NP

VOLUME 1

INTEGRATED RESOURCE PLAN (IRP)
EXECUTIVE SUMMARY

THE EMPIRE DISTRICT ELECTRIC COMPANY
(EMPIRE)

4 CSR 240-22

FILE NO. EO-2016-0223

APRIL 2016

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Executive Summary

The Empire District Electric Company (Empire or Company) 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 (Rule or IRP Rule) based on Empire's interpretation of the Rule. Under the current Rule, this IRP analysis is conducted once every three (3) years (triennial compliance filing), in conjunction with Empire's normal planning process, and assists Empire in making decisions concerning the 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 were known at the time the results were developed. IRP is a fluid process and involves numerous assumptions about the future. Empire will continually monitor critical uncertain factors and re-examine its decisions as the need for additional resources become more evident. The IRP will be subjected to ongoing evaluation as modeling assumptions change based on evolving business conditions.

SECTION 1 IRP OBJECTIVES

According to the IRP Rule, 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 compliance with all legal mandates, and in a manner that serves the public interest and is consistent with state energy and environmental policies. The fundamental objective requires that the utility shall consider demand-side, supply-side and renewable resources on an equivalent basis, and utilize the minimization of long-run utility costs as a primary criterion while also considering other factors such as risk and rate impacts.

By the end of the IRP process, the utility is required to select a preferred plan and adopt a resource acquisition strategy. The preferred resource plan means the resource plan that is contained in the resource acquisition strategy that has most recently been adopted by the utility decision-maker(s) for implementation by the electric utility. The IRP process, however, provides more than just a preferred plan; it generates a set of plans that includes contingency plans and other required plans for planning purposes. A contingency resource plan means an alternative resource plan designed to enhance the utility's ability to respond quickly and appropriately to future events or circumstances that could render the preferred resource plan obsolete. During the IRP process, the utility is also required to identify and monitor critical uncertain factors that include any parameters that are likely to materially affect the outcome of the resource planning decision.

This executive summary highlights the steps that the Company has taken to arrive at the selection of the preferred resource plan; describe the other plans studied in the IRP; identify the critical uncertain factors; and present the preferred resource plan and its accompanying implementation plan.

SECTION 2 ORGANIZATION OF THE IRP FILING

This IRP filing contains eight (8) volumes in total. This includes an executive summary; a volume dedicated to the Missouri IRP filing requirements and an index of Rule compliance; and six (6) technical volumes. The ordering and subject matter of the IRP volumes closely correspond to the IRP Rule sections. The technical volumes contain the Rule reference and the Company's response as appropriate. The responses to Special Contemporary Issues can be found in the final chapter of Volume 6: Integrated Resource Plan and Risk Analysis. The eight (8) volumes that comprise the IRP filing can be summarized as follows:

1. Volume 1: Executive Summary
2. Volume 2: Missouri Filing Requirements and an Index of Rule Compliance
3. Volume 3: Load Analysis and Load Forecasting
4. Volume 4: Supply-Side Resource Analysis
5. Volume 4.5: Transmission and Distribution Analysis
6. Volume 5: Demand-Side Resource Analysis
7. Volume 6: Integrated Resource Plan and Risk Analysis
8. Volume 7: Resource Acquisition Strategy Selection

SECTION 3 BACKGROUND

Empire's most recent Missouri triennial compliance filing was made in File No. EO-2013-0547 on July 1, 2013 (2013 IRP). After several post-filing IRP discussions in this case, a Joint Filing as required under 4 CSR 240-22.080(9), was made in EO-2013-0547 on January 31, 2014. The Commission issued an Order on March 12, 2014 finding that Empire's IRP filing demonstrated compliance with the requirements of Commission Rule 4 CSR 240-22; concluded that no hearing was necessary concerning any unresolved alleged deficiencies and concerns; and that the file shall be closed on March 23, 2014.

3.1 IRP Annual Update

In years that Empire does not make a triennial IRP compliance filing, an IRP annual update is required. The purpose of the annual update is to ensure that members of the Missouri stakeholder group have the opportunity to provide input and to stay informed regarding the changing conditions since the last filed triennial compliance (IRP) filing or annual update filing. This includes updates regarding the preferred resource plan; the status of the identified critical uncertain factors; the utility's progress in implementing the resource acquisition strategy; analyses and conclusions regarding any special contemporary issues (pursuant to 4 CSR 240-22.080(4)); resolution of any outstanding deficiencies or concerns (pursuant to 4 CSR 240-22.080(16)); and changing conditions in general. Empire made its most recent IRP annual update report filing on March 13, 2015 in File No. EO-2015-0216. An IRP annual update workshop with stakeholders was held on April 29, 2015. The Commission Order establishing the special contemporary issues list for Empire's 2015 IRP annual update was filed on October 22, 2014 in File No. EO-2015-0042 with an effective date of November 1, 2014.

3.1.1 Special Contemporary Issues

Rule 4 CSR 240-22.080(4) requires Missouri utilities to consider and analyze special contemporary issues in their IRP triennial compliance filings or their annual IRP updates. Such special contemporary issues are contained in a Commission order with input from staff, public counsel, and intervenors that are evolving new issues, which may not otherwise have been addressed by the utility or are continuations of unresolved issues from the preceding triennial compliance filing or annual update filing. In File No. EO-2016-0040, the Commission issued an order on October 28, 2015 establishing eleven (11) special contemporary planning issues for Empire to analyze and document in its 2016 triennial Integrated Resource Plan. The responses to these issues can be found in IRP Volume 6.

3.1.2 IRP Stakeholder Process

The Missouri IRP Rule establishes a Stakeholder process. By Rule, the Stakeholder group includes the Commission Staff, Office of the Public Counsel, and any person or entity granted intervention in a prior IRP proceeding; and any person or entity granted intervention in the current IRP proceeding. Empire held a Stakeholder meeting on September 29, 2015 to discuss the preliminary demand-side assumptions for the 2016 IRP. A required Pre-Integration Stakeholder Meeting was held on November 20, 2015 in Jefferson City, Missouri. This meeting as required by 4 CSR 240-22.080 (5) (A) (1) provides a preliminary look at 4 CSR 240-22.030 through 4 CSR 240-22.050 (i.e., load forecasting, supply-side analysis, transmission and distribution analysis and demand-side analysis) and presents an overview of the proposed alternative resource plans and intended procedures and analyses to meet the requirements of 4 CSR 240-22.060 and 4 CSR 240-22.070 (i.e., integration and risk analysis; and resource acquisition and strategy selection). As a result of these discussions, the Stakeholder Group has reviewed and provided feedback on the significant pre-integration assumptions in Empire's 2016 IRP filing.

3.1.3 Application for Variance

On April 1, 2015, one year in advance of the 2016 IRP filing, Empire filed an application for variance in File No. EE-2015-0249, seeking a variance of portions of 4 CSR 240-3.164 (Demand-Side Programs Filing and Submission Requirements), 4 CSR 240-22.030 (Load Analysis and Load Forecasting) and 4 CSR 240-22.050 (Demand-Side Resource Analysis). The Commission issued an Order Granting Application for Variance on June 2, 2015 with an effective date of July 2, 2015.

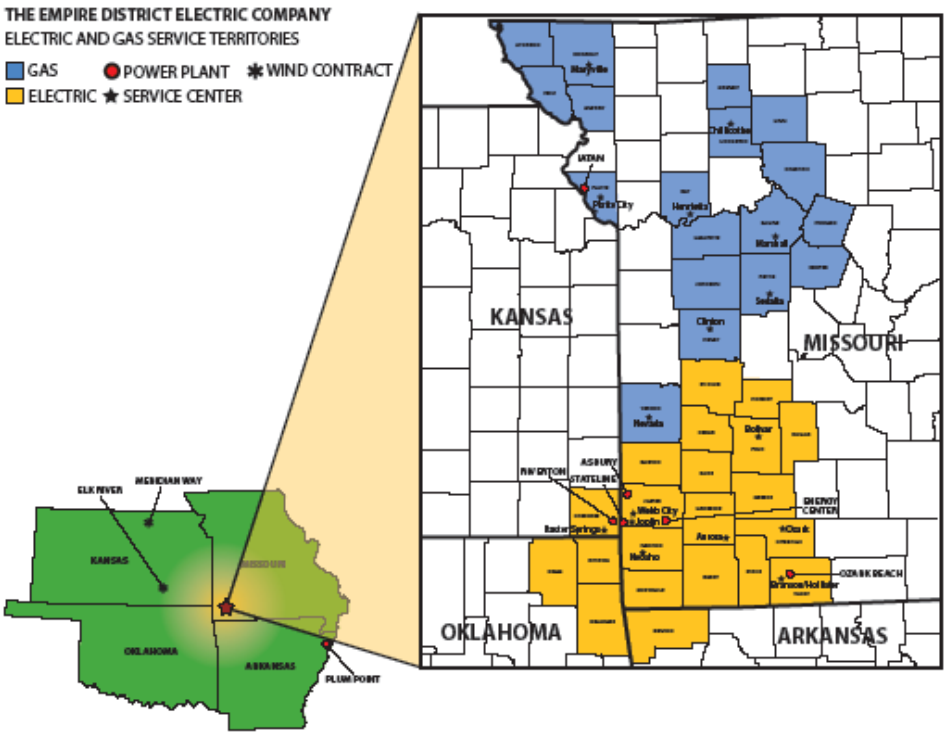
SECTION 4 COMPANY DESCRIPTION

Founded in October 1909 as a part of Cities Services Company, The Empire District Electric Company is an investor-owned, regulated utility company, based in Joplin, Missouri, that provides electric, natural gas (through its wholly owned subsidiary, The Empire District Gas

Company), and water service, with approximately 215,000 customers (total electric, natural gas and water). A subsidiary of the Company also provides fiber optic services. Empire has been listed on the New York Stock Exchange under EDE since 1946. On February 9, 2016, Empire announced an agreement and Plan of Merger under which Empire will merge with Liberty Utilities Central, a subsidiary of Liberty Utilities Co., the U.S. subsidiary of Algonquin Power & Utilities Corporation. The agreement preserves the Empire brand and Joplin corporate headquarters. This agreement and Plan of Merger do not affect the 2016 Empire IRP.

This IRP only applies to the Empire electric business. The electric operation is engaged in the generation, purchase, transmission, distribution and sale of electricity to over 170,000 electric customers in parts of Missouri (88.9%), Kansas (5.7%), Oklahoma (2.8%) and Arkansas (2.6%). Empire's electric service territory (see Figure ES-1) includes an area of about 10,000 square miles with a population of over 450,000. The electric service territory is located principally in southwestern Missouri and also includes smaller areas in southeastern Kansas, northeastern Oklahoma and northwestern Arkansas. The principal activities of these areas include light industry, agriculture and tourism.

Figure ES-1 Empire District Electric Service Territory



Empire supplies electric service at retail to 119 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 (population approximately 50,000), and its immediate vicinity, with a regional population including Joplin of approximately 160,000. Empire's system maximum hourly demand for 2015 was 1,149 MW which occurred on January

8, 2015. The all-time maximum hourly demand of 1,199 MW occurred on January 8, 2010. Empire's 2015 native customer load was 5,281,594 MWh. Empire's electric operating revenues in 2015 were derived as follows: residential 41.7%, commercial 31.1%, industrial 15.9%, wholesale on-system 3.3%, wholesale off-system 2.7% and other 5.3%.

Empire serves parts of twenty-one counties: sixteen (16) in Missouri, one (1) in Kansas, three (3) in Oklahoma and one (1) in Arkansas, as shown in Table ES-1.

Table ES-1 Counties in Empire's Electric Service Territory

State	Counties (Alphabetical Order)
Missouri	Barry, Barton, Cedar, Christian, Dade, Dallas, Greene, Hickory, Jasper, Lawrence, McDonald, Newton, Polk, St. Clair, Stone, Taney
Kansas	Cherokee
Oklahoma	Craig, Delaware, Ottawa
Arkansas	Benton

Table ES-2 offers some quick facts about Empire as of the end of 2015.

Table ES-2 Empire Quick Facts

Category	At Dec-31-2015
Population of Service Area	Over 450,000
Cities and Towns Served/Electric	119
Cities and Towns Served/Gas	48
Electric Customers	170,158
Gas Customers	43,639
Average Yearly Residential Usage (kWh)	12,881
Average Residential Price per kWh	$0.1256
Average Commercial Price per kWh	$0.1089
Average Industrial Price per kWh	$0.0828
Employees	749
Owned Capability	1,280 MW
Purchased Capacity	86 MW
Operating Revenues (000)	$605,573
Operating Income (000)	$96,301
Net Income (000)	$56,597
Earnings per Average Common Share	$1.30
Dividends Paid	$1.04
Gross Plant (000)	$2,601,592
On-System Electric Sales (MWh)	4,935,725
On-System Gas Sales (000) (Mcf)	7,783

4.1 Electric Generating Facilities

Empire owns and operates a diverse generating portfolio that includes wholly-owned units, jointly-owned units and power purchase agreements (PPA). The units operate on coal, natural gas, fuel oil (as a secondary fuel), hydro and wind as can be seen in Table ES-3 and Figure ES-2. These data represent the Empire capacity mix.

Table ES-3 Generating Resource by Type – 2015

Type	Capacity (MW)	%
Owned Coal	434	25.67%
Coal PPA	50	2.96%
Natural Gas	936	55.35%
Hydro	16	0.95%
Wind PPA	255	15.08%
Total	**1,691**	**100.00%**
Notes: Wind is nameplate capacity, not accredited capacity. Utilizes summer ratings		

Figure ES-2 2015 Capacity Mix

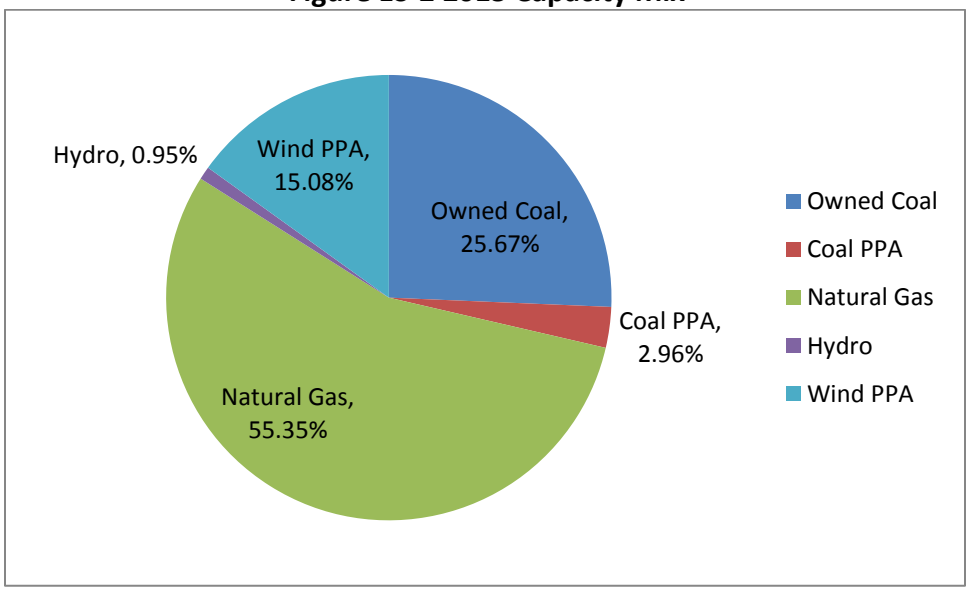
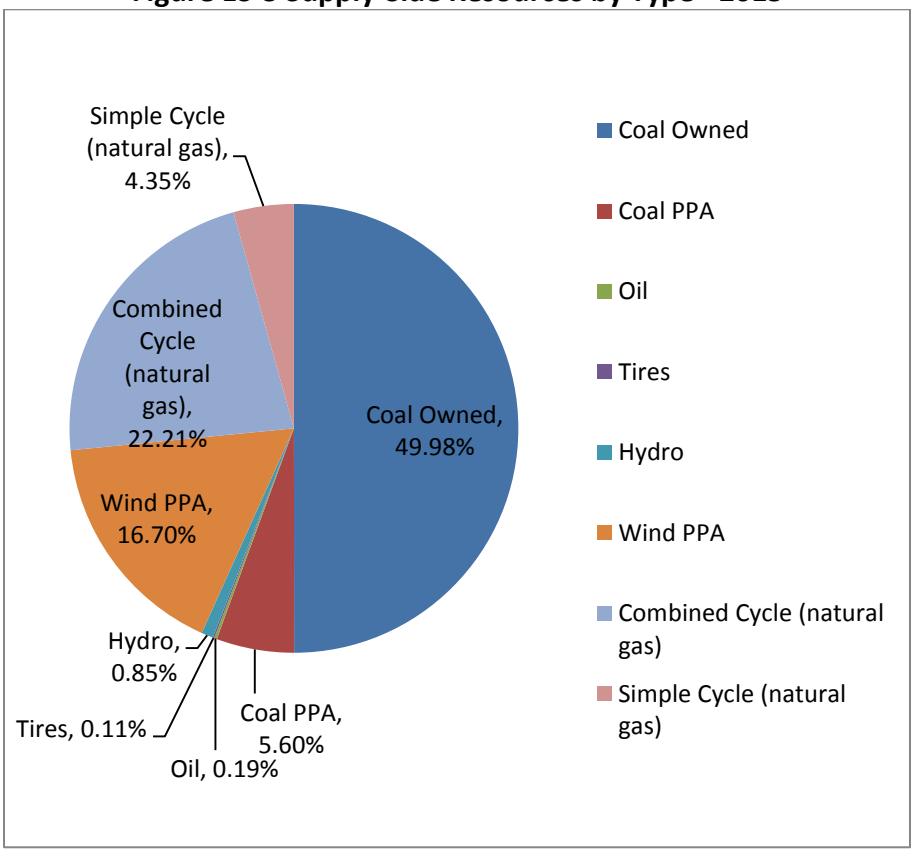


Table ES-4 and Figure ES-3 depict the generation mix (where the energy came from) by type for the year 2015. Data in Table ES-4 represent the total resource generation sold into the Southwest Power Pool Integrated Marketplace (SPP IM) for 2015.

Table ES-4 Existing Supply-Side Resources – 2015

Type	MWh	%
Coal Owned	2,467,334	49.98%
Coal PPA	276,550	5.60%
(Total Coal (Own + PPA) = 55.58%)		
Oil	9,480	0.19%
Tires	5,567	0.11%
Hydro	41,927	0.85%
Wind PPA	824,493	16.70%
Combined Cycle (natural gas)	1,096,386	22.21%
Simple Cycle (natural gas)	214,606	4.35%
(Total Natural Gas (CC + SC) = 26.56%)		
Total MWh EDE Resource	**4,936,343**	**100.00%**

Figure ES-3 Supply-Side Resources by Type - 2015



4.2 Existing Demand-Side Resources

At one time, Empire offered a demand-side portfolio in each of its four states, but at the time of this IRP filing, Empire only offers demand-side programs in Missouri and Arkansas. Customer programs began in Missouri in mid-2007 and in Arkansas in October 2007. Customer programs that began in Oklahoma in 2010 were discontinued on May 1, 2014 (Order No. 624718 in Oklahoma PUC Cause No. PUD 201300203), and the three-year Kansas pilot program that began in in June 2010 concluded in June 2013. The current Missouri and Arkansas programs are shown in Table ES-5 below. Currently, Empire has an Energy Efficiency Cost Recovery rider in Arkansas, which was designed to recover the full cost of implementing energy efficiency programs with a rate that is reconfigured annually. Empire does not have such a mechanism in Missouri, but recovers amortized energy efficiency costs through an on-bill line item that can be adjusted as part of a general rate case.

Table ES-5 Demand-Side Programs by State

Missouri	Arkansas
● ENERGY STAR® New Homes Program	● Arkansas Weatherization (Community Action Agency Program)
● High Efficiency Air Conditioner Rebate Program	● Arkansas Weatherization (Empire Contractor Program)
● Home Performance with ENERGY STAR® Program	● High Efficiency AC Rebate Program
● Low-Income New Homes	● Small Appliance Rebate Program
● Low-Income Weatherization	● Commercial and Industrial Rebate Program
● Energize Missouri Program	● Small Business Lighting
● Building Operator Certification	● High-efficiency Residential Lighting (CFL)
● Commercial and Industrial Rebate Program	● Energy Star® Appliance
● Energize Missouri Industries Program	● Online Audit and Energy Calculator
	● School-Based Energy Education
	● AC Tune-up and Duct Sealing

SECTION 5 LOAD ANALYSIS AND LOAD FORECASTING

Empire's load forecast methodology for its 2016 IRP is similar to that used for the 2013 IRP. It uses Statistically Adjusted End-Use (SAE) models for the Residential and Commercial classes and econometric models for the remaining classes. Two Variance Requests by Empire were approved by the Missouri Public Service Commission: 1) to forecast by revenue class and 2) to exempt end-use analysis for the Industrial class. The SAE models rely upon technology saturations and efficiencies developed by the Energy Information Administration (EIA) and calibrated to known Empire saturation survey results. The SAE models also utilize weather, the price of electricity and economic drivers. The econometric models utilize weather and economic drivers. The forecasts contain the impacts of existing DSM, increased efficiency standards, conservation trends and increased residential solar penetration, but exclude the impacts associated with future DSM.

Over the next 20 years (2016 to 2035), Empire's net system input is forecast to grow from **___ ** and its net peak (managed peak) is forecast to grow from **___ ** excluding the impact of future DSM. This forecast is developed using revenue class energy models, revenue class load profiles, and a system peak model. Load profiles are calibrated to both class energy and system peak forecasts resulting in both energy and coincident peak forecasts for all classes and the system. The forecast method employs at least ten years of historic load data and 30 years of historical weather data. Combined with economic and end-use data, these data are used to develop econometric models which forecast through 2035. The forecasts have been developed by Itron, an Empire Load Forecast consultant, with the MetrixND software.

As required by the IRP Rule, Empire has produced two (2) additional normal weather load forecasts, a high-growth case and a low-growth case, that bracket the base load forecast. Additionally, another load growth scenario referred to as a "High-High" scenario was developed in response to a request from the Missouri Stakeholder meeting. Finally, Empire developed a special forecast referred to as the "Aggressive Electric Vehicle" scenario, which was utilized in an IRP alternate plan (Plan 15).

The IRP load forecast shows that Empire is essentially a dual peaking utility. During the period 2010 through 2015, Empire's annual hourly peaks (not weather normalized) occur three times during the summer season, and three times during the winter season. Recent trends in energy efficiency, technology saturation and distributed generation appear to have shifted the Company more towards a winter peaking situation. The normal weather forecast from this IRP results in the annual peak occurring during the winter season. However, in this IRP, the need for new resources, as determined by the capacity balance, is still driven by the summer peak when the natural gas units have a lower capacity rating due to warmer ambient temperatures. As a result, both the summer and winter peaks are important and are presented below. Table ES-6 and Table ES-7 and Figure ES-4 and Figure ES-5 show the IRP summer and winter peak forecast. These include the impacts of Empire's existing DSM. Additionally, the realistically achievable potential (RAP) and RAP minus demand-side portfolio scenarios, as developed as potential candidates during this IRP study, are shown as subtracted from the summer base peak. The actual values in the graph are not weather normalized.

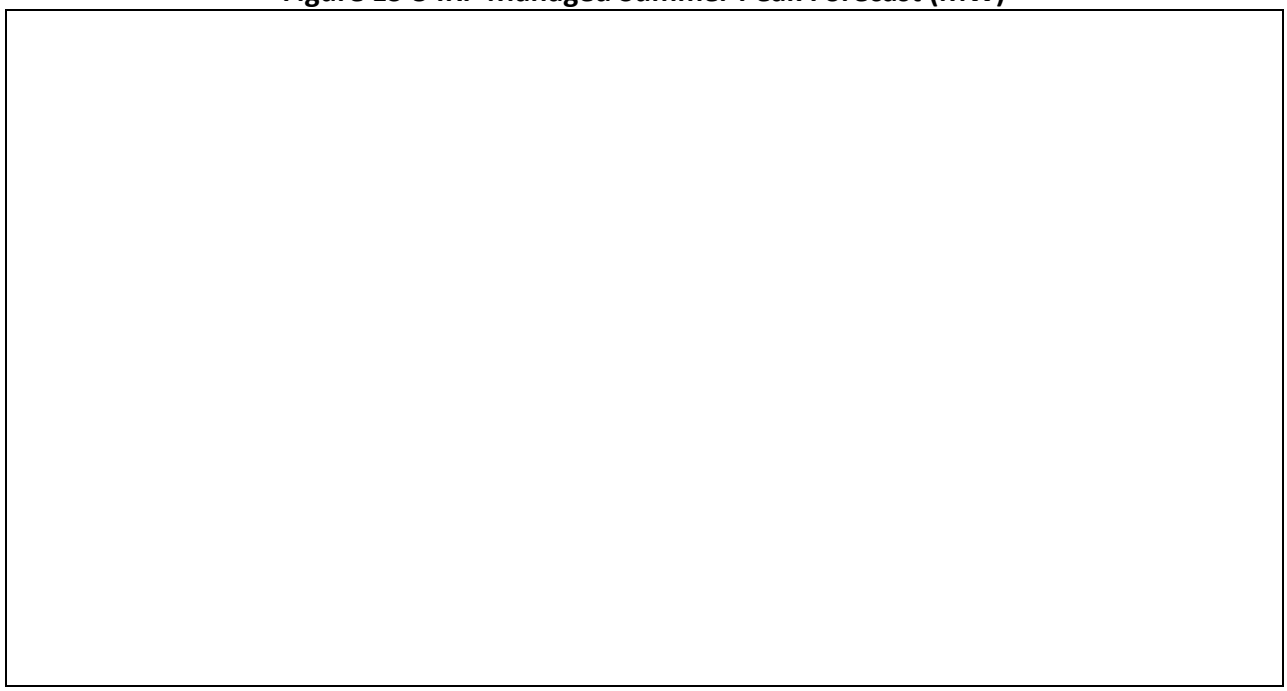
****Highly Confidential in its Entirety****
Table ES-6 IRP Managed Winter Peak Forecasts (MW)

****Highly Confidential in its Entirety****
Figure ES-4 IRP Managed Winter Peak Forecast (MW)

****Highly Confidential in its Entirety****

Table ES-7 IRP Managed Summer Peak Forecasts (MW)

****Highly Confidential in its Entirety****
Figure ES-5 IRP Managed Summer Peak Forecast (MW)



Similarly, Table ES-8 and Figure ES-6 show the 2016 IRP energy for all cases evaluated for the IRP planning horizon. The table and figures include the impacts of Empire's existing DSM. The actual values in the graph are not weather normalized.

****Highly Confidential in its Entirety****
Table ES-8 IRP Net System Input (NSI) Energy Forecasts (MWh)

****Highly Confidential in its Entirety****
Figure ES-6 Historical and Forecast Annual NSI Forecast (MWh)

The major forecasting classes for this IRP are the Residential, Commercial and Other Industrial classes. Figure ES-7 shows the forecasted energy (NSI) and Figure ES-8 shows the summer peak forecast for these three major classes, with and without the estimated impacts of the realistically achievable (RAP) and RAP- DSM portfolios.

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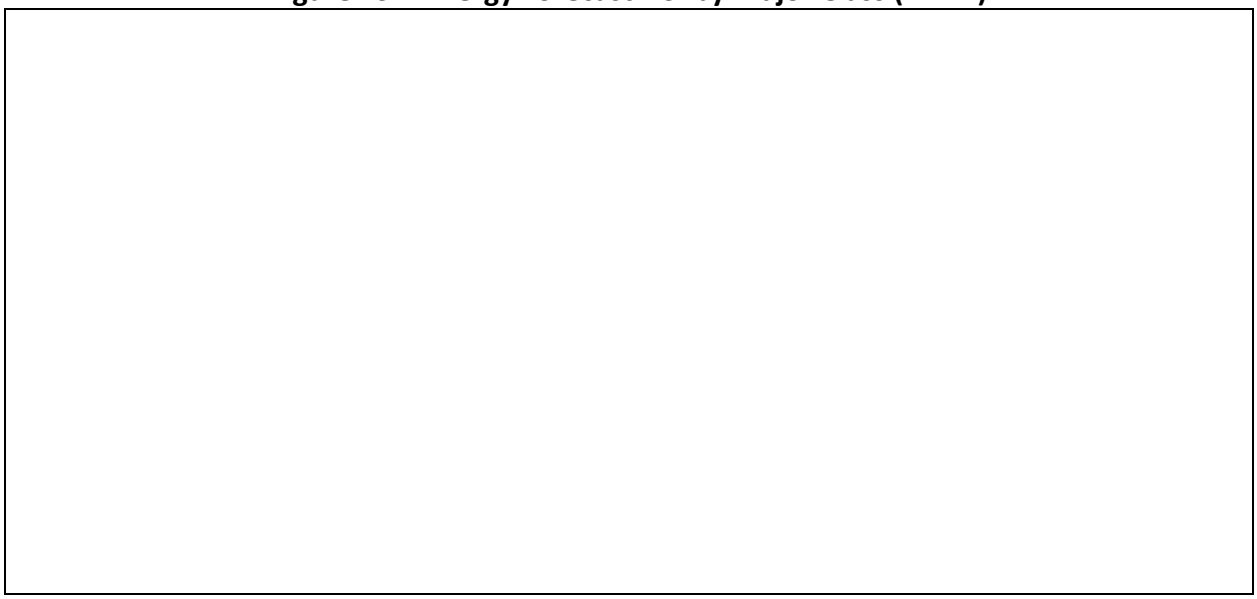
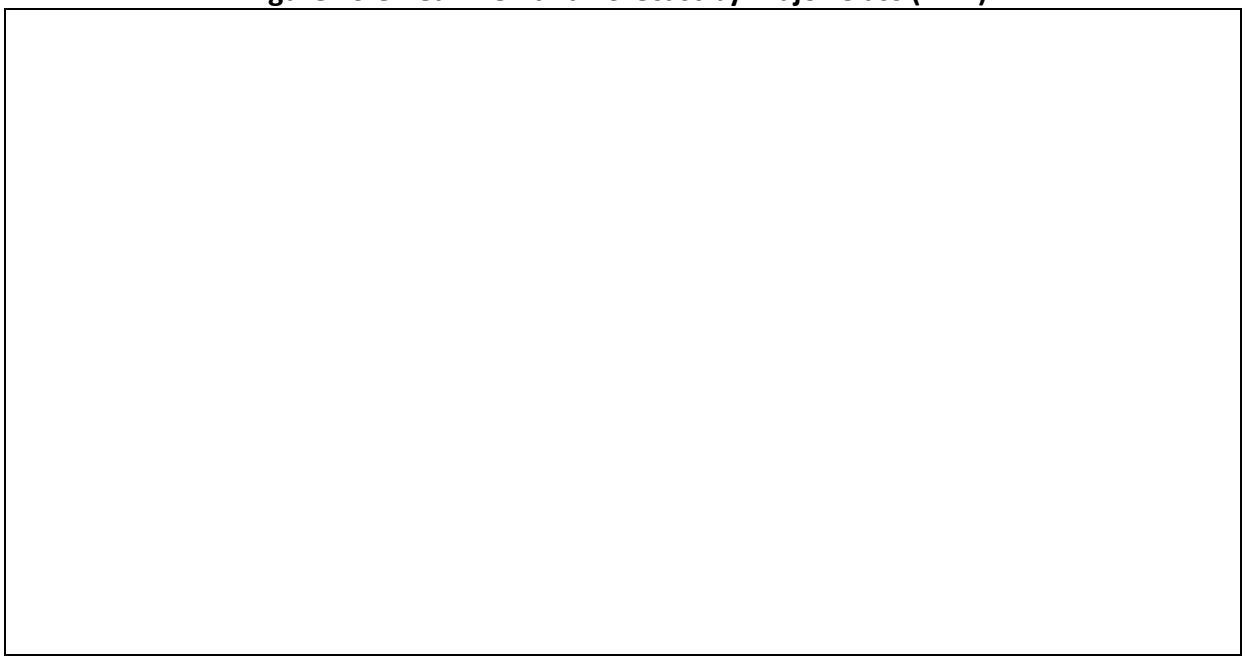
Figure ES-7 Energy Forecast NSI by Major Class (MWh)



****Highly Confidential in its Entirety****

Figure ES-8 Peak Demand Forecast by Major Class (MW)



SECTION 6 SUPPLY-SIDE RESOURCE ANALYSIS

The supply-side resource analysis section of the IRP involves an analysis of the existing supply-side resources followed by the formation of a diverse list of candidate supply-side resources that the utility can reasonably expect to use, develop, or acquire during the planning horizon. The utility must also develop the assumptions associated with the candidate resources, such as capital costs, fuel and purchased power costs, probable environmental costs, fixed and variable O&M costs, transmission and distribution (T&D) costs and other operational data. A preliminary resource screening may be conducted. Empire developed screening curves but did not eliminate any candidate resources from consideration by the capacity expansion modeling. In other words, all supply-side candidates were passed on to the integration analysis phase of the IRP process for consideration.

Table ES-9 shows Empire's existing supply-side resources. All unit ratings described in this IRP represent ratings and assumptions in effect at the time the IRP was in the process of being completed. Units are rerated from time to time and all assumptions are subject to change.

Table ES-9 Empire Existing Supply Side Resources

Resource Name	Primary Fuel	Current Rating (MW)	Ownership Percentage
Asbury	Coal	194	100%
Iatan 1	Coal	85	12%
Iatan 2	Coal	105	12%
Plum Point (Ownership)	Coal	50	7.52%
Riverton 10	Natural Gas	16	100%
Riverton 11	Natural Gas	17	100%
Riverton 12 Combined Cycle*	Natural Gas	250	100%
Energy Center 1	Natural Gas/Oil	82	100%
Energy Center 2	Natural Gas/Oil	82	100%
Energy Center 3	Natural Gas/Oil	49	100%
Energy Center 4	Natural Gas/Oil	49	100%
State Line 1	Natural Gas/Oil	94	100%
State Line Combined Cycle	Natural Gas/Oil	297	100%
Ozark Beach	Hydro	16	100%
Plum Point PPA	Coal PPA	50	
150 MW Elk River Wind Farm PPA	Wind PPA	17	
105 MW Meridian Way Windfarm	Wind PPA	19	
*Assumed capacity following the completion of the Riverton 12 combined cycle conversion project scheduled for approximately mid-2016			

6.1 Environmental Compliance Plan

In order to comply with current and forthcoming environmental regulations, Empire continues to implement its compliance plan and strategy (Compliance Plan). The Mercury Air Toxic Standards (MATS) and the Clean Air Interstate Rule (CAIR), replaced by the Cross State Air Pollution Rule (CSAPR), are the drivers behind its Compliance Plan and its implementation schedule. The MATS requires reductions in mercury, acid gases and other emissions considered hazardous air pollutants (HAPS). These reductions became effective in April 2012 and required full compliance by April 16, 2015. Empire is currently in material compliance with MATS, although the regulation has been remanded to the D.C. Circuit Court for further consideration. The CSAPR was first proposed by the Environmental Protection Agency (EPA) in July 2010 as a replacement of CAIR and came into effect on January 1, 2015.

Empire's Compliance Plan largely follows the preferred plan presented in its 2013 IRP. In addition to the Riverton Unit 12 project (described below in 6.2), the process of installing a scrubber, fabric filter, and powder activated carbon injection system at the Asbury plant has been completed since the last triennial IRP filing, and the equipment placed in service in December 2014. This addition required the retirement of Asbury Unit 2, a steam turbine rated at 14 megawatts that was used for peaking purposes. Asbury Unit 2 was retired on December 31, 2013.

6.2 Riverton 12 Combustion Turbine (CT) Conversion to Combined Cycle (CC)

Riverton Unit 12 is a natural gas-fired Siemens V84.3A2 combustion turbine that was installed at the Riverton power plant in Riverton, Kansas in 2007. It is currently rated at 142 MW for the summer peak season and it is primarily used as a peaking unit. When this unit was originally constructed, adequate natural gas piping and electrical transmission were designed and built to accommodate its conversion to a combined cycle unit at some point in the future. That conversion is currently in process. Upon completion in early to mid-2016, the Riverton 12 project will add about 100 MW to the system, making the Riverton 12 combined cycle unit's rated capacity approximately 250 MW. Once complete, this will become Empire's most efficient unit.

The approximate 100 MW gain in capacity from the Riverton Unit 12 conversion project will essentially replace the capacity lost from recent unit retirements at the Riverton site. Riverton Unit 7 (38 MW) and Unit 8 (54 MW) operated as small coal units for many years before their transition to natural gas only units in 2012. They were retired in June 2014 and June 2015, respectively. Riverton Unit 9 (12 MW), a small combustion turbine that used steam from either Unit 7 or Unit 8 for start-up, was also retired in June 2015. Together these units represent about 104 MW of recently retired capacity at Riverton.

6.3 Renewable Energy Standard (RES)

Empire operates in two (2) states, Missouri and Kansas, that currently have a renewable energy standard (RES) or Renewable Portfolio Standard (RPS) requirement that pertains to Empire (the Oklahoma requirements do not pertain as Empire has no generating capacity in Oklahoma). The Missouri requirement is based on a minimum percentage of renewable *energy*, while the Kansas target is based on a minimum percentage of renewable *capacity*. As the optimal build outs were determined in the integration phase of this IRP, the modeling was initially conducted based on the lowest cost plan without regard to the RES mandates (Plan 1). However, Plan 1 and all other plans in this IRP meet Empire's RES requirement. Table ES-10 shows the current Missouri RES. It is based on a percentage of a utility's sales. Two percent of this requirement must be solar. Empire began paying solar rebates to qualifying Missouri customers in June 2015, and the renewable energy credits (RECs) from those rebates can be used toward the solar portion of the RES requirement. The RES allows for some or all of the requirement to be satisfied by the purchase of RECs. Each eligible kWh of energy generated within the state of Missouri counts as 1.25 kWh.

Table ES-10 Missouri Renewable Energy Standard

Dates	RES Energy (no less than)
2011-2013	2%
2014-2017	5%
2018-2020	10%
Beginning in 2021	15%

There has been an attempt to change the definition of "renewable energy" so that it would no longer include Empire's Ozark Beach hydro facility. To meet the RES requirements for this IRP, energy credits from Ozark Beach were included with the additional 0.25 bonus credits for Missouri-generated energy. If Ozark Beach generation would not be considered "renewable energy" at some point in the future, this could raise the cost of Empire's RES compliance.

Table ES-11 represents the Kansas RPS voluntary targets where the percentage listed in the table is based on the average demand of the prior three years.

Table ES-11 Kansas Renewable Portfolio Standard

Years	Utility Peak Capacity
2011-2015	10%
2016-2019	15%
2020 and onward	20%

6.4 Environmental Uncertainty and the 2016 IRP

The timing of Empire's 2016 IRP makes it difficult to model environmental uncertainty, especially issues related to the U.S. Environmental Protection Agency's (EPA) Clean Power Plan

(CPP) under Section 111(d) of the Clean Air Act. The EPA proposal was introduced in June 2014 and the pre-published final version was unveiled on August 3, 2015, after Empire's IRP process was already underway. Empire has attended CPP meetings in each of the states that it serves. However, at this time there are no state-approved implementation plans in the states that Empire serves. Environmental uncertainty was discussed during Empire's pre-integration meeting with Missouri Stakeholders on November 20, 2015. During the November 20, 2015 Stakeholder discussions, it was agreed that CPP state and/or regional compliance plans are currently unknown, but, to move forward, Empire would need to make assumptions about the future to continue with the development of the 2016 IRP in order to meet its April 2016 IRP filing deadline. The annual update process and future triennial compliance filings could then be utilized to update environmental analyses as new information becomes known. Further, following the pre-integration meeting, on February 9, 2016, just months before Empire's 2016 IRP filing date, the U.S. Supreme Court issued a stay of the CPP in a 5-4 decision. Contributing to the uncertainty, the court's decision does not overturn the CPP, nor decide the legal merits of the challenges brought against the U.S. EPA for issuing the CPP. Rather, the court's decision stalls the implementation of the CPP while lawsuits challenging the legality of the plan are adjudicated by the D.C. Circuit Court of Appeals.

While there is much uncertainty surrounding the CPP timing and potential compliance, Empire did address environmental costs in its 2016 IRP filing as discussed below in Section 6.8. Although the CPP is unclear, based upon industry knowledge and where it seems likely states may be headed with respect to each state compliance plan from preliminary meetings, Empire modeled various carbon scenarios with some sensitivity around certain key aspects of the CPP.

6.5 Existing Units Assumptions for the 2016 IRP

The analysis of the existing supply-side resources and current supply-side projects has led to the existing unit parameters for this IRP. The following list summarizes these existing unit parameters for purposes of this IRP.

Summary of Existing Unit Parameters for the 2016 IRP

- Riverton combined cycle (CC) project
    - Convert Riverton Unit 12 CT (142 MW) into a 250 MW CC unit
    - Adds about a net 100 MW to the system
    - Expected completion early to mid-2016
- Wind PPA
    - 150 MW Elk River 20-year PPA expires December, 2025; but can be extended five 5 years at Empire's option
    - 105 MW Meridian Way 20-year PPA expires December, 2028
- Asbury 1

    - Assumed to retire for purposes of this IRP in 2035
- Energy Center
    - Unit 1 assumed to retire for IRP purposes in 2023. Unit 2 assumed to retire for IRP purposes in 2026.
- Riverton 10 and 11
    - Both units are assumed to retire for IRP purposes in 2033.

6.6 Supply-Side Resource Candidates

Burns & McDonnell, an engineering design firm, was retained to develop the cost and performance parameters for the supply-side resource candidates. The following lists the conventional and renewable resources that were considered as candidate resources for future capacity needs in the integration phase of the IRP. Some but not all of these types of resources were selected for the various plans that were studied.

Summary of Supply-Side Resource Candidates for the 2016 IRP

- Super-Critical Coal (joint-ownership with carbon capture and sequestration (CCS))
- Combustion Turbines (CT)
    - Aero-derivative CT
    - E and F Class Frame CT
- Combined Cycle
    - F-Class unfired and duct fired
- Integrated Gasification Combined Cycle (IGCC) with CCS
- Reciprocating Internal Combustion Engine (RICE)
- Distributed Generation (DG)
- Small Modular Nuclear (SMN)
- Traditional Nuclear (only PPA options)
- Wind
    - Ownership
    - PPA Options
- Biomass
- Landfill Gas
- Utility Scale Solar photovoltaic (PV)
- Battery Storage

6.7 Fuel Price Forecasts

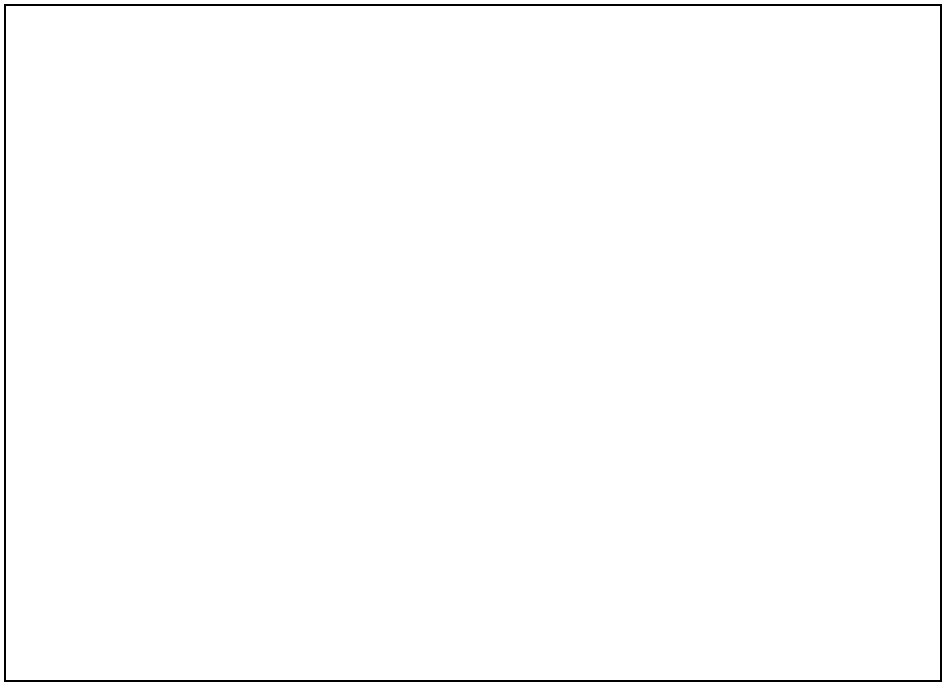
The coal price forecasts used for the Asbury, Iatan, and Plum Point facilities were supplied by Empire and are based on near-term contract knowledge and escalators from the U.S. Department of Energy's Energy Information Administration's (EIA) projections for the outer years. Generic coal prices were based on Iatan and Plum Point prices. Base, high and low

forecasts were also developed. Additional coal prices were developed to be consistent with the probable environmental cases.

The Henry Hub gas price forecast used for this IRP was based on information obtained from the ABB Spring 2015 Power Market Advisory database, which included base, high and low Henry Hub natural gas prices. ABB used Synapse CO_2 projections starting in 2022 to develop correlated gas prices by using ABB's Integrated Power and Fuels Module. The Henry Hub prices were adjusted to Southern Star Central Gas Pipeline (SSCGP) prices where Empire takes delivery. The SSCGP prices were used in the modeling. Figures ES-9 and ES-10 show the Henry Hub base, high and low forecasts for the base or no CO_2 scenario, and the Henry Hub Natural Gas Base Forecast for all three CO_2 Scenarios.

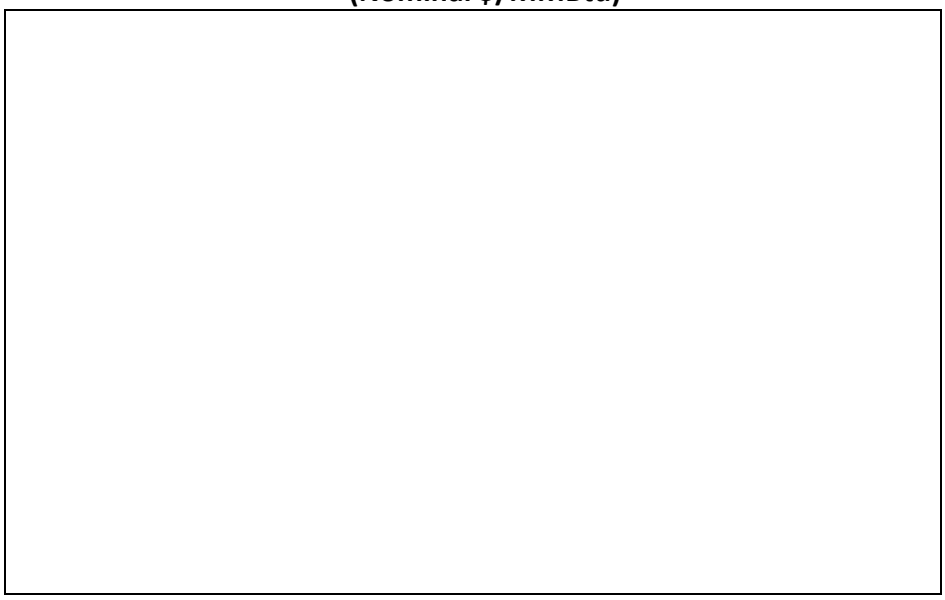
Fuel oil (No. 2 oil) prices for the IRP were also supplied by ABB. To forecast No. 2 Oil, ABB uses a technique similar to natural gas, where representative current NYMEX pricing is blended to its internal forward view. ABB generates forecasts of region-specific prices for refined oil products burned in power plants, e.g., diesel and residual, based on an analysis of historical relationships between these prices and the West Texas Intermediate Reference Case Forecast price.

****Highly Confidential in its Entirety****
Figure ES-9 Annual Henry Hub Natural Gas Forecast for No CO_2 Scenarios (Nominal $/MMBtu)



(Source: ABB Advisors)

****Highly Confidential in its Entirety****
Figure ES-10 Annual Henry Hub Natural Gas Forecast for CO_2 Scenarios (Nominal $/MMBtu)



(Source: ABB Advisors)

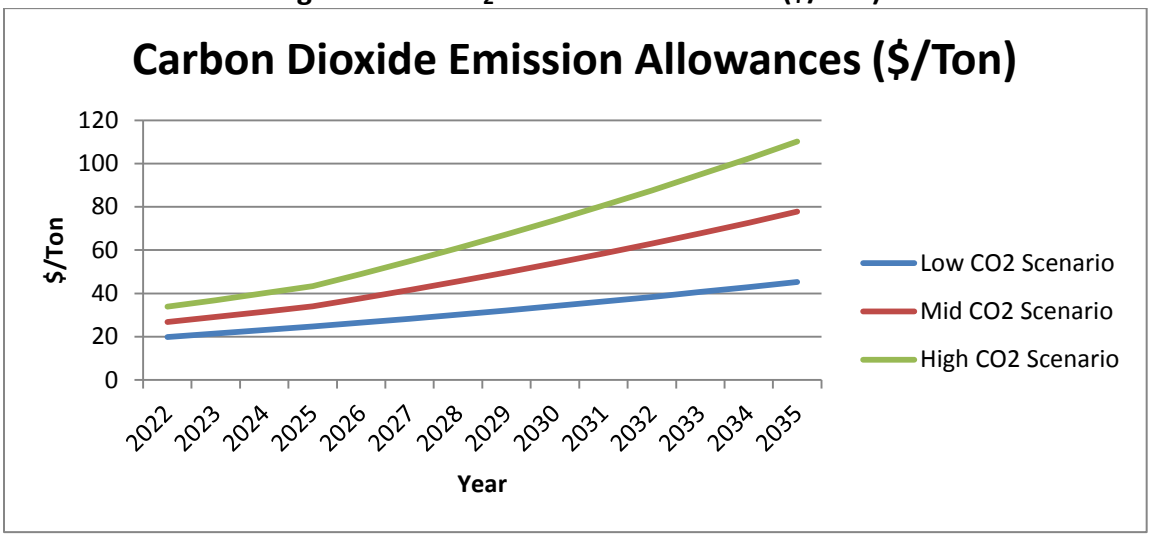
6.8 Probable Environmental Costs

Three levels of possible future carbon cost scenarios were assumed in the modeling using the Synapse CO_2 tax cases. Another environmental scenario assumed no carbon costs during the entire study period. Table ES-12 and Figure ES-11 show the projected CO_2 allowance prices for these scenarios.

Table ES-12 CO_2 Emission Allowance (Nominal $/Ton)

Year	Low CO_2 Scenario	Mid CO_2 Scenario	High CO_2 Scenario
2022	19.84	26.84	33.84
2023	21.43	29.16	36.90
2024	23.07	31.57	40.07
2025	24.77	34.06	43.35
2026	26.53	37.77	49.01
2027	28.35	41.62	54.89
2028	30.23	45.61	60.98
2029	32.17	49.74	67.30
2030	34.19	54.01	73.84
2031	36.26	58.44	80.62
2032	38.41	63.02	87.64
2033	40.63	67.77	94.90
2034	42.92	72.67	102.42
2035	45.29	77.75	110.21

Figure ES-11 CO_2 Emission Allowances ($/Ton)



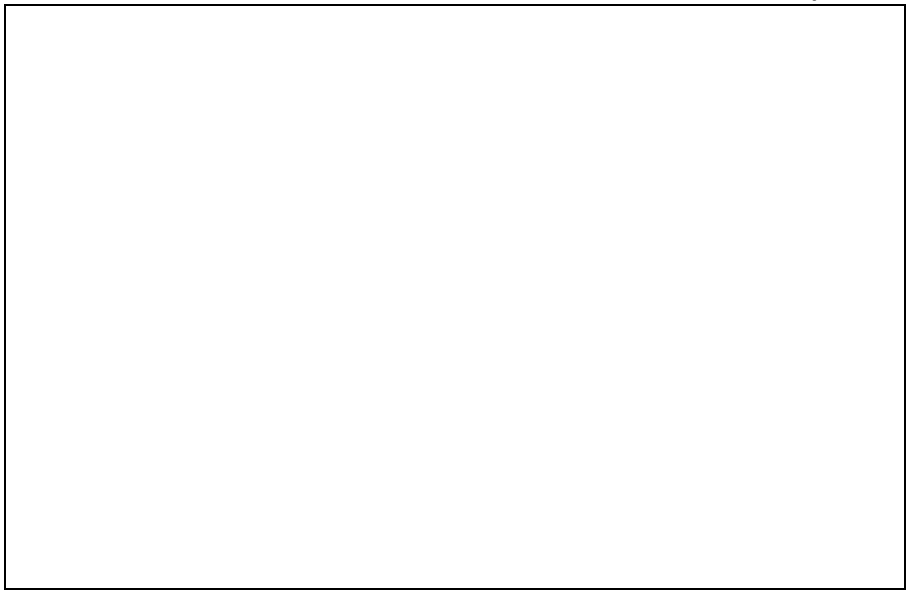
In addition to carbon dioxide emission costs, Empire also modeled emission cost allowances for NO_x and SO_2 and adjusted these costs based on the environmental scenario in order to have internally consistent plans.

6.9 Market Price Forecasts

ABB generated a forward market view of the Southwest Power Pool – Kansas/Missouri (SPP-KSMO) pricing hub specifically for the Empire IRP project utilizing the most recent market information available. Prices were created for an 8,760 hourly view to generate prices on- and off-peak. Figures ES-12 and ES-13 illustrate Empire's price forecast for the base assumptions under the four environmental scenarios as well as for high and low fuel price uncertainty scenarios.

****Highly Confidential in its Entirety****

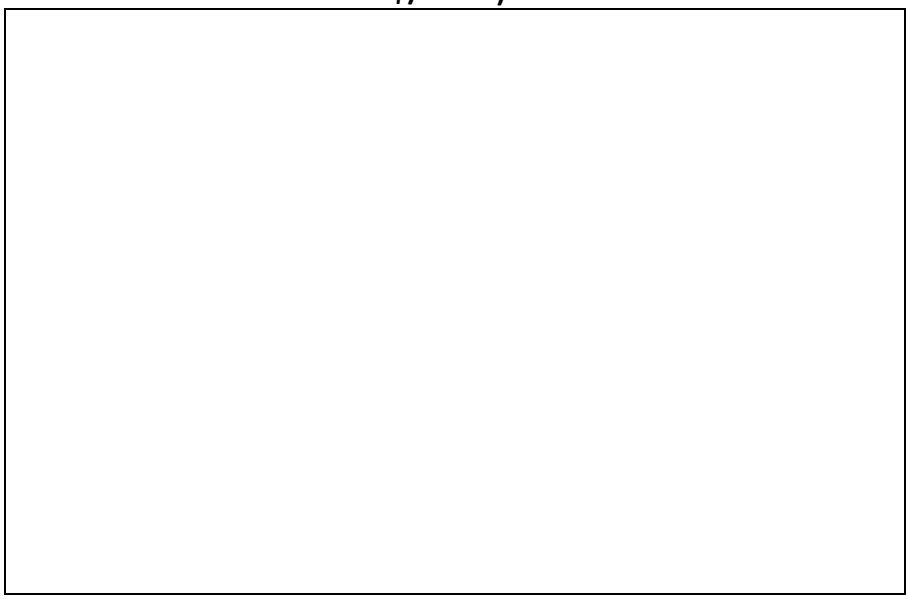
Figure ES-12 SPP-KSMO 7x24 Market Prices for Environmental Scenarios (Nominal $/MWh)



(Source: ABB Advisors)

****Highly Confidential in its Entirety****

Figure ES-13 SPP-KSMO 7x24 Market Prices for No Environmental Scenarios (Nominal $/MWh)



(Source: ABB Advisors)

SECTION 7 TRANSMISSION AND DISTRIBUTION ANALYSIS

The Transmission and Distribution Analysis (T&D) section of the IRP Rule requires the utility to:

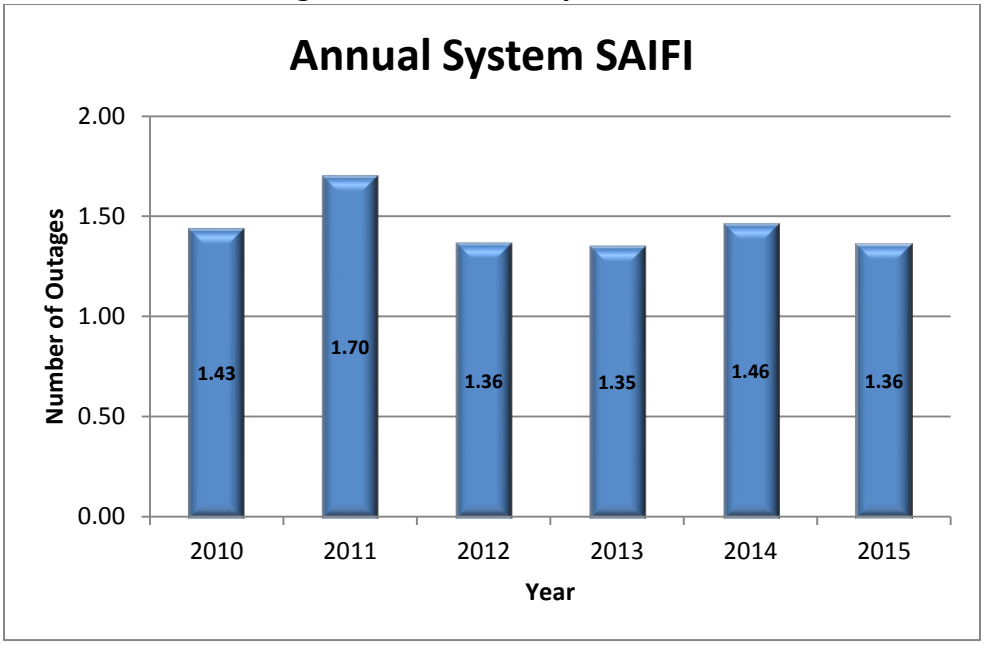
- assess the adequacy of the existing T&D system
- consider opportunities to reduce T&D losses
- consider interconnection of new generation facilities
- consider the potential incorporation of advanced T&D network technologies
- develop avoided T&D capacity costs for demand-side analysis; and
- describe participation with the utility's regional transmission organization (RTO).

Empire is a member of the Southwest Power Pool (SPP) and, as such, is reliant on the SPP's determination of which transmission lines will be built and on what schedule. As a member of SPP, Empire is assigned a cost sharing allocation of all lines that are built in the SPP. That cost allocation varies per line. The IRP filing describes and provides copies of the RTO transmission expansion plan; describes the utility-specific T&D projects; and identifies and describes any transmission projects under consideration by SPP for Empire's service territory.

7.1 Project Operation Toughen Up

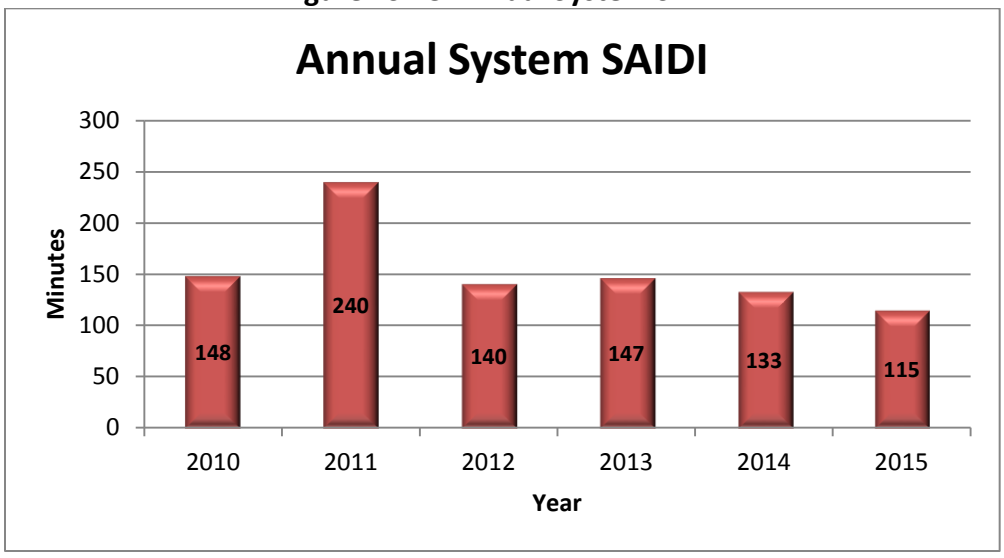
Operation Toughen Up is a long-term $100 million initiative currently in progress to strengthen the transmission and distribution (T&D) delivery system. Since reliable service is important for customers, Empire has established long-term goals to address two primary factors – interruption frequency and interruption duration. These factors are measured by the reliability indices SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index). Empire is continuing a variety of upgrades to physical assets in the T&D areas to improve system performance. The objective is to improve the reliability of Empire's electrical delivery system by reducing the number of outages and shortening outage duration. Empire's goal is to achieve a SAIFI of no greater than 1.00 and a SAIDI of no more than 100. Figures ES-14 and ES-15 show Empire's historical SAIFI and SAIDI.

Figure ES-14 Annual System SAIFI



SAIFI: An index of 1.36 means the average customer experienced 1.36 outages during the year.

Figure ES-15 Annual System SAIDI



SAIDI: An index of 115 means the average customer experienced a total of 115 outage minutes during the year.

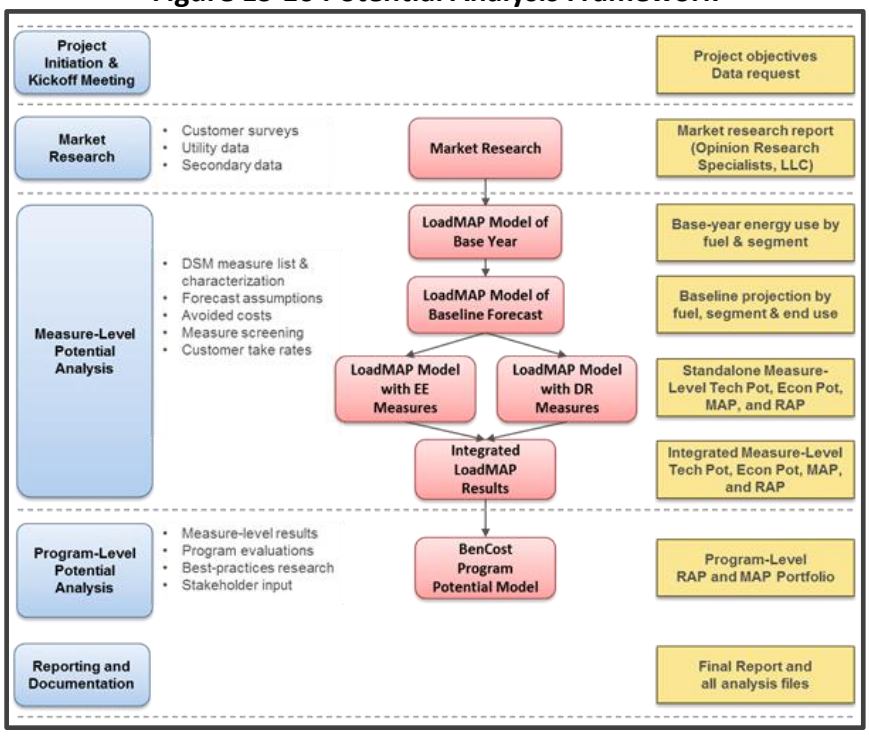
SECTION 8 DEMAND-SIDE RESOURCE ANALYSIS

The demand-side resource analysis section of the IRP involves the development of candidate demand-side resources for all major classes and end-uses with the goal of achieving all cost-effective demand-side savings. Empire engaged Applied Energy Group (AEG) to conduct a Demand-Side Management Potential Study in Empire's Missouri service territory. To perform the potential analysis, AEG used a bottom-up approach following the major steps listed below.

1) Perform a market characterization to describe sector-level electricity use for the residential and nonresidential sectors for the base year, 2014. This step used Empire market research data and other secondary data sources.
2) Develop a baseline projection of energy consumption and peak demand by sector, segment, and end use for 2016 through 2035.
3) Define and characterize demand-side resources to be applied to all sectors, segments, and end uses.
4) Estimate technical, economic, and achievable potential in terms of energy and peak demand impacts from each demand-side resource 2016 through 2035.
5) Develop estimates of program-level potential based on the measure-level potential by assigning specific delivery mechanisms and program cost structures.

The potential analysis framework is shown in Figure ES-16.

Figure ES-16 Potential Analysis Framework



8.1 Energy Efficiency Potential

In this study, the DSM potential estimates represent net savings developed into four types of potential: technical potential, economic potential, and two levels of achievable potential. Technical and economic potential are both theoretical limits to efficiency savings. Achievable potential embodies a set of assumptions about the decisions consumers make regarding the efficiency of the equipment they purchase, the maintenance activities they undertake, the controls they use for energy-consuming equipment, and the elements of building construction.

- **Technical Potential.** Theoretical upper limit, assuming that customers adopt all feasible measures regardless of cost or customer preference. At the time of existing equipment failure, customers replace their equipment with the most efficient option available. In new construction, customers and developers also choose the most efficient equipment option.
- **Economic Potential.** Adoption of all ***cost-effective*** energy efficiency measures, as measured by the total resource cost (TRC) test, which compares lifetime energy and capacity benefits to the costs of the delivering the measure. If the benefits outweigh the costs (the TRC ratio is equal to or greater than 1.0), a given measure is included in the economic potential. Customers are then assumed to purchase the most cost-effective option applicable to them at any decision juncture. Economic potential is still a hypothetical upper-boundary of savings potential as it represents only measures that are economic but does not yet consider customer acceptance and other factors.
- **Maximum Achievable Potential** estimates customer adoption of economic measures when delivered through DSM programs under ideal market, implementation, and customer preference conditions and an appropriate regulatory framework. Information channels are assumed to be established and efficient for marketing, educating consumers, and coordinating with trade allies and delivery partners. Maximum Achievable Potential establishes a maximum target for the savings that an administrator can hope to achieve through its DSM programs and involves incentives that represent a substantial portion of the incremental cost combined with high administrative and marketing costs.
- **Realistic Achievable Potential** reflects expected program participation given barriers to customer acceptance, non-ideal implementation conditions, and limited program budgets.

8.2 DSM Portfolio Scenarios in the 2016 IRP

AEG considered and assessed eight scenarios for the demand-side programs and demand-side rates. The IRP study also considered a no DSM case (Plan 5), making a total of nine potential DSM futures.

1) **RAP-**. Alternative demand-side portfolio designed to represent one-half of the Realistic Achievable Potential (RAP) Program Design portfolio participation.
2) **RAP Program Design**. The Realistic Achievable Potential (RAP) candidates from the DSM Potential Study that Empire proposes passing to the integration phase.
3) **RAP+**. Alternative demand-side portfolio designed to represent one-half of the difference between the Realistic Achievable Potential (RAP) Program Design and Maximum Achievable Potential (MAP) Program Design portfolios.
4) **MAP Program Design**. The Maximum Achievable Potential (MAP) candidates from the DSM Potential Study that Empire proposes passing into the integration phase.
5) **Aggressive Capacity Portfolio**. Alternative demand-side portfolio designed to utilize demand-side resources to meet additional future capacity.

6) **High CO_2 Portfolio.** The RAP Program Design scenario screened with the high environmental avoided costs.
7) **Low CO_2 Portfolio.** The RAP Program Design scenario screened with the low environmental avoided costs.
8) **No CO_2 Portfolio**. The RAP Program Design scenario screened with the no carbon costs in the planning horizon.
9) **No Additional DSM**.

8.3 Demand-Side Resource Candidates

While numerous demand-side resource candidates were considered in the screening process, the following list represents those candidates that were passed on to the integration phase for consideration. All of the demand-side resource candidates were selected for the most aggressive capacity case. Other portfolios contained some, but not all of these resources.

For Residential:

- Residential Lighting
- Residential Appliance Recycling
- Whole House Efficiency
- Residential Behavioral
- Low Income Whole House Efficiency
- Low Income Behavioral
- Low Income Weatherization
- Demand Load Control

For Commercial:

- C&I Prescriptive Rebate
- C&I Custom Rebate
- Strategic Energy Management
- C&I Retro-Commissioning
- Curtailment Agreement

SECTION 9 INTEGRATED RESOURCE PLAN AND RISK ANALYSIS

Load forecasting, supply-side analysis and demand-side analysis represent the data development portion of the IRP process. Candidate resource options are passed on to the integrated resource analysis phase and combined with loads to determine a series of optimal resource plans, where the combinations of resources are designed to perform best under the plan's set of assumptions. Integrated Resource Plan and Risk Analysis can be summarized as follows:

- Design alternate resource plans (required plans and utility selected plans)
- Develop a set of alternate plans based on substantively different mixes of demand-side and supply-side resources and variations in timing to assess their relative performance
- Provide performance measures and financial ratios for each plan
- Select critical uncertain factors, document and assign subjective probabilities
    - Empire chose to utilize a decision tree approach (stochastic and deterministic analysis with the calculation of an expected value)
- Provide a statistical evaluation of risk

9.1 Alternate Resource Plans

Empire developed nineteen (19) resource plans for this IRP. This includes base plans, contingency plans and required plans. The plans to be studied in the integration phase can be categorized as follows:

- Base Scenarios
    - Base assumptions with and without RPS requirements
    - Base DSM portfolios: RAP, RAP+ and RAP-
- Additional Load Growth Scenarios
    - Low, High and High-High
- Additional Environmental Scenarios
    - High, low and no (with corresponding DSM portfolios)
- Additional Fuel and Market Price Scenarios
    - High and low
- Other contingency plans and required plans for planning purposes
    - Federal Renewable Incentives
    - Aggressive Electric Vehicle future
    - Highly Aggressive DSM (MAP), Aggressive Capacity DSM, Aggressive Renewable
    - Early Asbury Retirement

Table ES-13 summarizes the 19 alternate plans.

Table ES-13 Alternate Resource Plans

Plan	Plan Description	Plan Type	DSM Portfolio	RPS	Carbon Costs for DSM Screening
1	Base Scenario	Base Plan	RAP Portfolio	None	Weighted
2	Base Scenario With RPS	Base Plan	RAP Portfolio	15 to 20% by 2021	Weighted
3	RAP + DSM	Base Plan	RAP + DSM	15 to 20% by 2021	Weighted
4	RAP – DSM	Base Plan	RAP – DSM	15 to 20% by 2021	Weighted
5	No DSM	Base Plan	None	15 to 20% by 2021	NA
6	Federal Renewable Incentives	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
7	High Environmental DSM	Contingency Plan	High Environmental	15 to 20% by 2021	High
8	Low Environmental DSM	Contingency Plan	Low Environmental	15 to 20% by 2021	Low
9	No Environmental DSM	Contingency Plan	No Environmental	15 to 20% by 2021	None
10	Low Load	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
11	High Load	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
12	High-High Load	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
13	Low Fuel	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
14	High Fuel	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
15	Aggressive Electric Vehicle	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
16	Early Asbury Retirement	Contingency Plan	RAP Portfolio	15 to 20% by 2021	Weighted
17	Highly Aggressive DSM	Required Plan	MAP Portfolio	15 to 20% by 2021	Weighted
18	Aggressive Capacity DSM	Required Plan	Aggressive Capacity Portfolio	15 to 20% by 2021	Weighted
19	Aggressive Renewable	Required Plan	None	Only renewables utilized	NA

Notes:
DSM – Demand-side Management
RAP – Realistic Achievable Potential
MAP – Maximum Achievable Potential
RPS – Renewable Portfolio Standard

9.2 The Integration Process

ABB was retained by Empire to provide analytical services in support of the 2016 IRP. ABB and Empire undertook a detailed analysis of the performance of the resource plans. Multiple alternative resource plans with demand-side and supply-side "build outs" were developed with the Capacity Expansion Model (CEM). All plans were then subjected to full financial modeling including the calculation of net present value of revenue requirements (PVRR) in the Strategic Planning model powered by MIDAS Gold® (MIDAS). Additionally, all plans were evaluated in the decision analysis phase, represented by a decision tree in the MIDAS model. From this modeling, a detailed risk analysis was performed for each of the 19 plans.

This process can be considered as a three phased approach. Candidate demand-side and supply-side resources were considered as available resources in the IRP's integration process. During Phase 1 (capacity expansion modeling), specific optimized resource plans were developed based on the lowest present value of revenue requirements (PVRR) for each of the different scenarios with a capacity expansion model. Each set of resources were developed specifically to perform the best under the assumptions made about the possible future for each plan. These plans may not be directly comparable since the assumptions about the future may vary significantly between the plans.

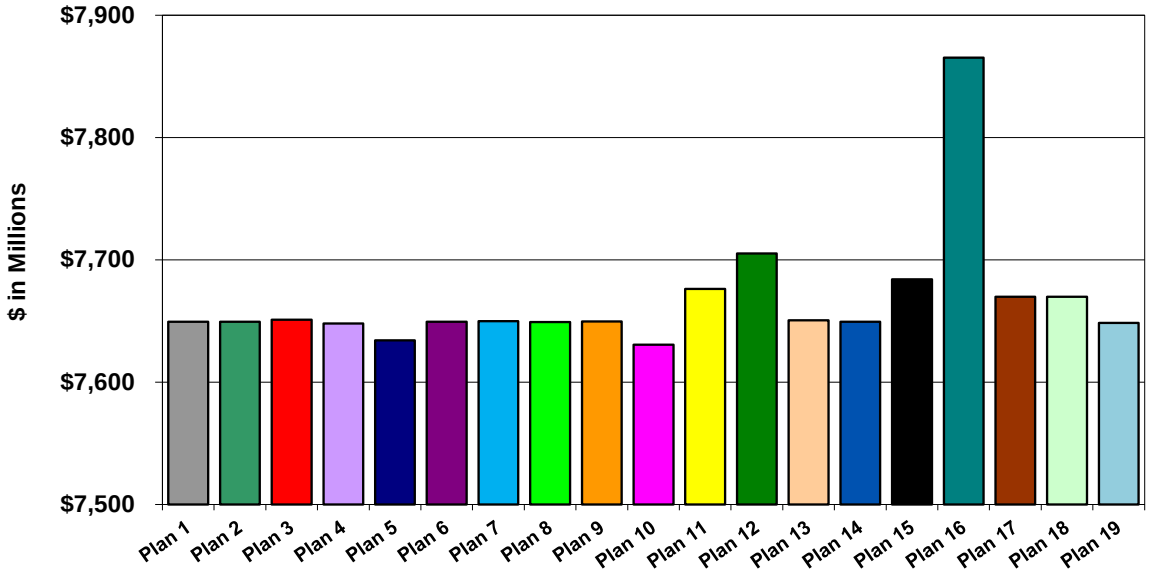
In Phase 2 (deterministic analysis), each plan that was developed during Phase 1 was evaluated against the base case assumptions. Hourly dispatch of the units and full financial modeling was performed over the planning horizon. Deterministic PVRRs were calculated to compare plans against each other. In Phase 3 (stochastic/risk analysis), each plan was subjected to decision analysis (with the critical uncertain factors), again, with full financial modeling over the planning horizon. These stochastic runs generated 48 endpoints for each of the plans analyzed. High and low gas prices with correlated market prices were used only for the No CO_2 environmental future which made the decision tree asymmetric for the gas and market price branches. Only base gas and correlated market prices were developed for the other three levels of CO_2 futures. The results from this phase were used to develop risk profiles and tornado charts across all plans. All of these analyses and the objectives of the IRP Rule were considered by Empire's decision makers during the development of the preferred plan. The preferred plan represents a balance between the planning objectives, planning risks, and financial impacts examined using the deterministic, stochastic, and risk analyses.

The demand-side inputs were supplied to ABB from AEG. ABB developed load shapes for distributing energy savings for the integration modeling. The demand-side programs are essentially a modification to the load forecast inputs. The CEM model did not optimize demand-side resources. CEM optimized supply-side resources around the demand-side resource modified load. In addition to demand-side energy and coincident peak savings, AEG also provided all program costs and the information required to calculate a net shared benefit. The costs associated with the demand-side resources, including the net shared benefit, were input into the MIDAS model and assumed to be recovered in a timely manner through customer rates.

9.3 Present Value of Revenue Requirements (PVRR)

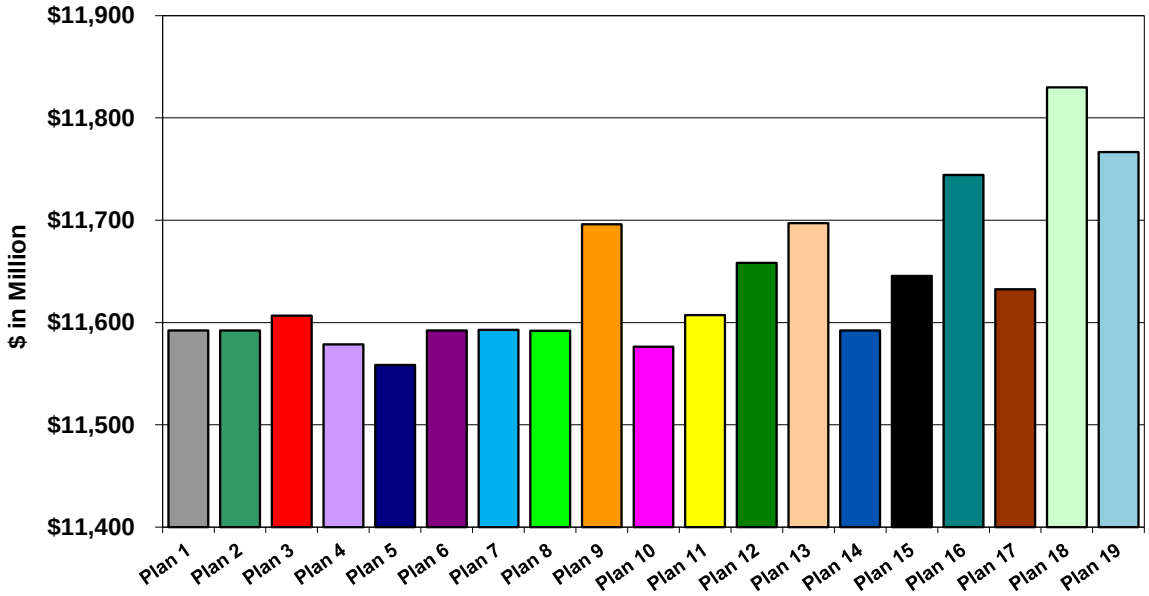
Minimization of PVRR is a primary criterion for the selection of the preferred plan. Figure ES-17 shows the PVRR of all 19 plans *utilizing the base assumptions* prior to introducing uncertainty represented by the decision tree (the deterministic case) for the twenty-year planning period of the IRP. Because so many resource decisions happen near the end of that twenty-year horizon, end effects were examined for a succeeding twenty years. The PVRR of all of the plans as expected over the 40 years (2016-2055) are shown in Figure ES-18.

Figure ES-17 All Plans – 20 Year Deterministic PVRR (2016-2035)



(Source: ABB Advisors)

Figure ES-18 All Plans with End Effects – 40-Year Deterministic PVRR (2016-2055)



(Source: ABB Advisors)

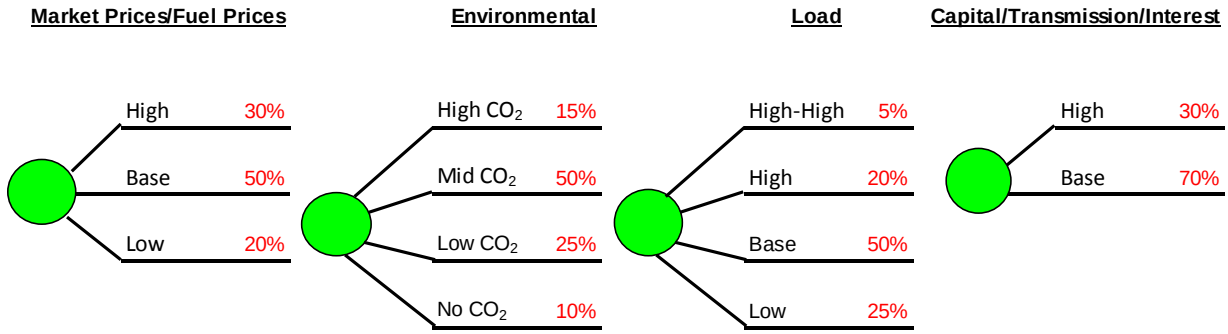
9.4 Critical Uncertain Factors

A critical uncertain factor is any parameter that is likely to materially affect the outcome of the resource planning decision. The critical uncertain factors that Empire has identified include

load growth, interest rates, fuel prices, siting and permitting costs and schedules for transmission, project construction costs/schedules, purchase power, and prices for emission allowances. As part of the normal course of business, these factors are monitored very closely by Empire personnel in coordination with senior management.

For purposes of the risk analysis for this IRP, Empire examined the impact of four major uncertainties: market prices/fuel prices, environmental, load, and capital/transmission interest. These uncertainties form the nodes of the decision tree as shown in Figure ES-19. Since the future is unknown, each plan is run through the decision tree generating 48 endpoints (or variable results) for each of the 19 plans for a total of 912 total endpoints. The subjective probabilities, or weighting, applied to each branch of the tree allow for the calculation of an expected value.

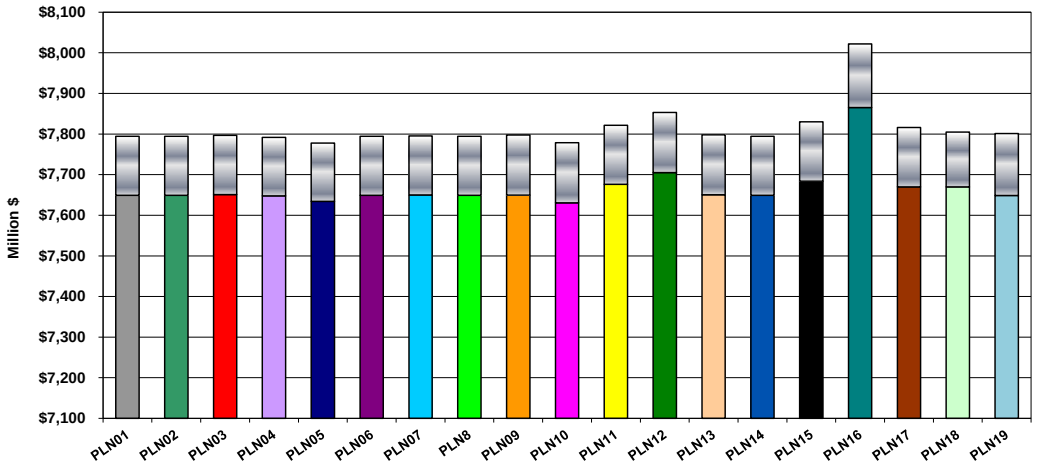
Figure ES-19 Decision Tree Uncertainties



(Source: ABB Advisors.)

Figure ES-20 expands on the previous PVRR graph by including a risk value representing the expected value of PVRR for each plan. This represents the stochastic case.

Figure ES-20 PVRR with Risk Value (2016-2035)

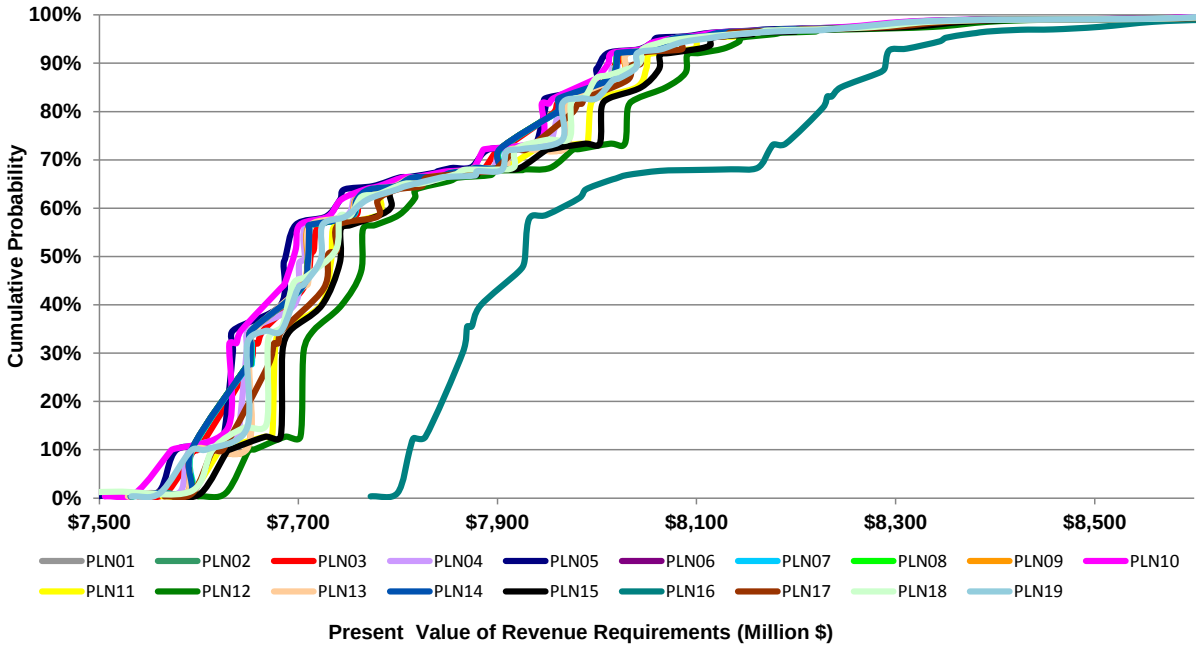


(Source: ABB Advisors.)

9.5 Risk Profiles

ABB utilized the MIDAS Risk Module to develop cumulative probability distributions which are also known as Risk Profiles. Risk Profiles provide the ability to visually assess the risks associated with a decision under uncertainty. From the risk profiles on Figure ES-21, one can view the risk profile to determine the probability that PVRR will be at a particular value and the range of outcomes.

Figure ES-21 All Scenarios – Risk Profiles (2016-2035)



(Source: ABB Advisors.)

SECTION 10 RESOURCE ACQUISITION STRATEGY SELECTION

This section of the rule requires the utility to select a preferred resource plan, document the process, develop an implementation plan, and officially adopt a resource acquisition strategy. The rule also requires the utility to prepare contingency plans. Empire's internal IRP team met on February 26, 2016 to review the results of the 2016 IRP and to select the preferred resource plan.

10.1 Preferred Plan Selection Criteria

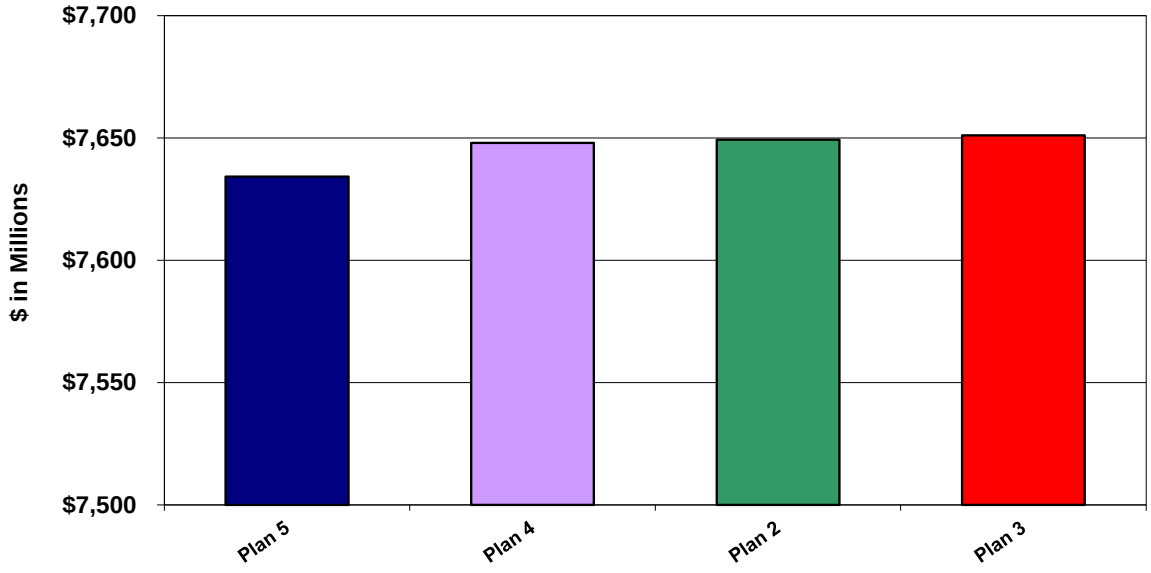
All of the IRP analyses and the objectives of the IRP Rule were considered by Empire's decision makers during the preferred plan selection process. The preferred plan represents a balance between the planning objectives, planning risks, resource diversity, rate impacts and financial measures that were examined using the information generated by the deterministic, stochastic,

and risk analyses of this IRP. As reviewed by the Empire IRP team, the following summarizes the preferred plan selection guidance as supplied by the IRP Rule.

- Provide the public with energy services that are safe, reliable, and efficient, at just and reasonable rates, in compliance with all legal mandates, and in a manner that serves the public interest and is consistent with state energy and environmental policies
- Analyze demand-side, renewable energy and supply-side resources on an equivalent basis (subject to legal mandates)
- Minimize the present worth of long-run utility costs as the *primary criterion* in selecting a preferred plan
- Identify, analyze and document other considerations to the preferred plan selection such as risks associated with the critical uncertain factors, risks associated with new or more stringent legal mandates and rate increases
- Strike an appropriate balance between the various planning objectives
- Invest in advanced Transmission and Distribution technologies unless they are not in the public interest
- Utilize demand-side resources to the maximum amount that comply with legal mandates, and are consistent with the public interest and achieve state energy policies

Since finding a low cost plan is a primary—but not the only—objective, Empire focused on a set of low cost plans that were variations of the base case plan and included a wide range of demand-side portfolios (RAP, RAP minus, RAP + and no DSM) as shown in Figure ES-22 and described in Table ES-14.

Figure ES-22 Base Plan Scenarios – 20 Year Deterministic PVRR (2016 – 2035)



(Source: ABB Advisors.)

Table ES-14 Base Plans

Plan	Description
2	Base Case (meet RPS)
3	RAP + DSM
4	RAP - DSM
5	No DSM

Plans 2, 3 and 4 are all very close with regard to PVRR, but Plan 5 has a lower PVRR. Therefore, considering all of the preferred plan selection criteria, and attempting to strike a balance over all of the planning objectives, Empire has selected the lowest cost base plan, Plan 5, the no DSM Scenario, as the preferred plan.

10.2 The Preferred Plan

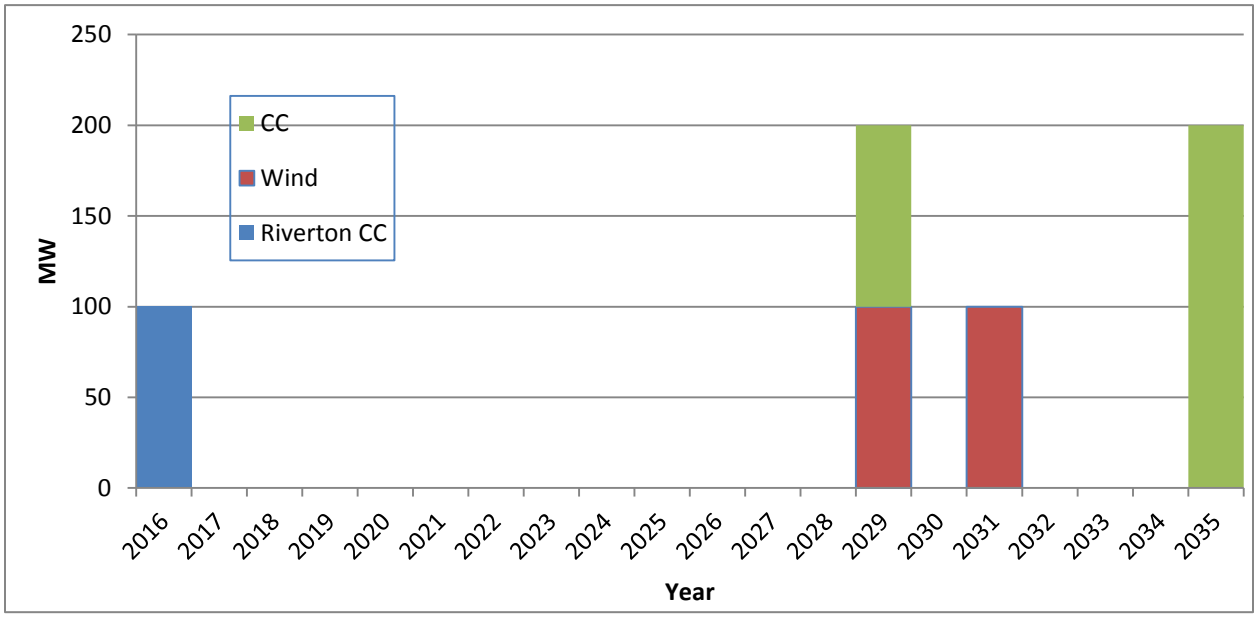
Plan 5, a base case meeting the RPS requirements but without additional DSM, is Empire's 2016 IRP preferred resource plan. Table ES-15 contains the highlights of the preferred plan. The approximate unit ratings listed in this table are summer ratings.

Table ES-15 Empire's 2016 IRP Preferred Plan Highlights

Year	Common to All IRP Plans (Applies to Preferred Plan)	Plan 5 (Preferred Plan)
2016	By Mid-2016, Riverton 12 begins combined cycle operation (100 MW addition to the Empire system)	
2017		
2018		
2019		
2020		
2021		
2022		
2023	Energy Center 1 assumed to retire for IRP purposes (82 MW loss)	
2024		
2025		
2026	Energy Center 2 assumed to retire for IRP purposes (82 MW loss)	
2027		
2028	Meridian Way 105 MW Wind PPA expires (19 MW loss)	
2029		100 MW Combined Cycle, 100 MW Wind Resource
2030	Elk River 150 Wind PPA expires after 5-year extension (17 MW loss)	
2031		150 MW Wind Resource
2032		
2033	Riverton Units 10 and 11 assumed to retire for IRP purposes (33 MW loss total)	
2034		
2035	Asbury Unit 1 assumed to retire for IRP purposes (194 MW loss)	200 MW Combined Cycle

Figure ES-23 shows the preferred plan supply-side additions (approximate summer ratings), including the Riverton combined cycle project. There are no DSM programs in the Preferred Plan.

Figure ES-23 Preferred Plan Supply-Side Additions



The Riverton combined cycle (CC) will be approximately a 250 MW CC. Figure ES-23 shows a net 100 MW approximate addition after incorporating the existing 142 MW Riverton 12 CT.

10.3 Implementation Plan

The implementation plan contains the descriptions and schedules for the major tasks necessary to implement the preferred resource plan over the implementation period which is the time interval between the triennial compliance filings. The next triennial IRP filing is scheduled for 2019. Therefore, the implementation period is the period 2016-2019.

10.3.1 Demand-Side Implementation Plan

As previously mentioned, the preferred plan does not contain a demand-side portfolio. At this time, avoided energy costs are relatively low due in large part to historically low natural gas prices. Additionally, load growth has moderated as compared to past IRP assumptions. Empire has recently concluded a significant construction phase and does not have a near-term capacity need that could be offset by energy efficiency programs. In order for the utilization of additional demand-side resources to be in the public interest, it must be cost effective. The analysis in this IRP, which includes the financial impact of a demand-side investment mechanism, finds that Plan 5, the "No DSM" option is the least cost plan. Therefore, there is no short-term implementation plan for additional demand-side resources to report for the implementation period. Additionally, based on the IRP results, which did not support the

inclusion of an updated demand-side portfolio in the preferred plan, the existing Missouri demand-side programs are planned to be discontinued as well. Empire will continue to monitor the factors related to demand-side management. Demand-side resources will be reevaluated during the next IRP currently scheduled for 2019. By that time, 2019, a statewide technical resource manual may be available in Missouri, which could help facilitate the analysis, reporting and evaluation of demand-side resources.

10.3.2 Supply-Side Implementation Plan

During the past few years, Empire has added generating capacity and has been working to complete its environmental Compliance Plan. During this period, Empire has completed several major projects. Plum Point and Iatan Unit 2 were added to the generation fleet in late 2010. Air Quality Control System (AQCS) additions were installed on Iatan Unit 1 and at Asbury in 2009 and 2014, respectively. Empire has recently retired the following small coal units: Asbury Unit 2 in December 2013, Riverton Unit 7 in June 2014 and Riverton Unit 8 in June 2015. Riverton Unit 9, a small gas turbine that utilized steam from either Riverton Unit 7 or Unit 8 for start-up, was also retired in June 2015. And finally, the conversion of Riverton Unit 12 to a combined cycle unit is nearing completion. This project is expected to add about 100 MW of capacity at the Riverton site.

As a result of the successful implementation of these projects, there are not any short-term supply-side projects related to capacity adjustments to address in this IRP. All of the supply-side resources from the preferred plan are outside the short-term implementation window through 2019. However, Empire will continue to evaluate opportunities for resource options between IRP filings as conditions warrant. This may include the evaluation of renewable resources not specifically required for capacity needs. Emerging technology changes, environmental changes, renewable incentive levels, renewable portfolio changes, pricing changes—particularly for renewable resources, and changing assumptions in general can impact resource planning. For example, during the development of this IRP, the EPA Clean Power Plan (CPP) moved from a proposal to a final rule to being stayed by the U.S. Supreme Court. The long-term status of the CPP and resulting state and/or regional compliance plans are still unclear at this time. Also, near the end of the 2016 IRP process, verbal price quotes from wind developers created the need for high-level investigation and additional IRP runs. Further, various legislative actions and initiative petitions may pose a need to alter Empire's renewable portfolio in the future.

10.3.3 Preferred Plan Considerations Beyond the Short-Term Implementation Period

As shown in Table ES-15, the preferred plan contains wind resources and combined cycle units in the latter part of the planning horizon. In fact, the preferred plan and nearly all contingency plans contain future wind resources beyond the short-term implementation period. The IRP refers to these future wind resources as wind purchased power agreements (PPA). However, this is based on the IRP modeling process and the engineering estimates for generic wind resources utilized for this IRP. Empire views these IRP wind resources as potential placeholders

for future wind resources. If new wind resources are actually required in the future, Empire would issue a request for proposal (RFP) and consider all wind PPA and ownership options. Further analysis of ownership versus PPA would need to be completed once specific proposals are known. The location of a specific future wind resource—unknown to a generic twenty-year planning study—could have a significant impact on related transmission upgrade costs, for example. The transmission requirements for specific projects including non-firm versus firm transmission risks would need to be considered to determine the low cost option. Ownership in what appears to be a saturated wind market within SPP may have advantages when looking at PPA take-or-pay contracts especially when production tax credit (PTC) payments are considered. When turning this aspect of the plan into an actual project, Empire may need to run more in-depth modeling to reflect recent negative Day Ahead and Real-time prices seen in the SPP integrated marketplace during periods of high wind production. Other important factors will be the status of future PTC, fuel prices and possible carbon costs.

Another important consideration beyond the short-term implementation period that was brought to light by this IRP, concerns the future retirements of Energy Center Units 1 and 2. These peaking units use natural gas as their primary fuel, but they can also burn fuel oil as a backup fuel if it is more economical or if natural gas is not available. Therefore, even though these units may not operate many hours, they exhibit a valuable reliability component due to their ability to operate on fuel oil during a natural gas curtailment. For IRP purposes, these units were assumed to retire in 2023 and 2026, but due to the positive capacity balance and the IRP model approach, the next new generation addition in the preferred plan was not added until after their retirement dates in 2029. However, the IRP capacity expansion modeling does not recognize the dual fuel reliability issue. While this planning approach does not violate any capacity reserve requirement, it could create a situation where Empire is exposed to a period of time without a historical level of fuel oil backup on its system. Additional IRP model runs were created to further assess this situation, but since this concern occurs outside the implementation period and the actual retirement dates of these units are unknown, the preferred plan and contingency plans were not adjusted. As the time to replace these units draws closer, future planning studies should consider dual fuel reliability issues along with fine tuning these units' retirement dates.

10.3.4 Preferred Plan Performance Measures

As required, performance measures of the preferred resource plan for each year of the planning horizon are presented in Table ES-16. These include the following: estimated annual revenue requirement; estimated level of average retail rates and percentage of change from the prior year; and estimated company financial ratios.

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Table ES-16 Performance Measures of the Preferred Plan

(Source: ABB Advisors)

SECTION 11 THE IRP PLANNING HORIZON 2016-2035

Planning for future resources in the electric utility industry involves the consideration and evaluation of many uncertainties. Those uncertainties have increased in number and magnitude over the last several decades. With the need for long-term planning for capital-intensive resources and the significant potential for changes during the intervening years, it is difficult and a bit daunting to attempt to forecast the future for the next twenty years. Therefore, the IRP filing is reevaluated once every three years; the process involves the consideration of risk and uncertainty; contingency plans are required; and utilities consider resources that they can reasonably expect to use, develop, or acquire during the planning horizon at the time the study is performed. The following is a list of some, but not all of the important factors that may play a significant role in resource planning over the next twenty years:

- Climate change
- The future of coal generation
- Carbon capture and sequestration

- Environmental regulatory requirements
- Nuclear power technologies
- Advanced T&D technologies
- Plug-in hybrid electric vehicles
- Energy efficiency resource standards
- Decoupling or other rate mechanisms
- Battery storage
- Horizontal drilling and hydraulic fracturing to access shale gas
- State or Federal mandates
- Commission decisions
- Advances in all renewable generating technologies (e.g., solar and wind)
- The penetration of distribution generation
- Cybersecurity
- Critical infrastructure protection
- Other emerging technologies

As required, Empire's 2016 IRP considers a twenty-year planning horizon. With all of the uncertainties discussed above, the resource planning process is a difficult and complex task. The IRP process, while rigorous, is built on a large set of planning assumptions that are always changing. The plan is subject to the ongoing need to reevaluate modeling assumptions based on changing business conditions. The plans presented in this IRP are based on the best information available at the time that the analysis was conducted. It is a plan. Requests for proposals, further analysis, and, in some instances, regulatory support are needed to turn aspects of the plan into actual projects.