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2018 Integrated Resource Plan Annual Update Report

The Empire District Electric Company

File No. EO-2018-0248

March 2018

****Denotes Confidential****

2018 Integrated Resource Plan Annual Update Report

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The Empire District Electric Company (Empire)
2018 Integrated Resource Planning (IRP) Update Report

1. Introduction

The purpose of the annual update is to ensure members of the Missouri stakeholder group have the opportunity to provide input and stay informed regarding the changing conditions since the last filed triennial compliance (IRP) filing or annual update filing. This includes updates regarding:

1) Utility's current preferred resource plan;
2) Status of the identified critical uncertain factors;
3) Utility's progress in implementing the resource acquisition strategy;
4) Analyses and conclusions regarding any special contemporary issues that may have been identified pursuant to 4 CSR 240-22.080(4);
5) Resolution of any deficiencies or concerns pursuant to 4 CSR 240-22.080(16); and
6) Changing conditions generally.

Empire's most recent Missouri triennial compliance filing was made in File No. EO-2016-0223, on April 1, 2016 (2016 IRP). This filing was made to comply with the requirements of 4 CSR 240-22 (Rule or IRP Rule) based on Empire's interpretations of the Rule with input from the Stakeholder Advisory Group established in Empire's 2010 IRP. This was Empire's second triennial compliance filing utilizing the revised Missouri IRP Rule. A Joint Filing, as required under 4 CSR 240-22.080(9), was made in EO-2016-0223 on October 25, 2016. Empire's most recent IRP annual update was filed in March 2017 in File EO-2017-0233 (2017 annual update). With this 2018 annual update, Empire will continue to inform Missouri stakeholders of ongoing IRP issues.

Since the filing of the last IRP in 2016, the Company has filed its Customer Savings Plan proposal in Docket EO-2018-0092. The Customer Savings Plan contemplates the addition of up to 800 megawatts of new wind generation and the retirement of the Asbury coal plant. The Customer Savings Plan was influenced by a number of considerations with two factors in particular:

1) Continued downward trends in the pricing of renewables to the point where it merits study as to whether the "all in" price of renewables is less expensive than variable costs associated with alternatives; particularly in light of the need to spend additional significant capital on coal plants to comply with environmental regulations in the event the current path is continued; and

2) Clarity around sundown dates associated with production tax credits creates an increased urgency to developing renewable resources immediately.

Critical uncertain factors identified in the 2016 IRP will be reviewed and updated as part of this report. The most significant update of these factors relates to fuel pricing. New published forecasts indicate an 18% reduction in coal and a 25% reduction in natural gas forward curve pricing compared to the forecasts used in the 2016 IRP. They also indicated a 4.5% increase in coal and a 16% reduction in natural gas pricing compared to the forecasts used in the 2017 IRP update.

An additional aspect of this report will be to respond to eighteen Special Contemporary Issues. As the Rule states, special contemporary issues involves a list of issues contained in a Commission order with input from staff, public counsel, and interveners on new evolving industry 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. Each utility shall evaluate and incorporate special contemporary issues in its triennial compliance filing or annual update filing. The Order establishing the special contemporary resource planning issues for this filing was issued on November 1, 2017 in File No. EO-2018-0048, with an effective date of November 10, 2017.

In addition to the periodic IRP analysis required by the Commission, Empire has an ongoing internal planning process. This internal planning process involves the creation of a rolling five-year business plan on an annual basis. Most of the updates in this IRP annual update will be based on Empire's most recent approved five-year business plan, which is internally referred to as the five-year budget. The internal budget covers the period 2018-2022.

Following section (1) introduction, this report will contain sections addressing, (2) a preferred plan update, (3) the status of the identified critical uncertain factors, (4) a resource acquisition strategy update, (5) special contemporary issues, (6) transmission and distribution analysis, and (7) other updates.

Empire's next triennial compliance filing is scheduled for April 1, 2019.

2. Preferred Plan Update

The 2016 IRP preferred plan was described in the Executive Summary on pages 40-44. The preferred plan near-term highlights since the 2016 IRP was filed including the IRP filing date can be summarized as follows:

- April 1, 2016 – 2016 IRP filed
- May 1, 2016 – Riverton 12 Combined Cycle begins commercial operations

- August 10, 2016 – Order received approving Stipulation and Agreement for File No. ER-2016-0023
- January 1, 2017 – Completion of Liberty Utilities/Empire District acquisition and merger
- March 10, 2017 – 2017 IRP Annual Update Report filed
- October 31, 2017 – Customer Savings Plan filed
- March 15, 2018 – 2018 IRP Annual Update Report filed

Demand-Side Management Preferred Plan Update (as of March 2018)
As mentioned previously in this report, the 2016 IRP did not include DSM as part of the preferred plan. However, as part of the approved stipulation and agreement in File No. ER-2016-0023, Empire now offers four programs with a total budget of $1.25 million annually for 2017 and 2018. Empire does not consider this a material change from the preferred plan due to the relatively small budget and limited timeline of the portfolio.

Load and Capability Balance Report Update
The Load and Capability Balance Reports for the 2016 IRP, the 2017 annual update, and the 2018 annual update based on the five-year business plan (as of March 2018) are presented on the following pages for comparison.

Forecast of Capacity Balance (MW)

2018 Annual Update (Mar-2018) Summer Ratings

	2016 IRP					2017-2021 Budget					2018-2022 Budget				
A. System Generation Capacity	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2020
Base Capacity	**CONFIDENTIAL IN ITS ENTIRETY**					**CONFIDENTIAL IN ITS ENTIRETY**					**CONFIDENTIAL IN ITS ENTIRETY**				
Asbury (coal)															
Iatan 1 (coal)															
Iatan 2 (coal)															
Plum Point (coal ownership portion)															
Ozark Beach (hydro)															
Total Base Capacity															
Intermediate Capacity															
State Line Combined Cycle (nat gas)															
Riverton Combined Cycle (nat gas)															
Total Intermediate Capacity															
Peaking Capacity															
Riverton 7 (nat gas)															
Riverton 8 (nat gas)															
Riverton 9 (nat gas)															
Riverton 10 (nat gas)															
Riverton 11 (nat gas)															
Riverton 12 (nat gas)															
Energy Center 1 (nat gas)															
Energy Center 2 (nat gas)															
Energy Center 3 (nat gas)															
Energy Center 4 (nat gas)															
State Line 1 (nat gas)															
Total Peaking Capacity															
Intermittent Capacity [1]															
Elk River (wind PPA)															
Meridian Way (wind PPA)															
Total Intermittent Capacity															
Percent Accredited Intermittent Capacity															
Total Accredited Intermittent Capacity															
Total Generation Capacity															
B. Capacity Transactions															
Purchases															
Plum Point (coal PPA)															
Total Purchases															
Sales															
Total Sales															
Net Transactions															
Total System Capacity															
C. System Peaks & Reserves															
Base Summer Peak Demands															
Forecasted Peak (Managed Peak)															
less Future DSM															
Peak Demands less DSM															
Capacity Reserves															
D. Capacity Needs [2]															
% Reserve Margin															
% Capacity Margin															
Required Capacity															
Capacity Balance															
E. Capacity Needs [3]															
% Updated Reserve Margin															
% Updated Capacity Margin															
Required Capacity															
Capacity Balance															

[1] The wind resources are purchased power agreements (PPA).

[2] Capacity needs are based off the previously approved 13.6% reserve margin.

[3] Capacity needs are based off the recently approved 12% reserve margin.

Forecast of Capacity Balance (MW)

2018 Annual Update (Mar-2018) Winter Ratings

A. System Generation Capacity	2016 IRP					2017-2021 Budget					2018-2022 Budget				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2020
Base Capacity	**CONFIDENTIAL IN ITS ENTIRETY**					**CONFIDENTIAL IN ITS ENTIRETY**					**CONFIDENTIAL IN ITS ENTIRETY**				
Asbury (coal)															
Iatan 1 (coal)															
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B. Capacity Transactions															
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Plum Point (coal PPA)															
Total Purchases															
Sales															
Total Sales															
Net Transactions															
Total System Capacity															
C. System Peaks & Reserves															
Base Summer Peak Demands															
Forecasted Peak (Managed Peak)															
less Future DSM															
Peak Demands less DSM															
Capacity Reserves															
D. Capacity Needs [2]															
% Reserve Margin															
% Capacity Margin															
Required Capacity															
Capacity Balance															
E. Capacity Needs [3]															
% Updated Reserve Margin															
% Updated Capacity Margin															
Required Capacity															
Capacity Balance															

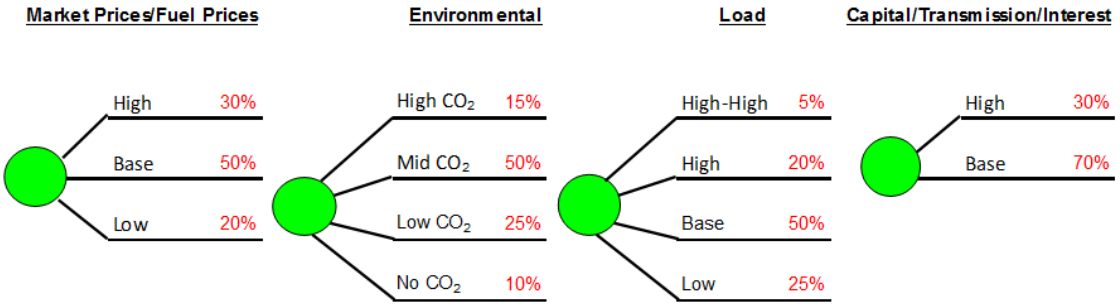
[1] The wind resources are purchased power agreements (PPA).

[2] Capacity needs are based off the previously approved 13.6% reserve margin.

[3] Capacity needs are based off the recently approved 12% reserve margin.

3. Status of the Identified Critical Uncertain Factors

In the most recent triennial filing (2016 IRP filing, most recent IRP, last IRP or recent IRP) Empire identified the following critical uncertain factors: market prices/fuel prices; environmental; load; and capital/transmission/interest rates. This section will address changes in these factors since the last IRP and the last annual update.



A. Market and Fuel Prices Update

This section will discuss natural gas, coal, and market prices. A summary of the fuel price forecasts was presented in the 2016 IRP Executive Summary on pages 23-24, while the market price forecasts were described on pages 26-27. Additional information can be found in IRP Volume 4: the natural gas price forecasts can be found on pages 92-100; coal price forecasts can be found on pages 86-92; and the market price forecast information can be found on pages 119-120. The 2017 IRP annual update report addressed these issues on pages 3-5.

Natural Gas Price Forecast Update

Natural gas prices can be influenced by a variety of factors and the prices can change frequently. For the long-range 2016 IRP study, Empire based the natural gas price forecasts from the ABB Spring 2015 Reference Case (considered highly confidential). ABB developed three separate price forecasts to model base, moderate, and high scenarios. A comparison of the ABB Fall 2017 Reference Case prices was conducted against the ABB Fall 2016 Reference Case, which was utilized in the 2017 IRP annual update filing. This case showed a reduction in prices of approximately 16%. The ABB Fall 2017 Reference prices were also compared to the ABB 2015 Spring Reference Case that was used in the 2016 IRP. On average, prices were approximately 25% lower than the ABB 2015 Spring Reference Case.

According to ABB, lower medium- and long- term natural gas forecasts with prices emerging in the $3.50 to $4.00/MMBtu range are expected due to ongoing cost reduction and increased productivity. After the impacts of lower gas prices play out over the next couple years, it is expected that prices will increase to meet combined demand growth from industrial users, LNG exporters, and pipeline exports to Mexico, as well as,

increased power demand driven by coal and nuclear retirements in the mid-2020's - although moderated by lower load growth and increasingly competitive renewable generation. Shale gas plays are expected to continue to maintain strong production levels supported by reductions in production costs.

Coal Price Forecast Update

During each budget cycle Empire updates coal forecasts for internal planning purposes. This includes contract knowledge and input from those in charge of procuring coal for jointly-owned units as it becomes available. When the 2016 IRP was developed, coal price forecasts for owned units were based on the 2015-2019 budget cycle. The most recent five-year budget, however, is based on the more recent 2018-2022 budget cycle. Overall, the aggregate weighted average coal price is about 18.1% lower in the 2018-2022 budget as compared to the same period in the 2016 IRP, shown in the table below. The matching periods covered by the 2017 and the 2018 IRP annual updates are similar, as the aggregate weighted average coal price is about 4.5% higher in the 2018 IRP annual update compared to the 2017 IRP annual update.

Weighted Average Coal Price Comparison ($/MMBtu)

Year	2016 IRP Base Case	2017 IRP Annual Update	2018 IRP Annual Update
2018	2.24	1.74	1.79
2019	2.35	1.79	1.97
2020	2.42	1.95	2.02
2021	2.53	2.01	2.07
2022	2.63	2.06	2.12

With regards to coal prices, the following explanation from the 2017 annual update still applies to the 2018 annul update. In general, coal prices have declined in recent years due to lower demand for coal. The combination of relatively low natural gas prices, increasing generation of electricity from renewables and the lack of a strong recovery in electricity demand have all contributed to a surplus of coal, causing coal prices to decrease. In addition, requirements to control emissions of mercury and acid gases have resulted in the retirement of some coal-fired generating capacity, contributing to a near-term decline in coal demand.

Market Price Forecast Update

Market prices have a correlation with fuel prices, particularly natural gas prices. In the 2016 IRP, multiple sets of market prices were developed by ABB based on forecasted fuel prices, emission prices, and other scenario assumptions. In order to develop market prices, ABB uses various modules to generate a forward market view of the Southwest Power Pool – Kansas/Missouri (SPP-KSMO) pricing hub by modeling the entire Eastern Interconnect, one of the major electrical grids in North America. The output is a set of 8,760 hourly market prices for each year in the study period. This process requires a

large amount of data and computer processing time. Liberty Utilities and its subsidiaries have licenses with ABB to generate updated long-term market prices. Based on the preceding updated fuel price forecasts, it is assumed that the base market prices (apart from environmental assumption changes) would shift in relation to the updated natural gas price forecast. Market prices for the 2019 IRP will include pricing for the SPP integrated marketplace (SPP IM) which began on March 1, 2014.

B. Environmental Update

In the 2016 IRP filing, the environmental analysis assumed four levels of future CO_2 (carbon) costs. The base case assumed there would be moderate carbon costs during the planning period. No carbon cost, low carbon cost, and high carbon cost cases were also studied. All cases assumed carbon costs would begin in 2022 except the no carbon cost case. The long-term environmental assumptions continue to be monitored and will be updated in future IRP studies as political changes unfold and court cases are decided. Special consideration will need to be given to recent environmental rule proposals concerning carbon regulation on existing power facilities which will be discussed later in this report. Empire's current five-year business plan which covers the period 2018 through 2022 does *not* include any carbon costs. This is still consistent with the 2016 IRP base case and Empire's preferred plan since the preferred plan does not include carbon costs until 2022.

All of the alternate plans in Empire's 2016 IRP filing assumed costs for other emissions as required such as SO_2, NO_X, and mercury. In the most recent five-year business plan, which assumes a normalized operating scenario, Empire does not anticipate the need to purchase any allowances for these pollutants in the period 2018 through 2022. However, Empire continuously evaluates the economics of purchasing allowances versus operating its control equipment which could result in the purchase of minimal quantities of allowances in the future and potentially provide opportunities for the sale of allowances.

Empire's Environmental Compliance Plan is described in the 2016 IRP Executive Summary beginning on page 21. The last component of the Compliance Plan was completed when Riverton 12 Combined Cycle began commercial operation on May 1, 2016.

In order to comply with current and forthcoming environmental regulations, Empire implemented its compliance plan and strategy (2013 Compliance Plan), which largely follows the 2013 IRP filed with the MPSC in mid-2013. On April 1, 2016, Empire filed the 2016 IRP, reflecting the completion of the 2013 Compliance Plan. The Mercury Air Toxic Standards (MATS) and the Clean Air Interstate Rule (CAIR), replaced by the Cross State Air Pollution Rule (CSAPR), were the drivers behind the 2013 Compliance Plan and its implementation and completion schedule. Compliance costs incurred are associated with the MATS, CAIR, and CSAPR regulations and are being recovered in our rates.

Environmental issues continue to be one of the leading factors facing the electric utility industry and resource planning. The following list summarizes the most significant environmental regulations affecting our operations:

- Air Emissions - NOx and SO2
- Acid Rain
- Clean Air Interstate Rule and the Cross-State Air Pollution Rule (CAIR/CSAPR)
- Mercury and Air Toxic Standards Rule (MATS)
- National Ambient Air Quality Standards (Ozone/PM NAAQS)
- Greenhouse Gases (GHGs) – CO_2
- Surface Impoundments
- Coal Ash Impoundments
- Water Discharges

MATS Update
As noted above, the completion of the 2013 Compliance Plan puts Empire in compliance with MATS. Although the regulation has been challenged, MATS has remained in place, and a final supplemental finding was issued on April 14, 2016 completing the EPA's requirements. The final Technical Corrections Rule was signed March 17, 2016.

Greenhouse Gases Update
The EPA's 2015 rule for limiting carbon emissions from existing power plants (the Clean Power Plan or CPP) continues to undergo legal challenges. On October 10, 2017, the EPA proposed to repeal the CPP and accepted comments through January 16, 2018. In addition, the EPA held public hearings on the proposed repeal on November 28th and 29th, 2017.

An Advanced Notice of Public Rulemaking (ANOPR) to solicit information from the public about potential future rulemaking to limit greenhouse gas emissions for existing electric utility steam generating units (EGUs) was published on December 18, 2017 by the EPA. The EPA accepted comments on this ANOPR until February 26, 2018. The Company continues to monitor the rulemaking process.

Surface/Coal Ash Impoundments Update
The EPA's final revision of the Clean Water Act (CWA) Steam Electric Effluent Limitation Guidelines (ELGs) for coal-fired power plants set technology-based ELGs based on the nature of the pollutants being discharged and the facilities involved. As originally published, beginning in November 2018, the EPA and states would have begun to incorporate the new standards into all wastewater discharge permits, including permits for coal ash impoundments. However, in September 2017 the EPA pushed the beginning of compliance to November 2020. These rules will be enforced through each power plant's NPDES permit which get renewed on a five-year cycle. In September 2017 when the EPA published the final rule postponing certain compliance dates, they estimated that the ELG Rule revision will take about three years to propose and finalize a revised

effluent limitation guidelines and standards. At this time the costs identified to comply with the CCR Rule are expected to cover most of the upgrades needed at Empire's coal facilities. Empire will revise the cost estimates for ELG compliance as more information becomes available on the final ELG Rule and/or new NPDES permits are adopted.

The EPA's final rule to regulate the disposal of coal combustion residuals (CCRs) as a non-hazardous solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA) impacts our Asbury plant. Compliance with both the CCR and ELG rules at Asbury is expected to require the closure of the existing ash impoundment, construction of a new utility waste landfill, and conversion of the existing bottom ash handling from a wet to dry system. Final closure of the existing ash impoundment, for which an asset retirement obligation of $15.5 million has been recorded, is anticipated after the new landfill is operational. Separately, an asset retirement obligation of $4.4 million has been recorded for our interest in the coal ash impoundment at the Iatan Generating Station.

On December 28, 2016, the Missouri Department of Natural Resources (MDNR) approved our permit application to construct a utility waste landfill on a 217 acre site adjacent to the Asbury plant.

At this time, CCR/ELG compliance costs are anticipated to be approximately $20-$30 million. This estimate is based on our current capital budget, information gathered to date in relation to the multiple CCR Rule reports, and the current execution plan. However, as the Company moves forward through the compliance timeline of the ELG and CCR rules', the plan may change. Currently, the landfill construction and bottom ash conversion are anticipated to be complete by early 2019. The CCR impoundment will be closed within five years after inactivity.

On March 1, 2018 the EPA issued a pre-publication copy of proposed amendments to the CCR Rules. At the time of writing this update the proposed rules are not anticipated to impact the current compliance plan at Asbury. Empire will continue to monitor the changing regulations that may or may not impact our facilities.

Water Discharges Update

Empire operates under the Kansas and Missouri Water Pollution Plans pursuant to the Federal Clean Water Act (CWA). The Company's plants are in material compliance with applicable regulations and have received all necessary discharge permits.

The EPA final rule under the CWA Section 316(b) for existing cooling water intake structures became effective on October 14, 2014. An industry coalition has filed an appeal of the rule and additional court challenges are expected. No future impact from the regulation is currently expected at Riverton as the new intake structure design and installed cooling tower, as part of the Unit 12 conversion, meets the regulatory requirement for aquatic life protections. Impacts at Iatan 1 could range from flow velocity reductions or traveling screen modifications for fish handling to installation of a closed cycle cooling tower retrofit. Iatan Unit 2 and Plum Point Unit 1 are covered by the

regulation, but were constructed with cooling towers, the proposed Best Technology Available, and are expected to be unaffected or minimally affected by the final rule.

C. Load Forecast Update

A summary of the 2016 IRP load forecast can be found in the Executive Summary on pages 12-18, and an entire 2016 IRP technical volume (Volume 3) is dedicated to load analysis and load forecasting. The load forecast section from the 2017 IRP annual update report appeared on pages 9-10. Since the 2017 annual update was filed in March 2017, Empire has developed a new five-year load forecast for the Company's five-year budget covering the period 2018-2022. The 2016 IRP projected a summer peak of **____** MW for 2018 without the impacts of new DSM. This compares to a 2018 projection of **____** MW from the 2017 annual update report, and **____** MW from the new five-year load forecast. The latter two forecasts incorporate more recent energy efficiency trends, updated distributed solar impacts, and known major customer expansions and contractions. Each of these forecasts display modest growth with annual peak and energy growth rates equal to or less than one percent during the five year period. The most recent forecast shows slight year over year annual peak and energy growth.

Empire's actual 2017 peak demand of 1,075 MW occurred in the month of July, which was lower than anticipated, as a result of the overall mild temperatures throughout the year. Empire is somewhat different than many of the other electric utilities in the region due to dual seasonal (winter/summer) system peaks almost equal to each other. In the past, Empire's winter peak has exceeded the summer peak in years with very cold winters. For example, in January 2018 there was a period of record setting cold temperatures in the middle of the month that resulted in a new record system peak of 1,211MW, which is 136 MW greater than Empire's 2017 actual peak demand.

The following tables compare the demand and energy forecasts from the 2016 IRP, the 2017 IRP annual update, and Empire's current five-year budget. The five-year budget's short-term forecast covers the period 2018-2022 and incorporates recent economic and efficiency trends, distributed solar impacts, and the Company's field knowledge regarding potential expansions and reductions over that period. The most notable expansion for the current budget forecast is the expansion of the Heartland Pet Food manufacturing facility. As previously reported, customer counts have exceeded the levels prior to the tornado in May 2011. Although there are parcels of land within the May 2011 tornado zone still undeveloped, the City of Joplin is continuing to progress towards its pre-tornado state, building back better and more energy-efficient than ever.

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D. Capital Costs and Interest Rates Update

After reviewing the long-term planning interest rates and capital costs for generic resources in the 2016 IRP, it has been determined that there are no updates to report at this time. Empire will reevaluate the capital costs and all other planning assumptions during the development of the 2019 IRP filing.

4. Resource Acquisition Strategy Update

Supply-side Implementation Plan Update
As reported in the 2016 IRP Executive Summary on page 42, no short-term supply side projects related to capacity adjustments were identified in the 2016 IRP, however Empire continues to evaluate opportunities to reduce customer costs and risks. In particular, the sense of urgency described in the introductory section of this document related to 1) the current availability of production tax credits; and 2) the possible opportunity to avoid certain pending capital infrastructure expenditures, point to the need for additional analysis.

Based on the above factors, along with other considerations, the Company made its Customer Savings Plan filing in Docket No. EO-2018-0092.

Demand-side Management (DSM) Implementation Plan Update
Perhaps the most significant change to the 2016 IRP implementation plan concerns DSM. The preferred plan did not include DSM. However, as a result of a stipulation and agreement in Missouri Case ER-2016-0023, Empire agreed to implement a $1.25 million annual DSM portfolio. The majority of the portfolio is an extension of two existing programs, the Commercial and Industrial Rebate program and the Heating, Ventilation, and Air-Conditioning Program. In addition, two small programs targeted at multi-unit dwelling families have been added and will provide energy efficiency kits to the recipients. These four programs were approved on June 1, 2017 and will be active through May 31, 2019. Performance and impact of the four programs will be measured and utilized to evaluate additional DSM opportunities in the 2019 IRP. Empire does not consider this a material change to the preferred plan.

5. Empire Special Contemporary Issues

According to the Chapter 22—Electric Utility Resource Planning Rules, special contemporary issues means a written list of issues contained in a Commission order with input from Staff, Public Counsel, and interveners 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 this section of the report, Empire will address the eighteen special contemporary issues (A through R) that were established by Commission Order in File No. EO-2018-0048.

A. Document Empire's most recent economic analysis for its system-wide implementation of AMI meters. Provide projected implementation dates and annual budgets for AMI implementation.

Empire has monitored and evaluated the use of advanced metering infrastructure (AMI) for many years and has recently observed improved technologies and significantly declining implementation costs. The new generation of technology provides two-way communication and real time usage information, allows for customer engagement and control, and is expected to enable real-time pricing information in the future.

Many benefits have been identified during Empire's evaluation of AMI. Improved billing accuracy, the enablement of increased customer access to usage data, reduction of operating expenses, and further energy efficiency improvements are among the primary benefits. Opportunities to provide additional customer service benefits have also been identified and include customer choice of billing date, payment alerts and options, early detection of meter failures, and the ability to review usage patterns. The creation of customer energy profiles will assist Empire in monitoring, evaluating, and targeting energy efficiency and demand response programs to be more impactful and cost effective.

Benefits associated with the deployment of AMI in relation to system operations include accurate outage managements, reduced transportation expenses for unscheduled check reads, increased meter reading accuracy, improved theft protection, and reduced manual meter reads.

Empire believes AMI is necessary technology for the future of the utility industry and the basis for wide spread deployment of the "smart grid" and grid modernization. The benefit is greater reliability, improved customer experience, and operational savings. A study was completed to estimate the costs and benefits of a system-wide implementation of AMI. The results indicated a **_____** investment, as well as, a net present value **_____** revenue requirement and a **_____** operating and maintenance savings, ultimately creating a **_____** savings to customers over a twenty year evaluation. Empire's recent evaluation in 2017 shows the project costs lowering to close to **_____**, down from **_____**. However, no further NPV or revenue requirement has been calculated until a final scope is determined. Empire continues to evaluate the project for the best timing and its impacts to customers and employees. Full AMI deployment is projected to take three years, including the RFP process which is starting in 2018.

B. When complying with 4 CSR 240-22.060(5) (A), analyze and document the impact of electric vehicle usage for the 20-year planning period upon the high-case load forecasts.

In the 2016 IRP, Empire created an aggressive electric vehicle ("EV) adoption case (Plan 15), which increased the base case forecast with a hypothetical electric vehicle adoption of 75% by the end of 2035. This 75% adoption was for the residential class only; no analysis was completed to determine the impacts for Industrial or Commercial class

electric vehicle adoption. Analyses were also conducted for 10%, 30%, and 50% adoption cases; however, none of these sufficiently exceeded the bounds of the high economic scenario and were not deemed useful comparisons.

In the 75% adoption scenario, electric vehicles assumed to consume 15 kWh per day with a demand of 5 kW per day and a system peak coincident factor of 10%. When comparing peak demands for the aggressive electric vehicle case to the high load case, the EV scenario system peak did not start exceeding the high load forecast until the year 2032. By the year 2035 there was still less than a five percent difference between the EV and high load scenarios. When comparing the net system input, the aggressive EV case did not exceed the high load case until 2026 and the difference was not greater than one percent until 2029.

Empire will continue to monitor industry trends and the impacts of electric vehicle adoption. The Company will also conduct a high load forecast study with electric vehicle usage as part of its 2019 IRP.

C. Analyze and document the cost of any transmission grid upgrades or additions needed to address transmission grid reliability, stability, or voltage support impacts that could result from the retirement of any existing Empire coal-fired generating unit in the time period established in the IRP process.

An analysis was conducted for the Customer Savings Plan filing, which included retiring Asbury early as a result of the Commission's approval for the Company to build up to 800 MW of wind generation. No material transmission upgrades are anticipated as it relates to the potential Asbury retirement.

Separately from the IRP process, Empire was an active participant in the development of the 2017 10-year Integrated Transmission Plan (2017 ITP10) conducted by the Southwest Power Pool (SPP). The study included a scenario in which several coal plants in the SPP region were retired under the Clean Power Plan for planning purposes. In this scenario Asbury was assumed to retire in 2020. No transmission needs were identified in relation to the assumed early retirement of Asbury. It should be noted only 100 kV and above were considered and identified for the 2017 ITP10 study.

D. Identify and evaluate the quantifiable non-energy benefits (NEBS) that could be included in Empire's demand-side management (DSM) portfolio planning process for the purposes of IRP planning under the Commission's recently revised Missouri Energy Efficiency Investment Act (MEEIA) rules. Additionally, evaluate the impact of a NEBs percentage "adder" on Empire's demand-side management portfolio planning process for the purposes of IRP

planning. Discuss Empire's preference for either a study to determine NEBs or the use of a NEBs percentage adder.

If Empire were to favor an approach that incorporated NEBs into its next triennial IRP filing, it would coincide with a new portfolio design and cost-effectiveness screening process. Because of this, the potential for NEBs to be reasonably applied to Empire's DSM portfolio is greater, because it would apply to a future portfolio design, rather than Empire's existing portfolio. Because of this, nearly all of the examples of NEBs listed in the update Chapter 20 rules have potential to be applicable. If it were to include NEBs, the full demand-side analysis of a triennial IRP would attempt to both qualitatively and quantitatively evaluate the NEBs as listed in the Chapter 20 rules. For the purposes of this Special Contemporary Issue, NEBS was qualitatively evaluated, as listed in the 4 CSR 240-20.092(1)(HH)(II), in the following section.

Direct benefits to participants in utility demand side programs, including, but not limited to[1]*:*

- *Increased property values* – Empire could design programs that would attempt to maximize this benefit to its customers, and may be able to quantify this or cite it as a contributing factor to a NEBs adder in cost-benefit testing.
- *Increased productivity* – Empire sees value in this, but it is more likely that this item would be evaluated qualitatively in a cost-benefit analysis, and cited as a contributing factor to a NEBs adder.
- *Decreased water and sewer bills* – When Empire evaluates water heating measures as part of the comprehensive demand-side program design cost-effectiveness screening process, finding a way to incorporate the savings its customers will experience to their water and sewer bills would be a fair and reasonable way to comprehensively evaluate the benefits of such programs. These could be quantified with some precision, or could be evaluated qualitatively as a contributing factor to a NEBs adder.
- *Reduced operations and maintenance costs* – Empire sees value in this, but it is more likely that this item would be evaluated qualitatively in a cost-benefit analysis, and cited as a contributing factor to a NEBs adder.
- *Improved tenant satisfaction* – This item is important, but difficult to quantify. It is more likely that this item would be evaluated qualitatively in a cost-benefit analysis, and cited as a contributing factor to a NEBs adder.
- *Increases to the comfort, health, and safety of participants and their families* – This items are one of the most important of all the NEBs to Empire's mission to

[1] 4 CSR 240-20.092(1)(HH)(II)(1)

improve the lives of its customers with its services. This item could be evaluated either qualitatively or quantitatively in the demand-side analysis.

Direct benefits to utilities, including, but not limited to[2]*:*

- *Reduced arrearage carrying costs, reduced customer collection calls/notices, reduced termination/reconnection costs, and reduced bad debt write-off* – Any action that, even as a byproduct, minimizes the amount of unpaid bills, and all of the subsequent actions and deficits that occur as a result of unpaid bills, allows Empire to minimize the cost of serving its customers safely and reliably. These items could be evaluated either qualitatively or quantitatively in the demand-side analysis.

Indirect benefits to society at large, including, but not limited to[3]*:*

- *Job creation* – Empire is committed to the improvement of the communities it serves, and values this NEB highly. However, this item could be difficult to calculate at an applicable granularity, and even more difficult to definitively attribute to the performance of an energy efficiency program. Empire does still greatly value this NEB, but it is more likely that this item would be evaluated qualitatively in a cost-benefit analysis, and cited as a contributing factor to a NEBs adder.
- *Economic development* – Like job creation, this factor is extremely important to Empire's commitment to improve the communities it serves. However, also like job creation, this item is difficult to calculate at an applicable granularity, and even more difficult to definitively attribute. Empire does still highly value this NEB, but it is more likely that this item would be evaluated qualitatively in a cost-benefit analysis, and cited as a contributing factor to a NEBs adder.
- *Energy security* – Providing safe and reliable service is also among the highest of Empire's priorities. This item could be evaluated either qualitatively or quantitatively in the demand-side analysis.
- *Public safety, reduced emissions and emission related health care costs, and other environmental benefits* – One of the primary tenants of Empire's mission to serve its customers is to help them by being good stewards of the environment Empire shares with its customers. Empire's commitment to this item is a factor in every decision the Company makes, particularly related to energy efficiency. These items could be evaluated either qualitatively or quantitatively in the demand-side analysis, but would certainly be a factor.

[2] 4 CSR 240-20.092(1)(HH)(II)(2)
[3] 4 CSR 240-20.092(1)(HH)(II)(3)

Because so many of the different NEBs cited in the Chapter 20 rules would be difficult to quantify and/or attribute to deployment of specific energy efficiency measures, but nonetheless important to Empire, Empire would favor qualitatively citing NEBs it considers contributing factors to a NEBs adder in cost-benefit analysis over attempting to create an itemized quantification of the different NEBs created by its energy efficiency portfolio.

E. Evaluate, describe and document the feasibility, cost-reduction potential, and potential benefits of joint DSM programs, marketing, and outreach with water utilities.

Empire made mention in its 2017 annual update to its exploration of the potential benefits of its acquisition by Liberty Utilities. In the year since, much work has been done to continually improve the energy efficiency programs of both Empire and Liberty Utilities. This work continues and will continue into the future, with one of the ultimate goals being to explore a heightened similarity, if not complete synergy, between the energy efficiency offerings of the legacy Empire District Gas, legacy Empire District Electric, and legacy Liberty Utilities gas territories. In theory, these changes will be adopted in all directions between the three jurisdictions, with the end product being something as closed to a homogenized portfolio comprised of best practices, or a "best of all worlds".

In 2017, Empire contributed to this overall effort in a few ways. Primarily, in compliance with Item 24 in the Stipulation and Agreement in MPSC Case No. EM-2016-0213, Empire contracted with the Missouri Division of Energy to administer the Low-income Weatherization programs for Empire District Electric and Empire District Gas. Division of Energy already administers the Low-income Weatherization for Liberty Utilities, and the results have been favorable. This partnership between Empire and Division of Energy—in addition to increasing synergy between the three legacy territories in Missouri—is designed to produce a higher participation level, and improved reporting and data collection.

Empire has also participated in many meetings over the past several years to work with other electric, gas, and water utilities and across platforms to find cost-effective measures and plans to continue collaborating with other area utilities.

Empire is also working to determine if and how the assumptions presented in the Missouri Statewide Technical Reference Manual ("TRM") may be of assistance as it continually evaluates its programs.

Empire's current programs do not offer any opportunities for synergies with water utilities. However, as it continually evaluates its programs and searches for new ways to deliver the best possible combination of programs to its customers, it will attempt to

explore the feasibility of designing programs that would create potential opportunities for collaboration with water utilities.

Empire expects to gather information and perform a more in-depth analysis during the 2019 IRP.

F. Describe and document the benefits and detriments for integrated resource planning to require achievement of targets under MEEIA.

It is not entirely clear from the wording of this question whether Empire is to discuss the benefits and detriments of modifying the 4 CSR 240-22.050 ("Chapter 22" or "IRP Rule") rules to require utilities to design *all* Integrated Resource Plan ("IRP") demand-side scenarios to achieve compliance with the peak demand and energy savings goals presented in 4 CSR 240-20.094 ("Chapter 20"), or whether Empire is being asked to weigh the benefits and detriments of being required to include within its various planning scenarios a demand-side portfolio for which all Chapter 20 demand and energy savings goals are met.

Empire is not opposed to including—and in previous IRP documents has included—an IRP scenario that includes a demand-side portfolio designed to comply with energy and demand savings goals in Chapter 20. If it were to become a requirement that *all* IRP scenarios comply with MEEIA rules, and achieve the demand and energy savings goals present in Chapter 20, then this could pose a detriment to both the comprehensiveness and the objectivity of the IRP process.

One of the fundamental objectives of the IRP process is to, "consider and analyze demand-size resources, renewable energy, and supply-side resources on an equivalent basis, subject to compliance with all legal mandates that may affect the selection of utility electric energy resources[4]." Requiring that a utility design all of its IRP scenarios to meet the savings and demands goals presented in Chapter 20, when compliance with Chapter 20 "is not mandatory[5]", is problematic because it presents the possibility that a utility would be required to select a plan containing a demand-side portfolio that was not considered, "on an equivalent basis" with other resources. Doing so may encourage or force selection of a preferred resource plan that is not the lowest-cost and least risk plan, which would be detrimental to the utility, its customers, and its shareholders.

[4] 4 CSR 240-22.010(2)(A)
[5] 4 CSR 240-20.094(2)(A)

Further, the Chapter 20 rules establish, "an expectation that the electric utility's demand-side programs can achieve a goal of all cost-effective demand-side savings[6]." There is a possibility that the threshold of cost-effectiveness becomes the upper boundary of energy and demand side savings before the savings goals in Chapter 20 have been met. Requiring a utility to design a demand-side portfolio to meet only the energy and demand savings goals may put the cost-effectiveness of that portfolio in danger in this scenario.

Lastly, later in that same section, the rule states, "the goals established in this section are not mandatory and no penalty or adverse consequence will accrue to a utility that is unable to achieve the listed annual energy and demand-side savings goals." Requiring a utility to design and select only plans that comply with the rule's energy and demand savings "goals", essentially modifying them to be hard "targets" would theoretically violate this section of the rule.

Requiring, instead, that utilities model a demand-side portfolio designed to achieve these savings goals as an additional planning scenario, in addition to demand-side portfolios designed based upon the results of their Market Potential Study, seems to Empire to be a reasonable expectation.

G. Describe, document, and evaluate potential DSM programs that could address the needs of customers that might otherwise "opt out" of participation and savings (both energy and demand), as well as program costs and cost-effectiveness. Additionally, describe and document the impacts of additional customer "opt-outs" on the MEEIA charges to customer classes and the ability to achieve estimated savings targets.

On June 1, 2017, Empire introduced a new energy efficiency portfolio, which dissolved several programs, introduced two new programs, and made substantive changes to two existing programs. Some of the most substantive changes to an existing program were to Empire's Custom Commercial and Industrial Rebate Program. Many of the changes made to this program were made in an effort to incorporate feedback received from Empire's largest customers (i.e., potential "opt-out" customers) about how Empire can better serve them. First, Empire changed the maximum incentive available to a single customer for a single project from $20,000 to $50,000, which could further entice larger customers which have expressed to Empire that the potential of a rebate capped at $20,000 is not enough for them to participate. Empire also increased the incentive to allow customers with multiple locations to receive multiple rebates up to $100,000 per program year between multiple projects.

[6] 4 CSR 240-20.094(2)

Empire does not currently have a MEEIA portfolio or a MEEIA Demand-side Investment Mechanism. Because of this, customers are not subject to MEEIA charges. Empire does, however, still offer energy efficiency programs, and recovers the costs of these programs via line-item on customers' monthly bills. The $/kWh factor by which customers are charged is adjusted in a rate case. Customers are allowed to opt out of this charge under the same processes and standards described in the MEEIA rule. While it would not happen immediately, additional customer "opt outs" would theoretically increase the charge to a single customer, because it would reduce both the number of customers over which the factor is spread, and the projected sales by which the factor is calculated. Empire did not have any additional customers "opt-out" of its programs during the 2017 opt-out availability window.

H. Evaluate the potential demand and energy load associated with electric vehicles within the Company's Missouri service territory, discuss how the preferred plan addresses the additional demand and energy load requirements, and evaluate potential means for shifting the additional demand and energy load to off-peak periods. Describe all current and planned electric vehicle initiatives undertaken by the Company.

The electric industry has taken a lead role in assisting the rollout of Electric Vehicles (EV). It is Empire's responsibility to ensure we provide safe and reliable power to our customers and continue to evaluate the future needs of customers. EVs are an increasing reality in the United States and recently became a bigger part of Empire's territory with an increase in customer demand. To accommodate the demand Empire began a pilot project to assist in marketing and adoption of EVs in our territory. We have a plan to partner with local retail and institutional customers to determine locations for installation of charging stations.

EVs provide many benefits to customers, drivers, and the community. EVs are zero operating emission vehicles, reduce CO_2 emissions, and help to reduce fossil fuel emissions including greenhouse gasses. Additionally, the majority of the charging is done in off-peak hours. With grid modernization, the ability to minimize the impact of EVs on peak load has improved greatly.

As part of the 2016 IRP, Empire evaluated an aggressive EV plan (Plan 15). The analysis of the potential growth of EVs in our territory shows a potential effect on peak (MW) of 15MW by 2035, assuming 10% of all vehicles are electric by 2035. Empire believes grid modernization can reduce the impact by managing charging intelligently. Empire currently has eight, Charge Point charging stations in the Missouri territory. The choice to install Charge Point was due to the level of technology which allowed for greater understanding of the usage and the ability to monitor and control impact on demand in the future.

I. Describe and document the roles which energy storage and conservation voltage reductions could play in the Company's system planning, particularly with regards to DSM and distributed energy resources.

System planning is faced with many challenges as technology advances in energy efficiency, renewable generation, electric vehicles, energy storage, and various other areas. Distributed energy resources have become increasingly popular over the past several years. Wind and solar costs have declined and when combined with utility offered rebates, customers are financially able to implement small energy resources. When many small resources combine, a larger impact is felt across the system during times of wind or daylight.

Energy storage provides a way to store excess energy produced in low usage times, such as windy overnight periods, to utilize during high usage periods when energy exceeds renewable output. In addition, energy storage will likely reduce the excess energy crossing transmission and distribution lines during low usage periods. The combination of distributed renewable generation and energy storage have the opportunity to smooth energy usage trends across peak and off-peak times creating a more consistent demand for utility generating power. Energy storage is cost effective in certain applications and for certain customers. Empire will continue to evaluate it as part of future Triennials and will work with specific customers who may have storage requirements on site.

Utilities around the country are tasked with responsibilities to encourage reduced customer energy consumption and increase renewable energy production. As stated above in special contemporary issue E, alternative rate structures to decrease utilities reliance on fluctuating energy usage as a primary source of revenue may be necessary to incent utilities to develop robust DSM and energy efficiency programs.

J. Evaluate the need to upgrade and enhance the Company's delivery infrastructure to ensure and advance system resiliency, reliability and sustainability. In this evaluation, describe and document the potential job growth which utility investments in delivery infrastructure could create.

The Operation Toughen Up (OTU) program utilizes cost effective advanced technologies to implement transmission and distribution improvements on Empire's system. OTU is an intensive review of issues related to System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) on the Empire distribution system. An anticipated amount of **_____** over a 10 year period is devoted to reducing SAIDI and SAIFI. The two aspects of this initiative involve both transmission and distribution.

In 2010, Empire started the OTU initiative. The focus of the initiative is to lower the SAIDI and SAIFI for customers and increase reliability of the transmission and distribution systems. Individuals within various departments were selected to be a part of an implementation team in an effort to gain perspective and representation from operations, transmission construction, system protection, and reliability departments. A steering committee was also formed from diverse internal departments in order to provide a broad spectrum of specialties and guidance to the OTU team. The steering committee tasked the OTU implementation team with addressing the SAIDI and SAIFI for customers, as well as, increasing the reliability for power delivery over a 10-year period. **_____** was allocated to be used over the 10-year period to address such needs by developing system improvement/hardening plans for existing facilities and future installations and to provide more reliable service for Empire customers. In its efforts, the OTU implementation team recommends projects to the steering committee to be considered and provides supporting information related to the budget, scope, and implementation plan for the proposed projects.

The OTU implementation team reviews SAIDI and SAIFI and performs root cause analyses for reported outages in order to relate the indices to causal elements. Proposals for addressing these elements are reflected either on the entire system or a more focused effort if applicable. As the initial step for evaluation, data was compiled to trend outage causes as compared to the month in which the outage occurred. This data was used as not only a springboard to launch remediation efforts, but also as progress trackers over the course of the initiative.

The OTU implementation team developed means to address Empire-specific outage causes and ways to better insulate customers from the most common outage causes experienced on the Empire system by using advanced technologies to better automate restoration efforts and improve response time to outages.

In 2016, Empire focused attention on the reliability of substations equipment to prevent outages affecting larger numbers of customers and implemented a renewed effort to maintain existing substation equipment. This renewed effort for 2016 increased the thoroughness of substation maintenance to include testing of the substation transformers and complete check out of the tap changer. Also, substation breakers were fully tested and checked for operation. In 2016 and 2017, approximately 41% of the substations were subjected to this program. Through this program, poor function equipment was thoroughly maintained and tested to verify it operated within specifications. Several breakers unable to operate within specifications were identified and replaced.

A pilot program was completed in 2016 on a distribution circuit to determine the cost and reliability benefit of installing animal guards on distribution transformers, primary risers, and re-closers in an effort to mitigate future outages due to animal contacts. In 2017, there was one animal outage on this circuit and it was deemed a very successful project.

K. Separately describe and document how the Company's investments in grid modernization, DSM (as evaluated in the current or most recent IRP) and renewable energy will ensure that the public interest is adequately served and that other policy objectives of the state are met. For example, please describe and document the potential for job creation and economic development.

Empire has invested in the ICON network, a fiber optic communications network between substations, in an effort to modernize the grid. ICON will provide more reliable and secure communications with substations for the Supervisory Control and Data Acquisition system (SCADA), offer protective relaying, and satisfy NERC PRC-005-02 requirement to periodically test tele-protection schemes for channel integrity. This connectivity also enables the ability to update and retrieve data remotely, rather than require physical travel to the substation. This project will replace legacy tone protection systems with a point-to-point fiber optic connection. This will provide a more secure and stable communications channel configured in a ring topology allowing for path rerouting in the event of a fiber break. In 2016, twenty (20) nodes were implemented in ring topology. An additional twenty-seven (27) nodes were planned in 2017; twenty (20) of the twenty-seven (27) nodes were actually installed in 2017. Expansion will continue to implement additional nodes and rings each year as appropriate. **_____** has been spent to date with an additional **_____** in the current five year budget (subject to change). SCADA reliability and security will be improved by primary and backup control centers residing on separate rings. In addition, the ICON will reduce the fiber pairs needed at various locations to provide for protective relaying needs.

Empire has been offering energy efficiency programs in its Missouri electric service territory since 2007, Missouri Gas territory since 2010, and Arkansas service territory since 2008. These programs offer nearly $2 million in rebates and incentives annually providing thousands of Empire customers with assistance to make needed energy-saving improvements to their homes and allowing Empire to support its mission to be good stewards of the environment.

The 2016 IRP preferred plan did not include a DSM portfolio as the costs of the programs analyzed did not exceed the benefits. However as part of the approved stipulation and agreement in File No. ER-2016-0023, Empire will offer four programs with a total budget of $1.25 million annually for 2017 and 2018. As previously discussed in special contemporary issues E, Empire continues to research potential cost-effective DSM and energy efficiency programs in an effort to provide reliable service to its customers at a reasonable cost. A robust analysis of DSM programs will be included in the 2019 IRP and followed with a MEEIA filing should a cost-effective portfolio of programs be identified in the preferred plan.

Empire has been a leader in the region with respect to renewable energy. In 2005, a 20-year purchase power agreement (PPA) was signed for the output of the 150 megawatt

(MW) Elk River Wind (ERW) Farm. ERW produces about 550,000 megawatt-hours (MWhs) annually. In 2008, Empire signed a wind PPA for all of the output of Phase I of the Meridian Way Wind Farm, which produces about 330,000 MWhs annually. These PPA's, in conjunction with our 16 MW Ozark Beach hydro facility and our newly implemented solar rebate program (currently 16 MW) in Missouri, generate approximately 17% of the total energy produced by our generating facilities each year. As a result, Empire is in full compliance with the Missouri Renewable Energy Standard which currently requires 5% renewable energy through 2017, then increases to 10% in years 2018-2020, and 15% by 2021. Empire is fully compliant with the Missouri Renewable Energy Standard and already meets the requirement through and beyond 2021.

L. Describe and document the Company's coordination with the State Emergency Management Agency to ensure readiness for physical and cybersecurity threats.

Empire's coordination with the State Emergency Management Agency is through local emergency management agencies. If a threat event were to occur, Empire would coordinate with local resources and local, state, and federal security partners for information sharing, as well as, coordinating responses.

Empire submits Tier II reports annually to ensure that emergency management and first responders have accurate information and an understanding of the hazards that exist when responding to one of the Company's facilities. In addition to the annual report submission, asset managers invite local first responders to tour the facility and answer any questions they may have.

In addition to maintaining relationships with local emergency management, Empire participates in a number of information sharing and intelligence sources to maintain situational awareness of cyber and physical security threats. The government information sharing resources include, but are not limited to, Missouri Information and Analysis Center (MIAC) and other state fusion centers, FBI InfraGuard, and DHS HISN. Empire also participates in industry information sharing efforts such as, EISAC, Water-ISAC, DNG-ISAC, and MS-ISAC. Additional information and security threat information is obtained through the Company's cyber security technology partners.

Empire participates in both in-house and industry lead exercises that allow testing of Empire's response plans and identify opportunities to improve those plans.

M. Describe and document the Company's efforts to address the corporate social responsibility and renewable energy purchasing goals of commercial, industrial, institutional, and public-sector customers for increased access to renewable energy and distributed generation resources.

Empire began to develop its wind renewable energy portfolio on December 10, 2004, when it entered into a 20-year contract with Elk River Windfarm, LLC (owned by Avangrid Renewables, LLC) to purchase all of the energy generated at the 150-megawatt Elk River Windfarm located in Butler County, Kansas.

On June 19, 2007, Empire enhanced its renewable energy portfolio when it entered into a 20-year purchased power agreement with Cloud County Wind Farm, LLC. EDP Renewables North America LLC is an indirect parent company of Cloud County Wind Farm, LLC. Pursuant to the terms of the agreement, Empire purchases all of the output from the 105-megawatt Phase 1 Meridian Way Wind Farm located in Cloud County, Kansas.

In addition, the Ozark Beach Hydroelectric Project, owned by Empire has produced renewable hydropower for many years.

Effective May 16, 2015, Empire began offering rebates for Missouri customers for qualifying solar installations in accordance with the Missouri Renewable Energy Standard (RES) and Empire's Solar Rebate Rider approved by the Commission. This program remains in effect.

For compliance with the Missouri RES, Empire currently retires sufficient renewable energy credits (RECs) to provide the equivalent of 5% of its retail electric sales. This number escalates to no less than 15% of its retail electric sales beginning in 2021. Generation from our Ozark Beach Hydroelectric Project and the purchased power agreement with Elk River Windfarm supplies the RECs which are retired for compliance, although Meridian Way is eligible as well.

The Missouri RES contains a requirement that at least 2% of the RES portfolio shall be derived from solar energy. Solar RECs (SRECs) from customer–generated sources are retired to meet the 2% solar compliance requirement.

Empire has seen significant adoption of the solar energy program that has been offered to customers. In addition, the company has begun exploring opportunities to expand the solutions to allow for greater adoption of renewable energy resource, distributed generation, and battery storage. To date, specifics of the solutions are being developed with a goal of defining a slate of products and services that would meet the needs of all customers, including those with corporate social responsibility goals.

Finally, as discussed above, Empire has filed its Customer Savings Plan proposal which will aide in meeting a number of these goals.

N. Describe and document how the utility's standby rates, cogeneration tariffs, and interconnection standards facilitate the development of customer-owned distributed generation resources and microgrids.

Empire's cogeneration tariff and interconnection standards facilitate the development of customer-owned distributed generation resources by providing financial incentives, as well as, safety and reliability standards.

Empire's cogeneration tariff offers seasonal rate production incentives, which provides a financial benefit based upon the annual useful energy output for customers who elect to participate in cogeneration.

Empire's interconnection process, specifications, and standards, as outlined in its Requirements for Net Metering, coupled with its Cogeneration Purchase Rate, facilitate a cogenerator's ability to safely, reliably, and economically interconnect with the existing grid. Empire's Requirements for Net Metering includes safety, performance, interconnection, and reliability standards established by the National Electrical Code, the National Electrical Safety Code, the Institute of Electrical and Electronics Engineers Underwriters Laboratories, the Federal Energy Regulatory Commission, and local governing authorities.

Missouri's Electric Utility Renewable Energy Standards (RES) require all electric utilities to generate or purchase electricity generated from renewable energy resources. Empire's Interconnection Application / Agreement for Net Metering Systems, includes a Missouri Solar Electric Rebate Application providing financial incentives to customers participating in Empire's Solar Rebate Program which count toward Missouri's RES.

Empire currently does not have a standby rate in Missouri. In addition to the items listed above, Empire is currently working with the Missouri Division of Energy and other stakeholders on several items contained in the Stipulation and Agreement from File No. EM-2016-0213, including special studies related to combined heat and power, microgrid interconnection process best practices, and the viability of offering a community solar program.

Combined Heat and Power:
In 2017, Empire assisted the Division of Energy ("DE") and the US DOE Midwest CHP Technical Assistance Partnership ("CHP TAP") in completing an outreach effort for screening potential CHP customers within Empire's Missouri gas service territory. A list of potential customers was compiled by Empire and provided to DE and CHP TAP. Educational materials and surveys were provided by CHP TAP in the July 2017 bill inserts, as well as, being published on Empire's website and presented at an informational webinar in August, 2017.

Customers interested in exploring CHP were then asked to complete the CHP TAP survey. If the survey results indicated further analysis, the customers were contacted to discuss the survey results and the possibility of a feasibility study. Challenges were encountered related to CHP TAP limited resources and obtaining timely responses; however, Empire continued to follow-up by phone and email with customers in the event no survey was returned and at each step during the process.

Empire has requested a report from CHP TAP summarizing the results of the outreach efforts for customers who utilized CHP TAP screening and feasibility services. However, no report has been received to date. Although no further action is required from Empire to complete the CHP outreach efforts in the Empire gas territory, business and community development personnel have initiated discussions regarding CHP implementations with Liberty Utilities (Midstates Natural Gas) gas customers who may be candidates and encouraging them to take advantage of the free services and assessments offered by CHP TAP.

Microgrid Interconnection Process:
The Empire team met with the Division of Energy, the Microgrid Industrial Consortium members, and Renew Missouri and discussed the key findings and opportunities, considerations from a customer perspective, municipal experiences, utility experiences, and draft standards for interconnection and interoperability of distributed energy resources. In addition, the group toured the Science and Technology Solar Village in Rolla, MO.

The Empire interconnection practices and procedures are consistent with the recommendations of the Microgrid Industrial Consortium. However, the possible need for a tariff or contract to interconnect systems larger than 100 kV was identified and is currently under investigation. Empire plans to continue the investigation of tariff or contract requirements for microgrid interconnections and look for growth opportunities related to microgrid additions to the Empire system.

Community Solar Program:
The Company has been actively working toward creating a community solar project and has identified conceptual performance and pricing for potential solar projects. Additionally, Empire has executed a Letter of Intent with a commercial customer to participate in the project.

O. Describe and document the extent to which federal investment, production, and other tax credits reduce the costs for utility plant.

Generally speaking, production tax credits or investment tax credits can be used as a means to ultimately reduce the cost of utility plant installed to benefit customers. In general, this is achieved through a reduction of income tax expense which is a cost

recovered through rates. Production tax credits reduce the revenue requirement as they are generated while investment tax credits do so over the life of the asset to which they relate.

P. Provide an explanation for stranded costs and ratepayer impact for the premature retirement of the "next-in-line" coal plant, including:

(i) The total costs of all stranded assets, who will pay the stranded costs, and, if the Company expects the customers to pay the stranded costs, the impact on customer rates;

(ii) All "cost of removal" considerations (dismantle, demolition) for plants that are retired early;

(iii) Costs associated with transmission upgrades or additions necessary for transmission grid reliability, stability, or voltage support affected by retirement.

As part of Docket EO-2018-0092, the Company has proposed to retire its Asbury coal plant. The regulatory filing contemplates a continued reimbursement by customers of all costs (return on and of investment) for the remaining plant balance due to the savings that will be conveyed to customers through investment in alternative, more economic resources and the fact investment decisions were in the best interest to our customers at the time they were made. Finally, no incremental transmission costs are anticipated as part of the proposed retirement while recognizing the Southwest Power Pool is continually performing economic flow analysis (Integrated Transmission Planning) on the entire SPP system and retirement of the Asbury generating asset could have a minimal impact on flows in the system potentially leading to investments in the system.

Q. For the upcoming energy efficient potential study, include adoption (or "take") rate considerations that are modified (+/-) with the following elements:

(i) Modified rate design scenarios (Including Block Rates, Time of Use, fluctuations in fixed charges +/- at $2, $5, and $10); and

(ii) Increase in volatile weather (additional Heating Degree Days and Cooling Degree Days).

Empire will conduct a DSM Potential Study as part of its 2019 IRP, and will consider these analyses for inclusion.

R. For purposes of its triennial IRP filing to be made in 2019, include the following as uncertain factors that may be critical to the performance of alternative resource plans in accordance with 4 CSR 240-22.060(5)M:

1) ***Foreseeable demand response technologies, including, but not limited to, integrated energy management control systems, linking smart thermostats, lighting controls and other load-control technologies with smart end-use devices;***
2) ***Foreseeable energy storage technologies; and***
3) ***Foreseeable distributed energy sources, including, but not limited to, distributed solar generation, distributed wind generation, combined heat and power (CHP) and micro-grid formation.***

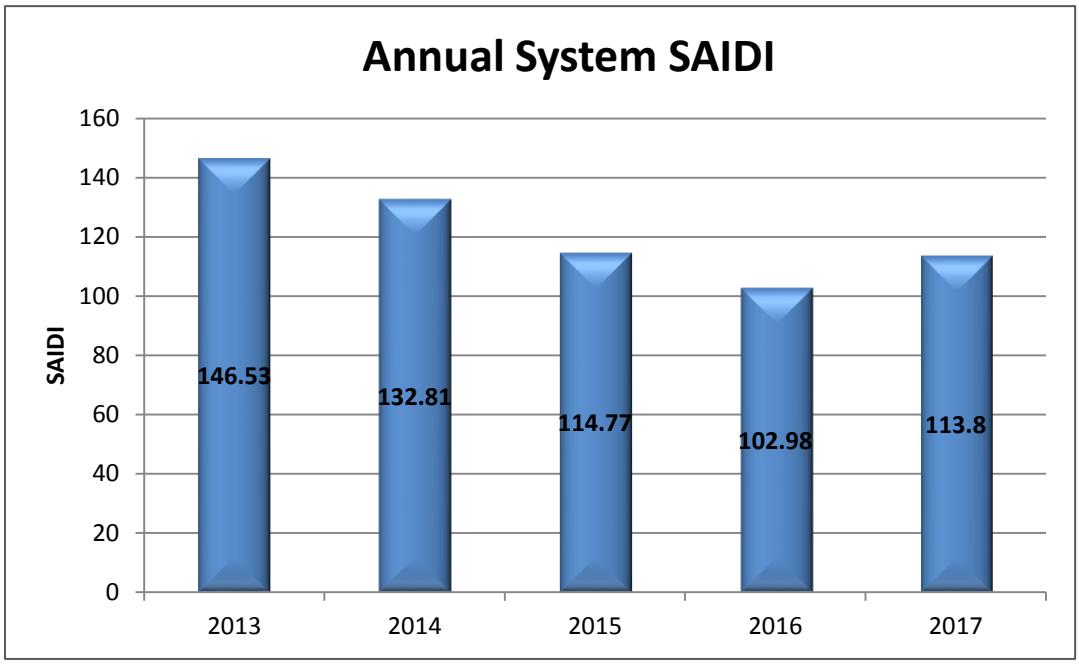
Empire will include the items listed in special contemporary issue "R" in the 2019 triennial IRP filing and ensure alternative plans developed to effectively measure the potential impacts of these issues to Empire and its customers.

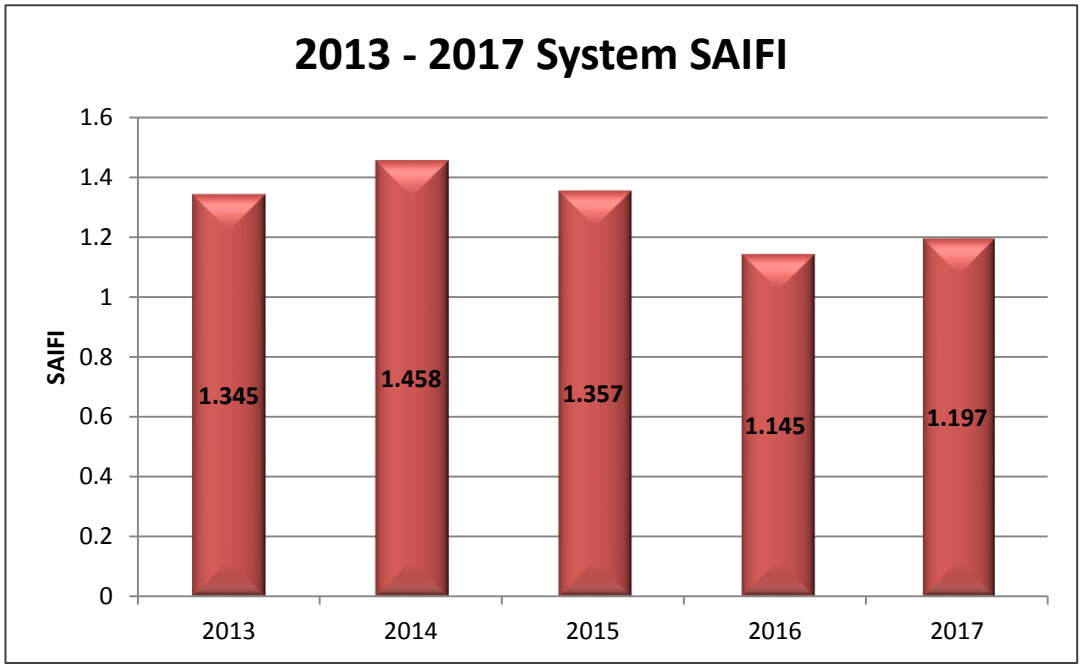
6. Transmission and Distribution (T&D) Analysis

In the Joint Filing required under 4 CSR 240-22.080(9) of the IRP Rule that followed the review of the 2013 IRP, Empire agreed to perform a comprehensive analysis of advanced distribution technologies in its transmission and distribution analysis section of the 2015 annual update report, and in its next triennial compliance filing, the 2016 IRP. This section of the report will update stakeholders about Empire's T&D system, reliability efforts—including Operation Toughen Up, a long-term initiative currently in progress to strengthen the T&D delivery system.

Operation Toughen Up (OTU)

As described in the 2016 IRP Executive Summary on pages 28-29, Operation Toughen Up is a long-term **_____** 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). One project completed in 2017 in conjunction with OTU was the installation of transformer breakers at the Fairplay substation to improve coordination and increase sectionalization. Also to ensure reliable service, Empire continued the annual transmission line inspection to identify potential issues with structures, hardware, conductors, vegetation and line clearance. This provides the opportunity to address situations before they become problems enhancing reliability to customers. As a result of the aforementioned initiatives and other additional reliability focused projects, the SAIDI rate dropped to 114 minutes, about a 22% improvement since 2013. The SAIFI rate dropped to 1.20 and improved by about 11% over 2013 levels. Empire will continue to work toward long-term goals to achieve a SAIDI of 100 and a SAIFI of 1.00.





The following table provides a description and schedule of the OTU projects installed since the last filing as well as the projects planned for the next three years.

Project Type	In Service Date	Description
Transmission Breakers	2017	Install (4) 69kV breakers at Fairplay #217 to upgrade existing protections for better coordination between 69kV & 34.5kV networks. Sectionalize 69kV transmission system. Protect associated assets within the substation and improve coordination on the 34.5kV sub-network.
Automated Transfer Scheme	2017	Install transfer scheme at Commerce #381 impacting Commerce and Quapaw area customers.
Automated Transfer Scheme	2018	Install transfer scheme at Jasper West #403 impacting Jasper, MO area customers.
Transmission Breakers	2018	Install (2) 161kV breakers, a control enclosure, and associated relay panels at Carl Jct. #366. In conjunction with 2016 project at Fir Road #417, this project will allow for further sectionalization of the transmission paths in/out of the Asbury generation substation by way of building on gains from 2016 project. Total project will benefit 5 different substations.
Automated Transfer Scheme	2019	Install transfer scheme at Galena #278 impacting Galena area customers.
Transmission Breakers	2019	Install (2) 161kV breakers, a control enclosure, and associated relay panels at Purcell #421. In conjunction with 2016 project at Fir Road #417, this project will allow for further sectionalization of the transmission paths in/out of the Asbury generation substation by way of building on gains from 2016 project. Total project will benefit 5 different substations.
Transmission Breakers	2019	Install (2) 161kV breakers, a control enclosure, and associated relay panels at Hollister #387. This project will allow for further sectionalization of the transmission paths on the southern loop of the Branson area service territory. This will eliminate the load tap present on the 161kV system and lower the exposure to customers in the Hollister/Branson areas.
Transmission Breakers	2019	Install (2) 161kV breakers, a control enclosure, and associated relay panels at Carthage #395. In conjunction with 2016 & 2017 projects at Fir Road #417 & Carl Jct., this project will allow for further sectionalization of the transmission paths in/out of the Asbury generation substation by way of building on gains from 2016 project. Total project will benefit 5 different substations.
Automated Transfer Scheme	2019	Install transfer scheme at Joplin NW #341 impacting Joplin, MO area customers.
Automated Transfer Scheme	2019	Install transfer scheme at Neosho #398 impacting Neosho area customers.
Transmission Breakers	2019	Install (2) 69kV breakers, a control enclosure, and associated relay panels at Anderson #322 to improve sectionalization of area transmission system. Presently 2 separate substations are load taps on the line section in consideration. Additional breakers will allow for line faults to be isolated and improve service to the Noel/Anderson area served customers.

Project Type	In Service Date	Description
Transmission Breakers	2019	Install (2) 161kV breakers, a control enclosure, and associated relay panels at Oakland #432 to improve sectionalization of area transmission system. Present substation is load tap on the line section in consideration. Additional breakers will allow for line faults to be isolated and improve service to the Joplin/Webb City area served customers.
Automated Transfer Scheme	2019	Install transfer scheme at Golden City #251 and Lockwood #400 impacting Golden City and Lockwood customers.
Automated Transfer Scheme	2019	Install transfer scheme at Pierce City #460 impacting Pierce City area customers.
Automated Transfer Scheme	2019	Install transfer scheme at Monett #152 impacting Monett area customers.
Automated Transfer Scheme	2019	Install transfer scheme at Racine Junction impacting Seneca area customers.
Transmission Breakers	2020	Install (4) 69kV breakers, control enclosure, and associated relay panels at Gateway Drive #258 to improve sectionalization of area transmission system. Additional breakers will allow for line faults to be isolated and improve service to Joplin area customers.
Transmission Breakers	2020	Install (3) 69kV breakers, control enclosure, and associated relay panels at Neosho Rocketdyne #296 to improve sectionalization of area transmission system. Additional breakers will allow for line faults to be isolated and improve service to Neosho area customers.

7. Other Updates

This section of the 2018 IRP Annual Update Report will provide updates to other IRP related issues, or what the IRP Rule refers to as "changing conditions generally."

Renewable Energy Standard (RES) Update
Empire reported on the RES in the 2016 IRP Executive Summary on page 21. Empire has been in compliance with all RES regulatory requirements in Missouri and Kansas as a result of ownership of the Ozark Beach Hydroelectric Project, purchased power agreements with the Elk River Wind farm (150 MW) located in Butler County, Kansas, and the Meridian Way Wind farm, (105 MW), located in Cloud County, Kansas. Currently, about 13% of Empire's native load is provided by these renewable resources (with a portion of the renewable attributes sold via renewable energy credits (RECs)).

As reported in the 2016 IRP, the Missouri regulations require that 2% of the energy from renewable energy sources must be solar. Empire pays solar rebates and anticipates all RES requirements will be met with solar renewable energy credits (SRECs) paid for by the solar rebates.

Demand-Side Management (DSM) Update for Arkansas
As stated in the 2017 IRP, Empire serves about 4,400 customers in northwest Arkansas. Besides Missouri, Arkansas is the only other jurisdiction where Empire offers demand-side programs. Empire has been granted variance from statewide energy efficiency savings targets for 2017-2019 due to the small customer count, the rural nature of Empire's Arkansas service territory and other factors. However, Empire continues to make improvements and offer a portfolio of programs with a proven record of success. In 2017, Empire introduced a streamlined portfolio, which offers a residential lighting program, a school-based energy education program, and a weatherization program for residential customers, as well as prescriptive and custom rebates for Commercial and Industrial customers. Empire also contributes its share to the statewide energy education program, Energy Efficiency Arkansas. Empire has offered customer programs in Arkansas since October 2007.

Capacity Margin Update
Reduction of the capacity margin was studied and discussed at length in the Supply Adequacy Working Group (SAWG) during the first half of 2017. Initially, this was part of a large revision request (RR187), and it was spun out on its own, as RR230. The SPP Board of Directors approved a 12% planning reserve, which translated into a 10.7% capacity margin in June of 2017. SPP filed the changes with FERC and continues to work through the approval process. Empire's 2018-2022 budget was developed during the SPP approval process and incorporated the previous approved capacity margins. The Company will revise the capacity margins used in the 2019-2023 budget cycle and the 2019 IRP to reflect the modified SPP requirements.

SPP Integrated Transmission Planning
Empire actively participates in the SPP Integrated Transmission Planning (ITP) process. The 2017 ITP10 contains a small project (approximately$120,000) to upgrade terminal ends and relieve a portion of the congestion related to the Neosho to Riverton flow gate, one of the top ten most congested areas within SPP. The project is considered a "no-regrets" project, meaning it is not expected to remediate all congestion on the flow gate, but rather to provide an incremental improvement. This will allow time to consider larger solutions which may address the needs of both the Neosho to Riverton flow gate and the Brookline transformer, another top ten congested area in SPP. This project is approved and awaiting implementation.

The SPP 2017 ITP Near Term (ITPNT) study recommendations were presented to the SPP Markets and Operations Policy Committee (MOPC) and the SPP Board of Directors (BOD) and approved in April 2017. Included in the recommendations and approvals was a $5.5 million project in the Empire service territory to re-conductor lines in the Republic, Missouri area.

The SPP 2018 ITPNT study is currently underway with results scheduled to be presented to MOPC and the SPP BOD in July 2018. Projects have not yet been identified for this study.

Additional analysis of the Morgan/Brookline transformer area and the Neosho to Riverton flow gate continues to be a part of the SPP-AECI Joint Regional studies and the SPP-MISO Joint Planning Studies. While these areas are not inside the Empire service territory, their proximity to it may influence market pricing during periods of congestion for load and generating units. Empire continues to monitor and participate in SPP ITP and joint system studies to ensure our customers receive the most cost-effective transmission solutions to provide reliable service.