paid by Empire's customers
- to accommodate and manage cost, environmental, and load growth uncertainties.

Assumptions

A wide variety of data assumptions must be made for IRP modeling. In addition to the load forecast, assumptions must be developed for fuel price forecasts, market price forecasts, planning margins, financial parameters, emission costs, and parameters specific to resources including size, capital costs, heat rates, forced outage rates, maintenance schedules, and operating and maintenance costs. All of the cases evaluated by Empire assume at least a basic level of a carbon dioxide tax is enacted by 2012.

Load Forecast

The forecast for Empire's peak demand and energy throughout the planning horizon was developed individually by jurisdiction by rate class with an econometric model, developed using the software known as *MetrixND*. Eleven years (1996-2006) of historical sales and weather data were used as part of this modeling process. Historical data used for modeling were derived by summing the monthly billing data by rate class by jurisdiction by pricing plan. Regression analysis techniques were used to determine weather-normalized peak demands and energies for Empire's historical load. The load impacts of already implemented demand-side management (DSM) programs are incorporated in the base load forecast, but the load impacts of proposed DSM programs are not.

The pricing plans were forecast individually by jurisdiction using historical sales and weather, monthly binaries, weather splines, and economic variables. System energy, peak demands, customer count, and sales were forecast with linear regression analysis employing the “least squares” method to determine the best fit line through a set of historical observations. The pool of economic drivers used to forecast most of the pricing plans included retail sales, population, gross regional product, employment, households, mean household income, and wealth. The most relevant economic drivers were selected for the pricing plan being forecast. The forecasts for a few of the smaller pricing plans used a moving average technique called “exponential smoothing.” Data for the drivers on a county-by-county basis were obtained by Empire from Woods & Poole Economics. Pricing plans were mapped to revenue classes to determine forecasts for each of residential, commercial, industrial, on-system wholesale, and other.

Demand-Side Management

As a result of the stipulation and agreement in Case No. EO-2005-0263, Empire agreed to form a Customer Programs Collaborative (CPC) with the MPSC staff, Office of Public Counsel, Missouri Department of Natural Resources, and other interested parties. The CPC was charged with making decisions pertaining to the development, implementation, monitoring, and evaluation of Empire’s affordability, energy efficiency, and demand response programs. Under the auspices of the CPC, a collection of demand-side management (DSM) programs was identified as cost effective for implementation over a five-year horizon and implementation was begun. Additional DSM programs, and enhancements to those DSM programs for which implementation had begun, were identified and modeling parameters developed for each. These modeling parameters were used so that these DSM programs could be provided as resource options in the optimization modeling. The DSM resource options included Low Income Efficiency, Low Income New Homes, Home Performance with ENERGY STAR®, ENERGY STAR® Change a Light, Residential High Efficiency Central Air Conditioning (CAC) Program, ENERGY STAR® Homes, Commercial and Industrial (C&I) Rebate, Building Operator Certification Program, C&I Peak Load Reduction Program, and Air Conditioning Cycling Program.

In Arkansas, Empire has participated in a collaboration on two state-wide energy efficiency programs, the Arkansas Weatherization Program and the Energy Efficiency Arkansas Program. Two additional DSM programs are offered to Empire’s Arkansas customers: CAC Tune-Up Program and the C&I Prescriptive Rebate Program.

Empire believes that earning a return of and return on capital for DSM program investments increases the effectiveness of such programs and provides a financial incentive for electric utilities to engage in DSM.

Supply-Side Resources

In this IRP, Empire considered a broad range of conventional and renewable resources as options for the future. These included: pulverized coal, combustion turbine (CT),

combined cycle (CC), nuclear, distributed generation, integrated gasification combined cycle (IGCC), atmospheric circulating fluidized bed, compressed air energy storage (CAES), wind, and biomass. To take advantage of economies of scale, Empire assumed that the nuclear option involved a small ownership share of a larger unit built by one or more larger utilities in the region. The pulverized coal option was also modeled as a small ownership share of a larger unit built in the region. Combined cycle options included both a new CC unit and the conversion of the Riverton Unit 12 CT to a CC unit.

Development of Preferred Plan

Both DSM and supply-side resources were considered as available resources in this IRP. Empire chose not to eliminate from consideration any of the potential future DSM programs, conventional resources or renewable resources except for CAES before they were modeled in the Capacity Expansion Model (CEM) of Global Energy Decisions (GED). However, no nuclear units were allowed as a resource choice in the base case. In addition, no scrubber was installed on Asbury Unit 1 in the base case.

A number of scenarios and contingency scenarios were examined in developing the preferred plan. Resource assumptions made for the base case (and which are common to all cases) include:

- 1) The Westar contract for 162 MW of purchased power from the Jeffrey coal units terminates in 2010, prior to the summer peak.
- 2) An ownership share of 50 MW in the coal-fired Plum Point generating unit and a 50 MW PPA (with the option to convert to ownership in 2015). Plum Point is assumed to begin operation in 2010, prior to the summer peak. Although the IRP assumes that the PPA is converted to ownership in 2015, the decision to convert has yet to be made.
- 3) A 100 MW ownership share in Iatan 2 which will begin operation in 2010, prior to the summer peak.
- 4) A PPA for 105 MW of wind from the Meridian Way Wind Farm, scheduled to begin operation in 2009.
- 5) ** _____ **
- 6) Five percent of installed wind capacity counts towards the capacity reserve margin.
- 7) ** _____ **

With these supply-side resource decisions and implementation of the slate of DSM programs, Empire's planning reserve margins appear to be satisfied until the ** ____ ** timeframe using the base load forecast in this IRP.

Although eleven plans were developed in addition to the base case, four of those plans were deemed to be contingency scenarios and the full stochastic analysis was not conducted for them. The primary scenarios are:

- High fuel, market, and wind prices
- Low fuel and market prices
- High load
- Low load
- ** _____ **
- Base assumptions, nuclear available after 2020
- Base assumptions, no coal units after 2010

The contingency scenarios are:

- Medium environmental costs
- High environmental costs
- No Riverton CC conversion
- ** _____ **

A specific alternative deterministic analysis was conducted to examine the timing for the installation of a potential scrubber at Asbury. The base case did not include any scrubber. Alternative cases included the scrubber installed in 2013 and the scrubber installed in 2018

The examination of the scenarios as well as the contingency scenarios led to a set of DSM and supply-side resource additions over the planning horizon that constitute Empire's preferred plan. Figure ES-1 shows the supply-side additions in the preferred plan. Figure ES-2 shows the DSM programs selected in the preferred plan.

Table ES-1 details the supply-side and DSM resources that in total constitute the resources in the preferred plan. With the current assumptions for the cost of new nuclear units, it appears that ownership participation in a jointly-owned unit might be a cost effective alternative for Empire if capacity were available from such a unit. However, the plans associated with such a unit in the area have not advanced to such a point that it could be realistically considered by Empire in the preferred plan over the twenty-year planning horizon in this IRP.

Figure ES-1
****Highly Confidential in its Entirety****
Preferred Plan Resource Additions

(Source: GED)

Figure ES-2
****Highly Confidential in its Entirety****
Preferred Plan – DSM Programs

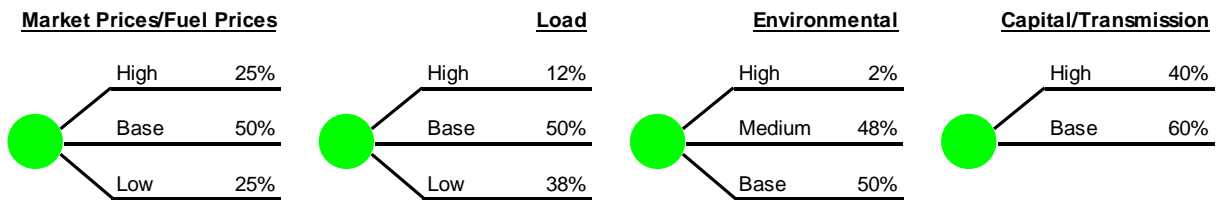
Table ES-1
Empire's Preferred Plan – DSM and Supply-Side Resource Additions

Year	New Resources	Committed Resources for this IRP
2007		
2008	** _____ **	
2009	** _____ _____ **	Meridian Way Wind Farm (105 MW)
2010		Iatan 2 (100 MW), Plum Point (100 MW)
2011		** _____ **
2012		
2013		
2014	** _____ **	
2015		
2016		
2017	** _____ **	
2018	** _____ **	
2019	** _____ **	
2020	** _____ **	
2021	** _____ **	
2022	** _____ **	
2023	** _____ **	
2024	** _____ **	
2025	** _____ **	
2026	** _____ **	
** _____ **		** _____ **

Uncertainty Analysis and Risk Profiles

Risk profiles were prepared in order to quantify the risks associated with the preferred plan and the alternate scenarios. These risk profiles are cumulative probability distributions of the present value of revenue requirements (PVRR) developed across a range of uncertainties that reflect the key uncertainties or risks associated with the future. The decision tree developed for the uncertainty analysis examined four uncertain variables for each of the eight primary plans. The uncertainties examined included: 1) market and fuel prices, 2) load forecast, 3) environmental costs, and 4) capital and transmission costs. For the market prices/fuel prices and load, the uncertainties reflect a high and low around a base. For capital and transmission costs, only a higher level was examined. For environmental costs, the base served as the lowest expected future and both medium and high environmental costs were examined. The decision tree is shown in Figure ES-3.

**Figure ES-3
Decision Tree Uncertainties**

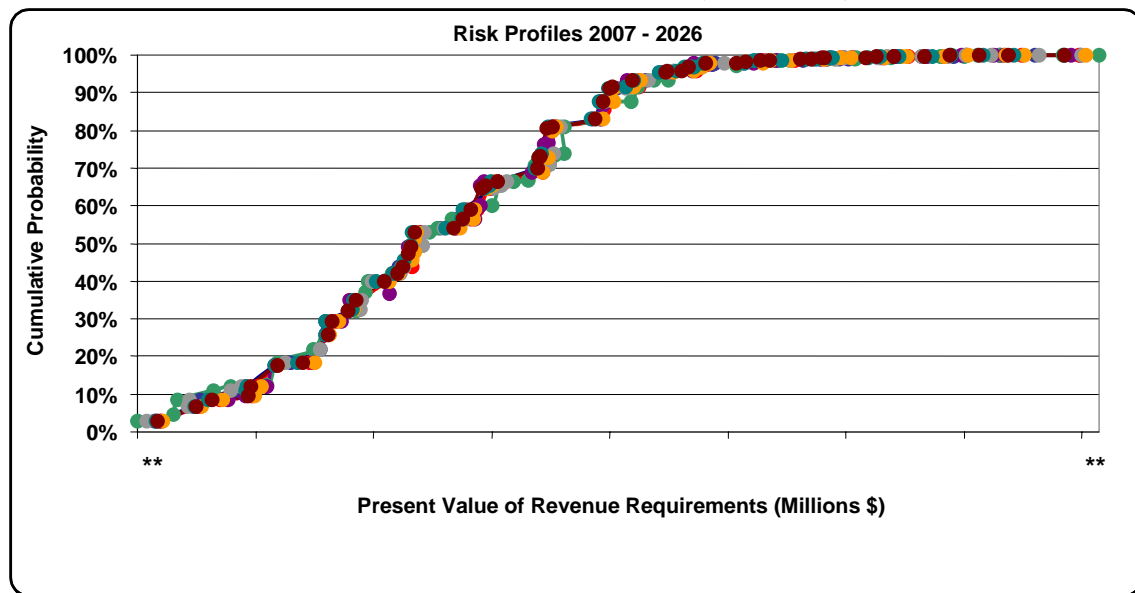


(Source: GED)

Comparison of the Plans

The range of risks associated with each of the plans examined is seen to be fairly similar in Figure ES-4. The PVRs for the scenarios with the risk values plotted in a different manner are provided on Figure ES-5. The risk values (the dotted areas) represent the difference between the expected value of the PVRs in a deterministic simulation and the expected value of the PVRs once all of the risks are considered through the uncertainty analysis. Figure ES-5 again demonstrates the similarity among all of the scenarios examined in terms of both expected value and risk profile.

**Figure ES-4
All Scenarios – Risk Profiles (2007-2026)**



(Source: GED)

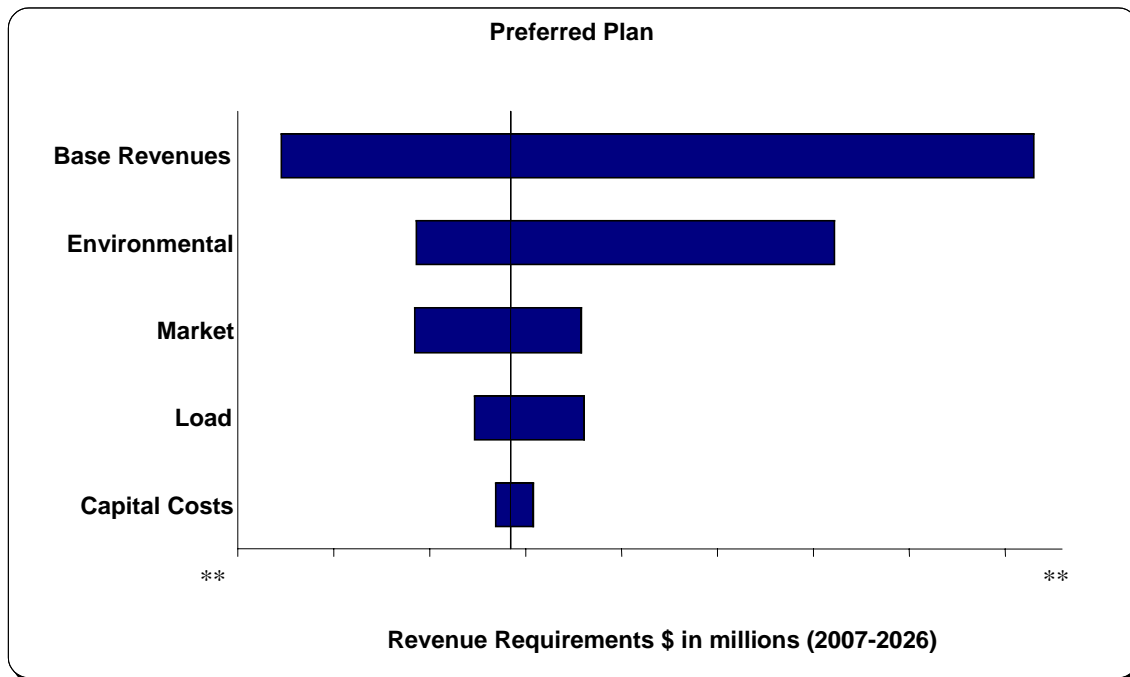
Figure ES-5
All Scenarios – PVRR with Risk Value (2007-2026)
****Highly Confidential in its Entirety****

PVRR With Risk Values (2007 – 2026)

(Source: GED)

The tornado chart for the Preferred Plan, Figure ES-6, demonstrates that the primary driver of PVRR uncertainty is environmental considerations. For all scenarios examined, environmental risk (as represented by the future implementation of a carbon tax or other carbon dioxide mitigation strategy) is the primary risk driver that Empire should be closely monitoring.

Figure ES-6
Preferred Plan – Tornado Chart



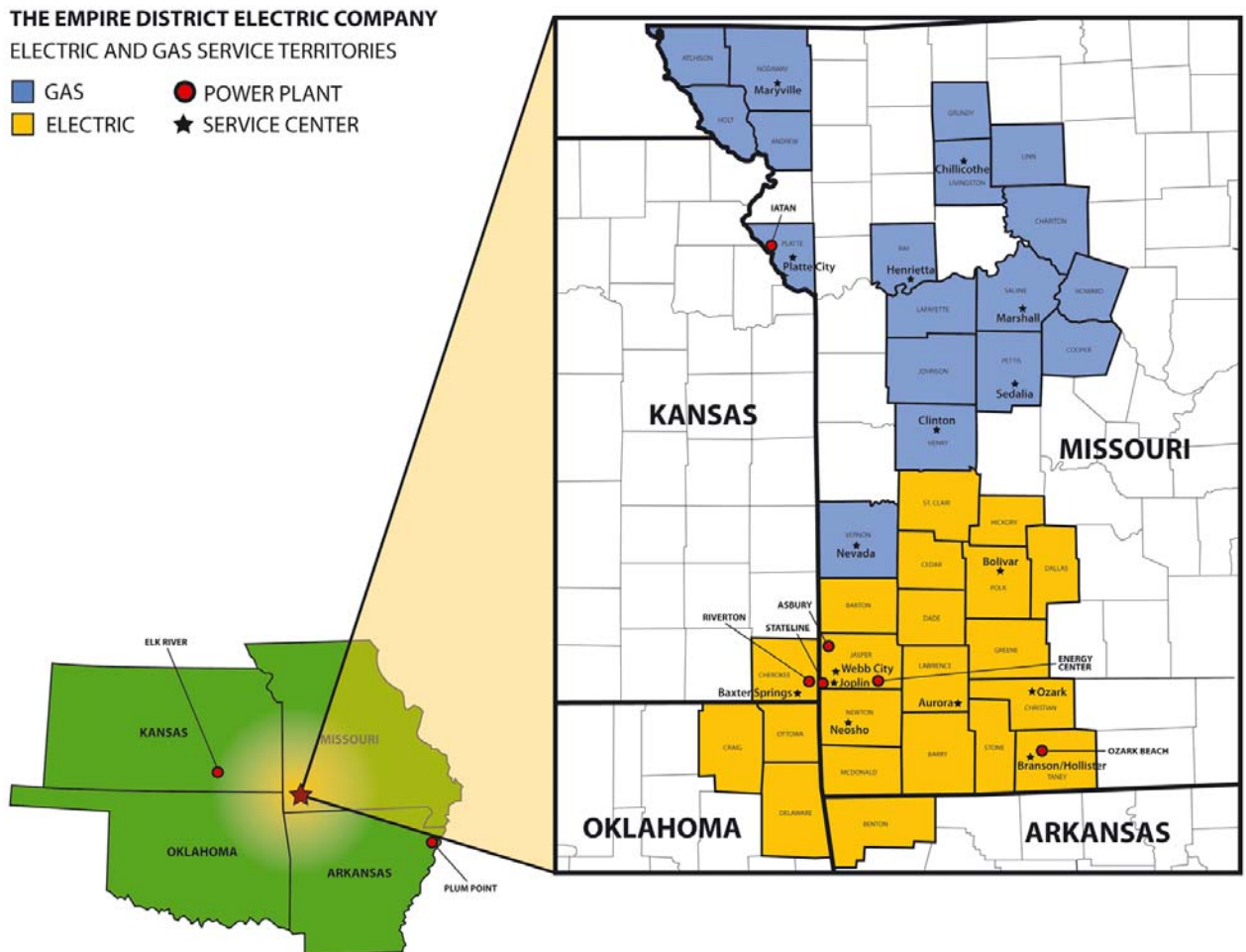
(Source: GED)

Introduction

Background

The Empire District Electric Company (Empire) is an operating public utility engaged in the generation, purchase, transmission, distribution and sale of electricity in parts of Missouri, Kansas, Oklahoma and Arkansas. Empire's service territory includes an area of about 10,000 square miles with a population of over 450,000. The service territory is located principally in southwestern Missouri and also includes smaller areas in southeastern Kansas, northeastern Oklahoma and northwestern Arkansas (Figure 1). The principal activities of these areas include light industry, agriculture and tourism.

Figure 1
Empire District Electric Service Territory



Empire's total 2006 retail electric revenues were derived approximately 87.6% from Missouri customers, 6.1% from Kansas customers, 3.0% from Oklahoma customers and 3.3% from Arkansas customers. Empire supplies electric service at retail to 121 incorporated communities and to various unincorporated areas and at wholesale to four municipally owned distribution systems. The largest urban area served is the city of

Joplin, Missouri, and its immediate vicinity, with a population of approximately 157,000. Empire's 2007 system peak was 1,173 MW which occurred on August 15, 2007, when the temperature was 102°F, surpassing the 2006 peak of 1,159 MW. Empire's 2006 Net System Input was 5,330,214 MWh. Empire's electric operating revenues in 2006 were derived as follows: residential 41.7%, commercial 30.1%, industrial 16.9%, wholesale on-system 4.6%, wholesale off-system 3.2% and other 3.5%.

Organization of the Report

The report is organized into various volumes as follows:

- Volume I: Introduction, Overview and Executive Summary
- Volume II: Load Analysis and Forecasting (4 CSR 240-22.030)
- Volume III: Supply-Side Resources Analysis (4 CSR 240-22.040)
- Volume IV: Demand-Side Resource Analysis (4 CSR 240-22.050)
- Volume V: Integrated Resource Analysis (4 CSR 240-22.060) and Risk Analysis and Strategy Selection (4 CSR 240-22.070)

Follow up to 2006 IRP Action Plan

The 2006 Integrated Resource Plan (IRP) contained a commitment on the part of Empire to undertake the following activities in conjunction with the preparation of the 2007 IRP:

- Incorporate a new forecasting methodology into its 2007 Electric Resource Plan process in conformance with the Stipulation and Agreement in Case No. EO-2005-0263
- Track and evaluate results of the implementation of DSM programs and keep the CPC informed as to the results
- Issue a Request for Proposals (RFP) for wind energy resources post 2007 or enter into negotiations with wind developers for wind energy resources in the region with a goal of procuring 100 MW of additional wind energy. Commitments will be made for such wind energy resources only to the extent that they are priced in a cost effective manner and suitably located
- **

_____**
- **

_____**
- Monitor state and federal legislative requirements and regulatory requirements for renewable portfolio standards
- Continue to evaluate opportunities to participate in jointly owned coal-fired units within the region
- Monitor developments of neighboring utilities with regard to plans for new nuclear units
- Monitor federal efforts with regard to imposition of a carbon tax

- Prepare a 2007 Electric Resource Plan that will update and revise this IRP reflecting then current conditions

The following paragraphs describe those steps that Empire has taken to comply with these commitments.

1. Empire used *MetrixND* in developing its load forecast. Peak demands and energy usage were forecast by rate class and for the entire Empire system using weather, customer, and economic variables.
2. Empire has been tracking the results of the DSM programs, has evaluated DSM programs on an equal basis with supply-side options in this IRP, and has kept the CPC informed of this progress through regular meetings and reports.
3. An RFP for wind generation was issued in November 2006. A contract for a wind energy resource from which Empire will start receiving energy in 2009 was signed in July 2007.
4. ** _____

_____ **
5. ** _____

_____ **
6. State and federal legislative requirements for renewable portfolio standards (RPS) are being monitored. In 2007, Missouri Senate Bill 54 was signed by Governor Matt Blunt which sets good-faith renewable energy targets for utilities to meet (4% by 2012, 8% by 2015 and 11% by 2020). With its current and committed wind energy purchase power agreements from the Elk River Windfarm and the Meridian Way Wind Farm, Empire is well-positioned to meet the targets.
7. Empire is monitoring plans in the region for jointly-owned coal-fired power plants.
8. Empire has been monitoring publicly released information on new nuclear unit developments in the region. A second unit at Callaway appears to be under consideration. There do not currently appear to be any plans for any new nuclear units in Kansas or Arkansas.
9. The potential imposition of a carbon tax appears much more likely as a result of the U.S. Supreme Court decision of April 2, 2007. This decision ordered the Environmental Protection Agency to consider regulating greenhouse gases, including carbon dioxide. Significant additional analysis was undertaken during the modeling aspects of this IRP to evaluate the result of an imposition of a tax on carbon dioxide emissions.
10. This document is one of several which present the results of the analysis undertaken for the 2007 Integrated Resource Plan.

Integrated Resource Planning Objectives

Empire's objectives in preparing its 2007 IRP reflect its commitment to provide cost-effective, safe, and reliable service to its electric customers:

- to generate and provide reliable electricity service while complying with all environmental standards
- to minimize rate impacts for customers
- to achieve and/or maintain investment grade ratings on its debt; thus providing for corporate financial stability and minimizing the financing costs included in the rates paid by Empire's customers
- to accommodate and manage cost, environmental, and load growth uncertainties.

Abbreviations

C&I – Commercial and Industrial
CAC – Central air conditioning
CAES – Compressed Air Energy Storage
CC – Combined cycle
CEM – Capacity Expansion Model
CPC – Customer Programs Collaborative
CT – Combustion turbine
DG – Distributed generation
DSM – Demand-side Management
FERC – Federal Energy Regulatory Commission
GED – Global Energy Decisions
IGCC – Integrated Gasification Combined Cycle
IRP – Integrated Resource Plan or integrated resource planning
kW – kilowatt
kWh – kilowatthour
MPSC – Missouri Public Service Commission
MW – Megawatt
MWh - Megawatthour
NSI – Net system input
PPA – Power purchase agreement
PVRR – Present Value of Revenue Requirements
RFP – Request for Proposals
RPS – Renewable Portfolio Standards