



Empire DistrictTM

A Liberty Utilities Company

2017 Integrated Resource Plan Annual Update Report

The Empire District Electric Company

File No. EO-2017-0233

March 2017

****Denotes Highly Confidential****

2017 Integrated Resource Plan Annual Update Report

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The Empire District Electric Company (Empire) 2017 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. With this 2017 annual update, Empire will continue to inform Missouri stakeholders of ongoing IRP issues.

Since the filing of the last IRP in 2016, three main influencing factors have changed. These changes have not yet caused a shift from Empire's preferred plan but have resulted in the initiation of a special study. If the special study results in a departure from the preferred plan, Empire will provide the notice required by the IRP Rule. The three influencing factors are:

- 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
- 2) Clarity around sundown dates associated with production tax credits creates an increased urgency to developing renewable resources immediately, to the extent warranted by the special study; and

- 3) Empire's sale on January 1, 2017, has resulted in new owners with experience in the utilization of tax equity structures within regulated utilities to enable customer savings through the development of renewable energy resources not otherwise available to customers.

The confluence of these three factors has created a sense of urgency to evaluate renewable energy investment opportunities. This special study is in progress and to the extent the results suggest a different path than the current preferred plan, Empire will file notification and additional information with the Commission as required by 4 CSR 240-22.080 (12). The special study completion is anticipated within the next 6 months.

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 11% reduction in coal and a 17% reduction in natural gas forward curve pricing.

An additional aspect of this report will be to respond to sixteen 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 October 26, 2016 in File No. EO-2017-0076 with an effective date of November 1, 2016

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 2017-2021.

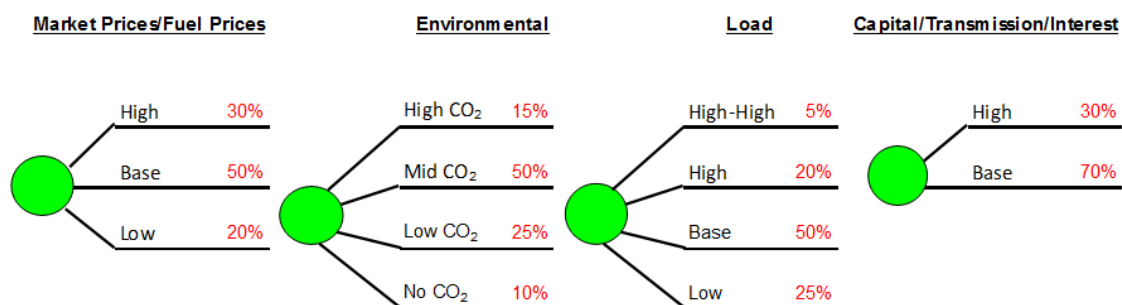
Following section (1) introduction, this report will contain sections addressing, (2) the status of the critical uncertain factors, (3) a resource acquisition strategy update, (4) transmission and distribution analysis update, (5) other updates, (6) a preferred plan update, and (7) special contemporary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

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

2. 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: environmental; market

prices/fuel prices; 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 prices, coal prices 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.

Natural Gas Price Forecast Update

Natural gas prices can be influenced by a variety of factors and the prices can change daily if not hourly. For the long-range 2016 IRP study, Empire based the natural gas price forecasts from the ABB Spring 2015 Power Market Advisory database (considered highly confidential). ABB developed three separate price forecasts to model base, moderate, and high (carbon tax) CO₂ scenarios. Empire purchased the ABB Spring 2016 Reference case for the development of the 2017-2021 budget. On average, prices were approximately 17% lower than the ABB 2015 Spring Reference Case. Further investigation was conducted by analyzing the ABB 2016 Fall Reference Case. This case showed higher gas prices when compared to the 2016 Spring Reference Case, a result of increased prices in the market during the last half of 2016. When compared to the 2015 Spring Reference Case utilized in the 2016 IRP, the 2016 Fall Reference case indicated approximately 10% reduction in predicted gas prices on average.

According to ABB, natural gas prices are expected to stabilize from the lows of the past few years and settle in the low-to-mid \$4.00/MMBtu range during the 2020-2029 decade. Factors influencing this forecast include 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 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 2017-2021 budget cycle. Overall, the aggregate weighted average coal price is about 11.4% lower in the 2017-2021 budget as compared to the same period in the 2016 IRP as shown in the table below.

**Weighted Average Coal Price
Comparison (\$/MMBtu)**

Year	2016 IRP Base Case	2017 IRP Annual Update
2017	1.96	1.74
2018	2.05	1.79
2019	2.18	1.95
2020	2.24	2.01
2021	2.33	2.06

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. Since there are no future coal units in any of Empire's 2016 IRP plans, this lower coal price forecast is not expected to impact capacity expansion planning.

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, 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. Empire has not contracted with ABB to generate updated long-term market prices since the 2016 IRP was developed. However, 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. Insufficient data was available to estimate SPP IM pricing for the 2016 IRP and prior studies. At the time the 2019 IRP commences in early 2018, enough time will have

passed to allow Empire to utilize four years of actual data to develop basis forecast differentials between pricing nodes.

B. Environmental Update

In the 2016 IRP filing, the environmental analysis assumed four levels of future CO₂ (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 2017 through 2021 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 SO₂, 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 2017 through 2021. 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.

Environmental issues continue to be one of the leading factors facing the electric utility industry and resource planning. This report will provide an update on the following environmental issues among those Empire continuously monitors.

- Clean Power Plan (Section 111(d) of the Clean Air Act)
- Clean Air Interstate Rule and the Cross-State Air Pollution Rule (CAIR/CSAPR)
- Mercury and Air Toxic Standards Rule (MATS)
- Ozone, particulate matter, National Ambient Air Quality Standards (Ozone/PM NAAQS)
- Clean Water Act (CWA)
- Coal Combustion Residuals (CCR)

Clean Power Plan (Section 111(d) of the Clean Air Act)

On August 3, 2015, the EPA released the final rule for limiting carbon emissions from existing power plants. The “Clean Power Plan” (CPP) requires a 32% carbon emission reduction from 2005 baseline levels by 2030 and requires fossil fuel-fired power plants across the nation, including those in Empire’s fleet, to meet state-specific goals to lower carbon levels. States will choose between two plan types to meet their goals: an emission standards plan which includes source-specific requirements impacting affected power plants or a state measures plan which includes a mixture of measures implemented by the state.

On February 9, 2016, the Supreme Court ordered a stay on the CPP. Twenty-seven states and numerous industry groups have challenged the CPP’s legality in the D.C. Circuit. The stay will remain in effect until the court resolves the legal challenges to the CPP. Presentation of oral arguments from defenders and challengers of the climate rule were heard before a ten-judge panel on September 27, 2016. The D.C. court is expected to decide the case by late February 2017. If, however, the case is appealed to the Supreme Court, the matter is likely to continue into 2018.

Other than the cancellation of the initial submittal deadline in September 2016, the EPA has not made any definitive statements regarding whether CPP timelines may change under the stay. The EPA continues to work on the CPP and released a proposed rule for the Clean Energy Incentive Program (CEIP) design guidelines on June 16, 2016. The rule is undergoing legal challenges and political pressures as a result of the presidential change. The ultimate cost of compliance cannot be determined at this time because of the uncertainties regarding the final outcome of the greenhouse gas regulations and the compliance methods yet to be chosen by the jurisdictions in which we operate if the rule is upheld. In any case, we expect the cost of complying with any such regulations to be material and therefore further supporting the evaluation of rule compliant renewable sources of energy in order to minimize potential impacts to customer rates.

CAIR/CSAPR Update

The CAIR generally called for fossil-fueled power plants greater than 25 megawatts to reduce emission levels of SO₂ and/or NO_x in 28 eastern states and the District of Columbia, including Missouri, where Empire’s Asbury, Energy Center, State Line and Iatan Units No. 1 and No. 2 are located. Kansas was not included in CAIR and the Riverton Plant was not affected. Arkansas, where the Plum Point Plant is located, was included for ozone season NO_x but not for SO₂.

SO₂ allowance allocations under the Title IV Acid Rain Program were used for compliance in the CAIR SO₂ Program. The alternate plans in the IRP assumed costs for other emissions such as SO₂, NO_x and mercury. It was economically beneficial to purchase NO_x Annual allowances in the final year of the CAIR Program (2014).

The Cross-State Air Pollution Rule (CSAPR) began on January 1, 2015, and requires 23 states to reduce annual SO₂ and NO_x emissions to help downwind areas attain the 24-hour and/or annual PM_{2.5} (fine particle matter) NAAQS. September 7, 2016, the EPA

finalized an update to the CSAPR for the 2008 ozone National Ambient Air Quality Standards (NAAQS) by issuing the final CSAPR Update. Starting in May 2017, this rule will reduce summertime (May - September) nitrogen oxides (NOX) emissions from power plants in 22 states in the eastern U.S. The rule will reduce air quality impacts of ozone pollution that crosses state lines and will help downwind areas meet and maintain the 2008 ozone air quality standard. The CSAPR NOx annual program impacts Empire's Missouri and Kansas units while the final CSAPR Update NOx ozone season program impacts units in these two states plus Empire's unit in Arkansas.

The CSAPR divides the states required to reduce SO2 into two groups. Both groups must reduce their SO2 emissions in Phase 1. Group 1 states, which include Empire resources in Missouri and Arkansas, must make additional SO2 reductions for Phase 2 in order to eliminate their significant contribution to air quality problems in downwind areas. Empire's units in Kansas are in Group 2 of the CSAPR SO2 program.

Under the CSAPR Program, in the most current five-year business plan (2017-2021), which assumes normal operations while maintaining compliance with permit conditions, Empire anticipates that it will be economically beneficial to purchase allowances for some of these pollutants if needed. Empire does not expect the cost of these allowances to be material should allowance purchases be required.

MATS Update

The MATS standard became effective in April 2012, and requires compliance by April 2015 (with flexibility for extensions for reliability reasons). For all existing and new coal-fired electric utility steam generating units (EGUs), the MATS standard was phased in over three years, and allowed states the ability to give facilities a fourth year to comply. On March 28, 2013, the EPA finalized updates to certain emission limits for new power plants under the MATS. The new standards affect only new coal and oil-fired power plants that will be built in the future. The update does not change the final emission limits or other requirements for existing power plants. The completion of the Compliance Plan puts Empire in compliance with MATS.

Ozone/PM NAAQS Update

The NAAQS are standards established by the U.S. EPA under authority of the Clean Air Act (42 U.S.C. 7401 et seq.) that apply to outdoor air quality throughout the country. In January 2013, the EPA finalized the revised PM 2.5 primary annual standard at 12 ug/m3 (micrograms per cubic meter of air). States are required to meet the primary standard in 2020. The standard should have no impact on Empire's existing generating fleet because the regional ambient monitor results are below the PM 2.5 required level. However, the PM 2.5 standards could impact future major modifications/construction projects that require additional permits.

Ozone, also called ground level smog, is formed by the mixing of NOx and Volatile Organic Compounds (VOCs) in the presence of sunlight. In October 2015 a lower Ozone standard (70 ppb) was finalized by the EPA. Based on the new standard, Empire's service territory is proposed by the state to be designated as attainment, meaning that it is in

compliance with the standard. The EPA should make the final designation by December 2017.

CWA Update

Empire operates under the Kansas, Missouri, and Arkansas Water Pollution Plans pursuant to the Federal Clean Water Act (CWA). Empire's plants and investment interests 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. We expect the regulations to have no future impact at Riverton as the new intake structure as designed and built, as part of the Unit 12 Combined Cycle Conversion Project, completed in May 2016, meets the new regulatory requirement for aquatic life protections. Additional industry court challenges are expected. Future 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. The new Iatan Unit 2 and Plum Point Unit 1 are covered by the new regulation and were constructed with cooling towers, the Best Technology Available. Empire expects these units to be unaffected or minimally affected by the final rule.

CCR/ELG Update

Effective October 19, 2015, the EPA established a final rule to regulate the disposal of coal combustion residues (CCR) as a non-hazardous solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA). Additionally, the EPA has finalized a revision of the CWA Steam Electric Effluent Guidelines (ELGs) for coal-fired power plants. The new rule sets technology-based ELGs based on the nature of the pollutants and the facilities involved. No later than November 2018, the EPA and states will incorporate the new standards into all waste water discharge permits, including permits for CCR impoundments. On January 20, 2017, the draft Asbury discharge permit renewal notice was posted for public comment. Consistent with the current preferred plan, compliance with both the CCR and ELG rules at the Asbury plant 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. This significant capital investment required for this plan is yet another factor influencing Empire to study potential alternatives to the current preferred plan. Upon conclusion of the special study, if the preferred plan is changed, Empire will immediately file notification, consistent with Rule 4 CSR 240-22.0810 (12).

Surface impoundment is the treatment, storage, or disposal of wastes in a lagoon or pond in order to prevent their escape into the environment. Empire owns and maintains a coal ash impoundment located at the Asbury Power Plant. Final closure of the existing ash impoundment, for which an asset retirement obligation of \$5.4 million has been recorded, is anticipated after the new landfill is operational. Additionally, Empire owns a 12% interest in a coal ash impoundment at the Iatan Generating Station. Separately, an asset retirement obligation of \$4.4 million has been recorded for our interest in this facility. Empire also has a 7.52% interest in a coal ash impoundment at the Plum Point Energy

Station in Arkansas. A new leachate collection pond and transfer piping system was installed in December 2016. As a result of the early transition from coal to natural gas fuel the former Riverton Kansas ash impoundment has been capped and closed. Final closure as an industrial (coal combustion waste) landfill was approved on June 30, 2014 by the Kansas Department of Health and Environment (KDHE).

On December 28, 2016 Empire was issued a Construction Permit for a new Utility Waste Landfill (UWL) at Asbury. The approval is the final regulatory step before construction. The UWL will sit on 217 acres just south of the existing ash impoundment and will include 87.9 acres of disposal area, multiple storm water control measures, leachate treatment facilities, holding ponds and new access roads form the plant. At the time of this update we anticipate CCR/ELG compliance costs to be approximately \$30 million. This estimate is based upon information gathered to date in relation to the multiple CCR rule reports, and current execution plan. As we move forward through the ELG and CCR rules' timelines of compliance, these plans and cost estimates may change. Construction of the UWL is currently planned to begin in 2017 with completion of the first 10 acre disposal cell in late 2018. The bottom ash conversion to a dry system is anticipated to be complete by early 2019.

C. Load Forecast Update

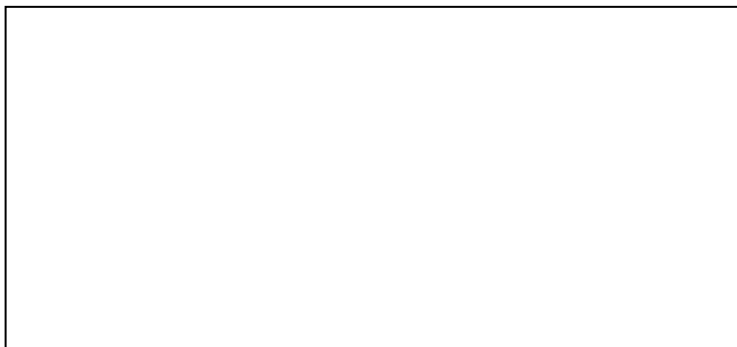
A summary of the 2016 IRP load forecast can be found in the Executive Summary on pages 12-18, and an entire 2016 IRP technical volume (Volume 3) is dedicated to load analysis and load forecasting. Since the 2016 IRP was filed in April, 2016 Empire has developed a new five-year load forecast for the Company's five-year budget covering the period 2017-2021. The 2016 IRP projected a summer peak of **_____** MW for 2017 without the impacts of new DSM. This compares to a projection of **_____** MW from the new five-year load forecast. The latter forecast incorporates more recent energy efficiency trends, updated distributed solar impacts, and known major customer expansions and contractions. The 2017-2021 5-year forecast demonstrates modest growth with annual peak and energy growth rates less than one quarter percent during the five year period.

Empire's actual 2016 peak demand of 1,113 MW occurred in the month of December, marking the third consecutive time the annual peak fell during the winter season. 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.

The following tables compare the demand and energy forecasts from the 2016 IRP and Empire's current five-year budget. The five-year budget's short-term forecast covers the period 2017-2021 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 Owen's Corning 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.

Empire recently completed the conversion of the existing Riverton Unit 12 simple cycle combustion turbine to a combined cycle unit and began commercial operations May 1, 2016. This project cost was approximately \$168 million and below the budget of \$175 million (without AFUDC).

3. 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 for resource options not related to capacity, specifically in regard to renewable resources. 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.

Further, over the past year, Empire has received unsolicited project updates from wind developers, as well as market research performed by Empire regarding the costs associated with renewable generation technology, which indicate a further reduction in wind power generation prices since the 2016 IRP. In addition, as previously mentioned, the acquisition and merger with Liberty Utilities has provided additional experience to consider a tax equity structure to potentially take advantage of production tax credits (PTC) opportunities. Based on the above factors, it was determined a special study was necessary to evaluate the wind opportunities prior to the next triennial IRP in order to include consideration for production tax credit (PTC) benefits.

To demonstrate this potential benefit, Liberty Utilities previously used a tax equity structure in conjunction with its Luning Project, a 50 MW solar facility constructed in Mineral County, Nevada. Use of a conventional ownership structure in which the utility directly owns 100 percent of the project and finances construction with internal funds, would not allow Empire's customers to realize the full effective value of the PTC benefits, which includes both the face value of the credits and the ability to use the credits in the near-term. In contrast, use of the tax equity financing structure may enable Empire to reduce its capital investment necessary to construct a project by an amount reflecting the ability of the tax equity partner to utilize the PTC benefits in the near term. This reduction could result in a lesser amount being placed into rate base, if a similar model is utilized and adopted for an Empire wind or solar project, and translates directly into lower costs for Empire customers through the life of the project.

Empire has contracted with ABB to perform a special study to determine if available opportunities are available for capital investment while reducing customer costs. This analysis will take into consideration current fuel prices, market prices, capital assumptions, wind pricing structures, and operating and maintenance costs. In addition, the model is being updated to a nodal pricing structure to simulate the SPP IM.

An important consideration for this special study is related to market price basis differentials between potential wind sites and Empire load areas in order to model the Neosho to Riverton transmission constraint, which has been on the Top 10 SPP Congested Flow Gate list for several years. Historically, the most wind-rich sites have been on the "wrong" side of this congested flow gate, and thus do not provide significant benefit to Empire customers. Scenarios currently under evaluation include Kansas wind sites outside the Empire service territory and Missouri, Kansas and Oklahoma wind sites in or near the Empire service territory.

All scenarios will be compared to the current preferred plan revenue requirements to determine the least cost to customers. No results are available at this time; however, Empire will discuss findings with stakeholders in the event a deviation from the preferred plan is warranted.

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 will be active for 2017-2018. 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.

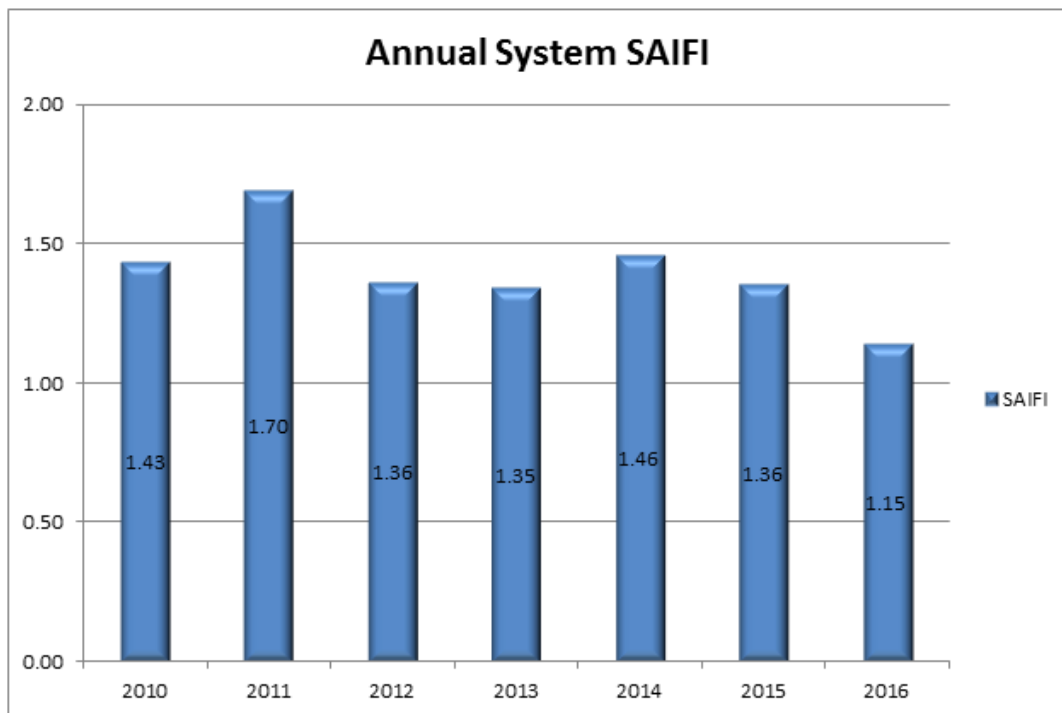
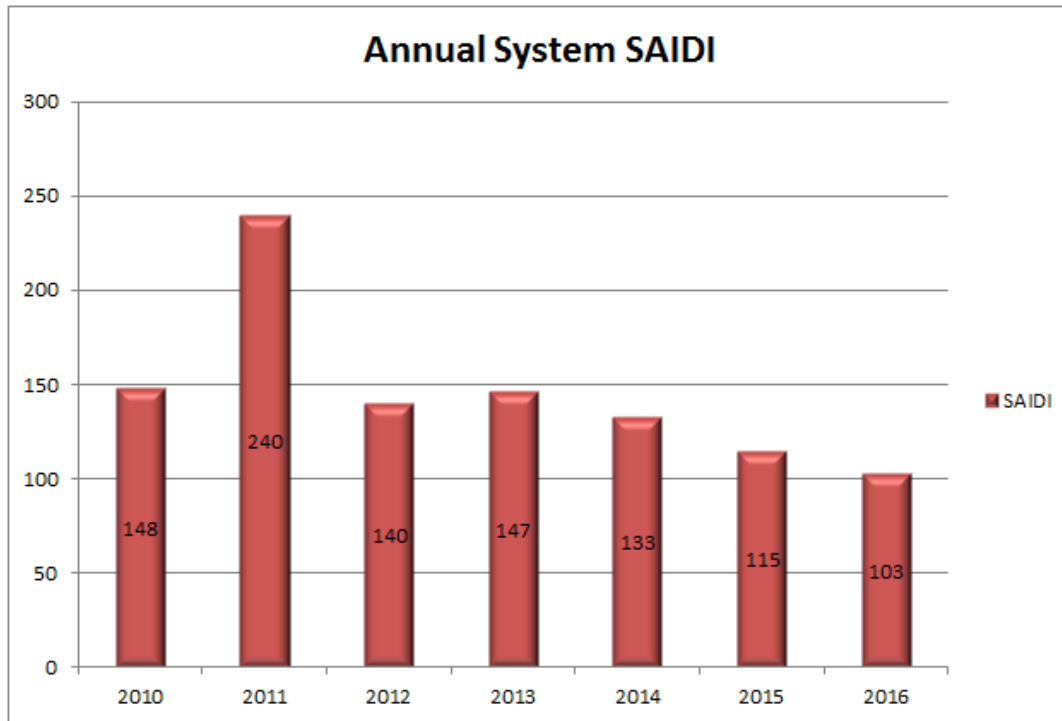
4. Transmission and Distribution (T&D) Analysis

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 \$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). One project completed in 2016 in conjunction with OTU was the rebuilding of 27 miles of transmission line in the Welch, Oklahoma, and Chetopa, Kansas, areas. 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 103 minutes, about a 30% improvement since 2013. The SAIFI rate has dropped to 1.15 and improved by nearly 15% 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
Automated Transfer Scheme	2016	Engineer transfer scheme at Brighton - East substation (#323) impacting Brighton area customers.
Rebuild	2016	At Baxter Springs West Substation (#271), this project replaces identified B.O. porcelain on switches, bus supports, and D.E. insulators. Line Work: 2014: Construct Phase 1 of 69-kV rebuild from Welch-North (#186) to Chetopa-Twin Valley (#388). 2014: Engineer and purchase rights-of-way for Phase 2 of 69-kV rebuild from Welch-North Substation (#186) to Chetopa-Twin Valley Substation (#388). 2015: Construct Phase 2 of 69-kV rebuild from Welch-North Substation (#186) to Chetopa-Twin Valley Substation (#388).
Automated Transfer Scheme	2016	Install at Sub# 372 in downtown Joplin area. Presently a load tap between existing breakers. Will allow for much reduced outage times during contingency events
Automated Transfer Scheme	2016	Install at Sub# 362 Tap in Sarcoxie area. Presently a load tap between existing breakers. Will allow for much reduced outage times during contingency events
Transmission Breakers	2016	At Joplin-Fir Road Substation (#417), this project adds 2 161-kV breakers, a control enclosure, and associated relay panels. This work is the first of a 5 part project involving 5 distribution serving substations as well as addressing protection issues at Asbury. The overreaching project will better sectionalize the transmission circuits in/out of the Asbury generation plant as well as insulate customers served from any of the 5 distribution substations from the extended exposure present. At Joplin Oronogo Junction Substation (#110), this project replaces the existing line relay panel on the line to Asbury (breaker #16154).
Transmission Breakers	2016	Substation Work (completed): At Columbus S.E. Substation #94, this project adds 5 69-kV breakers in a ring-bus configuration, a control enclosure, and associated relay panels. At Columbus Tennessee St. Substation (#282), this project adds a motor-operated, auto throw-over switch scheme. Line Work (work to be completed in 2016): Existing lines will need to be rerouted to allow for the substation expansion and inclusion of 69-kV breakers. Provisions should be made for a fifth new line segment exiting the substation to serve the current Columbus tap.
Transmission Breakers	2017	Install (4) 69kV breakers 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.
Transmission Breakers	2017	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

Project Type	In Service Date	Description
Automated Transfer Scheme	2017	Install transfer scheme at Jasper West #403 impacting Jasper, MO area customers.
Automated Transfer Scheme	2018	Install transfer scheme at Commerce #381 impacting Commerce and Quapaw area customers.
Automated Transfer Scheme	2018	Install transfer scheme at Galena #278 impacting Galena area customers.
Transmission Breakers	2018	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	2018	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	2018	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	2018	Install transfer scheme at Joplin NW #341 impacting Joplin, MO area customers.
Transmission Breakers	2019	Install (2) 69kV breakers, a control enclosure, and associated relay panels at Neosho #398 to improve sectionalization of area transmission system. Presently 3 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 Neosho area served 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.
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.

Project Type	In Service Date	Description
Transmission Breakers	2019	Install (2) 69kV breakers, a control enclosure, and associated relay panels at Golden City #251 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 Jasper/Boston/Lockwood area served customers.

5. Other Updates

This section of the 2017 IRP Annual Update Report will provide updates to other IRP related issues, or what the IRP Rule refers to as “changing conditions generally.”

Liberty Utilities’ Acquisition of The Empire District Electric Company

On January 1, 2017, Liberty Utilities completed the acquisition of and merger with The Empire District Electric Company. This is significant because Liberty Utilities and its affiliates are experienced developers of renewable energy and have successfully developed renewable energy projects within the rate base of regulated utilities which are enabling significant customer savings in other jurisdictions. Combined with the sundown of the production tax credits and current availability of tax equity structures, there is a sense of urgency to evaluate the viability of additional renewables to be incorporated in to Empire’s preferred plan, to the extent they can result in customer savings.

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 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 15% of Empire’s native load is provided by these wind 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 RECs paid for by the solar rebates. However, additional RECs will be purchased if necessary to fulfill the requirements.

Demand-Side Management (DSM) Update for Arkansas

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

SPP created a Capacity Margin Task Force (CMTF) to update the SPP capacity margin requirements and methodology based up SPP stakeholder and staff input and to present a recommendation of the updated information to the Market Operations and Policy Committee (MOPC). The recommendation was made to reduce the capacity margin from 13.64% to 12%. After the CMTF presented its findings a new working group, the Supply Adequacy Working Group (SAWG), was created in late September 2016 as a combination of the CMTF and the previous Generation Working Group. The final implementation dates are not known at this time as other working groups are considering the recommendation. Empire continues to monitor the SPP working groups for updates regarding the capacity margin implementation plan and does not anticipate a significant impact to the preferred plan as a result of the reduction.

SPP Integrated Transmission Planning

Empire has actively participated in the SPP Integrated Transmission Planning (ITP) process. The newly approved 2017 ITP10 contains a small project (~\$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 and 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.

The recent SPP 2017 ITP Near Term (ITPNT) study recommendations will be presented to MOPC and the SPP BOD for approval in April 2017. Included in the recommendations is a \$5.5 million project in the Empire service territory to re-conductor a few lines in the Republic area.

Additional analysis of the Morgan/Brookline transformer area is in progress as part of the SPP-AECI Joint Regional study with plans to submit recommendations to MOPC and the SPP BOD in April 2017. The Brookline transformer area and Neosho to Riverton flow gate will be studied in the SPP-MISO Joint Planning study with results and recommendations scheduled to be presented to MOPC and the SPP BOD in July 2017. While these areas are not inside the Empire service territory, their proximity to it influences 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.

6. 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 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, 2017 – 2017 IRP Annual Update Report filed

Riverton 12 Combined Cycle (Riverton 12 CC) began commercial operation on May 1, 2016. The unit has been offered into the SPP Integrated Marketplace (SPP IM) for operation each day with the exception of periods the unit was on outage. During 2016, the Riverton 12 CC supplied nearly 642,000 MWh of energy at a cost of just under \$14.5 million. Revenue received from the SPP IM for the same period totaled over \$17.2 million, providing nearly \$2.8 million in margin to offset fuel and purchase power expense.

As discussed in the Resource Acquisition Strategy Update section of this report, no supply-side projects are currently in the short term for the preferred plan. However, studies are underway to determine the benefits to customers related to available production tax credits for wind resources. More information will be provided as it comes available.

Demand-Side Management Preferred Plan Update (as of March 2017)

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 will offer 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 and the 2017 annual update based on the five-year business plan (as of March 2017) are presented on the following pages for comparison.

Forecast of Capacity Balance (MW)2016 IRP - 2017 Annual Update (Mar-2017) Summer Ratings

	2016 IRP					2017-2021 Budget				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
A. System Generation Capacity	**Highly Confidential in its Entirety**					**Highly Confidential in its Entirety**				
Base Capacity										
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										
% Reserve Margin										
% Capacity Margin										
Required Capacity										
Capacity Balance										

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

Forecast of Capacity Balance (MW)2016 IRP - 2017 Annual Update (Mar-2017) Winter Ratings

	2016 IRP					2017-2021 Budget				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
A. System Generation Capacity	**Highly Confidential in its Entirety**					**Highly Confidential in its Entirety**				
Base Capacity										
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										
% Reserve Margin										
% Capacity Margin										
Required Capacity										
Capacity Balance										

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

7. 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 sixteen special contemporary issues (A through P) that were established by Commission Order in File No. EO-2017-0076.

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 types of 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”. The benefit to the smart grid 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 resulted in a net present value ** _____ ** revenue requirement and a ** _____ ** operating and maintenance savings ultimately creating a ** _____ ** savings to customers over a twenty year evaluation. Empire continues to evaluate project for best timing and impacts to customers

and employees. Full AMI deployment is projected to take three years, including the RFP process.

B. Analyze and document the future capital and operating costs faced by each Empire coal-fired generating unit in order to comply with the following environmental standards:

- (1) Clean Air Act New Source Review provisions;***
- (2) 1-hour Sulfur Dioxide National Ambient Air Quality Standard;***
- (3) National Ambient Air Quality Standards for ozone and fine particulate matter;***
- (4) Cross-State Air Pollution Rule, in the event that the rule is reinstated;***
- (5) Mercury and Air Toxics Standards;***
- (6) Clean Water Act Section 316(b) Cooling Water Intake Standards;***
- (7) Clean Water Act Steam Electric Effluent Limitation Guidelines;***
- (8) Coal Combustion Waste rules;***
- (9) Clean Air Act Section 111(d) Greenhouse Gas standards for existing sources;***
- (10) Clean Air Act Regional Haze requirements; and***
- (11) Clean Power Plan.***

This is a repeat issue from the 2014 and 2015 Annual Update and the 2016 IRP. In 2014, Empire sought clarification regarding this issue. The issue requires Empire to analyze and document the future capital and operating costs faced by each Empire coal-fired generating unit to comply with several different environmental standards. Empire asked whether the Commission is requiring it to document the cost to comply with each of the environmental standards separately. Empire explained that all of its air quality control system (AQCS) projects are designed to satisfy multiple environmental standards at once. The Commission clarified as follows: “The Commission is interested in the cost associated with compliance by each coal-fired generating unit with the eleven environmental standards in total. Empire does not need to separately breakdown the cost to comply with each of the eleven environmental standards.” Based on that guidance, Empire has updated its response from past filings as follows:

In December 2014 Empire completed an environmental retrofit at the Asbury plant. The retrofit project included the installation of a pulse-jet fabric filter (baghouse), circulating dry scrubber and powder activated carbon injection system. This new equipment enables Empire to comply with the Mercury and Air Toxics Standard (MATS). Final cost of the project was \$112.1 million, excluding AFUDC.

Empire has and will continue to incur capital and operating costs at its coal-fired generating facilities to comply with existing and future environmental regulations. At Asbury, for instance, with the AQCS project operating and maintenance costs are expected to be approximately **_____** annually in addition to the approximately \$1.0 to 1.2 million that will be spent annually to operate and maintain the selective catalytic reduction (SCR) system previously installed. The AQCS and SCR systems are monitored by control equipment and a Continuous Emissions Monitoring System (CEMS). The cost to operate and maintain the CEMS is approximately \$0.4 to 0.5 million annually. Asbury is also constructing a landfill for its ash and scrubber byproduct at a cost of approximately **_____**. The eventual closure and ongoing post-closure costs of this landfill are expected to be around \$9.1 million (2015 dollar value), while operating costs are expected to be **_____** (in addition to the **_____** included for fly-ash and byproduct handling included in the Asbury AQCS operating costs above) during active operation. With the addition of the new CCR landfill the existing impoundments will be closed in place. Asbury has budgeted **_____** for the impoundment closure. In addition, Asbury has budgeted approximately **_____** for future conversion to a dry bottom ash conveyance system. This new handling system will also require the hauling of dry bottom ash to the new landfill at an estimated annual cost of \$210,000.

Riverton Units 7 and 8 (formerly coal units) were transitioned to natural gas only operation in September 2012 prior to their eventual retirements. Riverton Unit 7 was retired from service in June 2014, and Units 8 and 9 were retired from service June 2015. The decommissioning of the three retired units began in December 2016 and is expected to be complete mid-2017. The Riverton Unit 12 combined cycle conversion was completed in May 2016. Although the Riverton Unit 12 combined cycle conversion is a natural gas-fired plant, it is included in this discussion because it was constructed to replace the coal-fired capacity of Riverton Units 7, 8, and 9; whose retirements were accelerated due to environmental regulations. The Riverton Unit 12 Combined Cycle conversion project had a total cost of \$168 Million (without AFUDC), which includes approximately \$12 million for construction of a cooling tower and 316(b)-compliant river water intake. Operating costs for the SCR on the combined cycle unit are expected to be approximately \$20,000 annually. Costs associated with the retirement of Riverton Units 7, 8 and 9 include approximately \$1.43 million spent to close the existing ash landfill and approximately \$6.6 Million for the environmental remediation and demolition of the units. Operating costs for the landfill post-closure are forecast to be approximately **_____** per year.

On Empire's 7.52% ownership share of Plum Point, annual costs for operating the air pollution control equipment and the fly ash landfill are expected to be approximately \$425,000 per year. There is also the infrequent need to construct a new landfill cell – the last cell constructed cost was approximately **_____** for Empire's share.

On Empire's 12% ownership share of the two units at the Iatan Station, operating costs for the air quality control system are approximately **_____** per year for the consumables used, and an O&M cost of approximately **_____** for compliance

with CWA 316(a)/Cooling Towers. There will also be the need to construct additional landfill cells in the future and ash conversion projects to comply with the ELG and CCR rules with an approximate cost to Empire of ****_____****. Ongoing capital projects needed for compliance for the CWA 316(a) rules have an estimated cost to Empire of ****_____****.

In response to the Clean Power Plan (CPP), Empire is still waiting for the states to submit their implementation plans. However, on February 9, 2016 the U.S. Supreme Court issued a stay of the CPP in a 5-4 decision. Contributing to the uncertainty, the court's decision did 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 stalled the implementation of the CPP while lawsuits challenging the legality of the plan are adjudicated by the D.C. Circuit Court of Appeals. The stay will remain in effect until the court resolves the legal challenges to the CPP. Based on these actions, the states Empire operates have ceased working on an implementation plan. Empire modeled multiple scenarios in the 2016 IRP to respond to CPP and other scenarios. At the time there was only speculation on how CPP compliance would be approached by the states, therefore, those model results were suppositious. With no material updates since 2016 and until more information is known, it is impossible to forecast capital and additional O&M expenses associated with CPP, if it is implemented. More information directly related to CPP is provided in Contemporary Issue "E." Empire's ultimate compliance approach would be based upon whatever alternative is most economical for customers.

The costs associated with these programs reinforce the need for the special study mentioned herein to be conducted in order to evaluate whether incorporating renewables would offer a lower cost solution for customers than the preferred plan.

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.

This twenty-year IRP covers the period 2016-2035. For this study, Empire had to make retirement assumptions for IRP purposes. It was assumed the Asbury coal-fired unit would retire in 2035, the final year of the planning horizon, for IRP purposes. One alternate plan (Plan 16) was a "what-if" scenario and examined an earlier retirement date for the Asbury unit in 2022. Since the *assumed* Asbury retirement occurs near the end of the planning horizon, not enough information was available to determine any transmission upgrades as a result of this retirement. No additional transmission upgrade costs were included for the assumed Asbury retirement in this IRP. Empire will continue to consider this issue in its planning models as more details become available.

Separately from the IRP process, Empire was an active participant in the development of the 2017 ITP10 (2017 10 year Integrated Transmission Plan) 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. 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 needs were 100 kV and above were identified for the 2017 ITP10 study.

D. Review the options available to Empire for providing customer financing for energy efficiency measures. Discuss Empire's current, near term (next three years) and long-term activities and plans for providing customer financing for energy efficiency measures.

Empire evaluated and discussed customer financing for energy efficiency measures in Vol.6-177 in the 2016 IRP and currently does not offer customer financing to its electric customers, and does not anticipate offering financing for energy efficiency measures for its Missouri electric customers in the near term. The currently proposed DSM programs developed with the guidance of the DSM Advisory Group did not incorporate financing options for Empire's Missouri electric customers. However, that does not preclude implementation contractors from proposing third-party financing to Empire.

As discussed in the AMI section, the Liberty Utilities acquisition and merger may also provide an opportunity to consider an implementation of a new billing system capable of supporting customer financing options during evaluations of current systems in the transition process. All systems are being evaluated to determine the current and desired functionality and performance as well as projected costs and prioritization of upgrades. No timeline is currently available for a billing system upgrade or replacement.

Empire arranged for a presentation to the Missouri Public Service Commission regarding the Pay As You Save (PAYS) program on November 30, 2016 as part of the Stipulation and Agreement for File No. ER-2016-0023 and will continue to consider opportunities which provide cost-effective benefits for customers as the billing systems are evaluated and as part of the 2019 IRP. Feasibility studies of the implementation of these types of programs are planned to assist in the determination of costs and considerations associated with customer financing software, processes, and programs.

E. Describe and document how the preferred plan of the Company's Integrated Resource Plans (IRPs) positions the utility for full or partial compliance with the U.S. Environmental Protection Agency's (EPA) Clean Power Plan (CPP) under Section 111(d) of the Clean Air Act, as released in final form on August 3, 2015, assuming that the rule is upheld by the courts in its current form, except as compliance timelines may need to be modified as a result of the delay in implementation resulting from the U.S. Supreme Court's stay. Please include in this regard:

- (1) Qualitative and quantitative evaluations of how renewable energy, energy efficiency and other demand-side resources (including combined heat and power) deployed by the Company after January 1, 2013 could contribute to compliance;*
- (2) Qualitative and quantitative evaluations of how renewable energy, energy efficiency and other demand-side resources (including combined heat and power) deployed by the Company after the submission of a final State Implementation Plan could qualify under EPA's proposed Clean Energy Investment Program (CEIP);*
- (3) A description and quantification of additional investments (in fiscal, capacity, and energy terms by year) which will be required by the Company to meet the targets in the CPP under a trading-ready "mass-based" approach, with and without participation in the CEIP;*
- (4) Qualitative and quantitative descriptions of the barriers to achieving these additional investments;*
- (5) The price of carbon used by the Company in the analyses above and a justification for this price;*
- (6) A description and explanation of the Company's preferences regarding specific compliance options under a state implementation plan; and*
- (7) A description of all meetings, analyses, or other efforts made towards preparation for compliance with the CPP (and CEIP, as applicable). To the extent that any uncertainty is involved in determining compliance pathways under the CPP (and CEIP, as applicable) based on the scenarios provided above, please describe and document the Company's choices under the most probable compliance scenarios, with an explanation of why the Company believes these scenarios are the most probable.*

The timing of Empire's 2016 IRP made it difficult if not impossible to adequately address all aspects of the special contemporary 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 2016 IRP process was underway. Empire has attended CPP meetings in each of the states it serves. However, at this time there are no state approved implementation plans for the states within Empire's service territory. 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 were 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 did 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 stalled the implementation of the CPP while lawsuits challenging the legality of the plan are adjudicated by the D.C. Circuit Court of Appeals. The stay will remain in effect until the court resolves the legal challenges to the CPP. Presentation of oral arguments from defenders and challengers of the climate rule were heard before a ten-judge panel on September 27, 2016. The D.C. court is expected to decide the case by late February 2017. If, however, the case is appealed to the Supreme Court, the matter is likely to continue into 2018.

Other than the cancellation of the initial submittal deadline in September 2016, the EPA has not made any definitive statements regarding whether CPP timelines may change under the stay. The EPA continued to work on the CPP and released a proposed rule for the Clean Energy Incentive Program (CEIP) design guidelines on June 16, 2016. The ultimate cost of compliance cannot be determined at this time because of the uncertainties regarding the final outcome of the greenhouse gas regulations and the compliance methods yet to be chosen by the jurisdictions in which we operate if the rule is upheld.

While there is much uncertainty surrounding the CPP timing and potential compliance, Empire did address environmental costs in its 2016 IRP filing. 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. There is no material update at this time with respect to carbon cost or the likelihood of implementation. Rather, if anything, the 2016 IRP would most likely be considered a conservative approach as the timing and possible implementation of the CPP appears to be delayed, at a minimum. Furthermore, with no state compliance plan it is not feasible to determine how or if renewable energy, energy efficiency and other demand-side resources (including combined heat and power) deployed by the Company after the submission of a final State Implementation Plan could qualify under EPA's proposed Clean Energy Investment Program (CEIP).

As highlighted below, Empire modeled four future carbon cases and one alternate plan related to environmental compliance in its 2016 IRP filing:

1. No carbon rule during the study period
2. Cap and Trade – Low allowance cost Case
3. Cap and Trade – Mid allowance cost Case
4. Cap and Trade – High allowance cost Case
5. Alternate Environmental Plan: Retire Asbury early in 2022 (Asbury's assumed retirement for other plans is 2035)

Along with a no carbon cost future, carbon allowance costs per ton were studied at three levels based on publicly available data from a CO₂ price forecast published by Synapse Energy Economics, Inc., a research and consulting firm specializing in energy, economic and environmental topics. The annual CO₂ price per ton, which is assumed to begin in year 2022, is shown in the table below.

Year	No Carbon	Low	Mid	High
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

Table 6-1 – CO₂ \$/Ton for 2016 IRP Cases

As explained in the 2016 IRP technical volumes and as discussed during the Stakeholder process, Environmental cost is a critical uncertain factor and the environmental uncertainty was assigned subjective probabilities to recognize the unknown future as required by the IRP Rule. The Mid CO₂ case shown in *Figure 6-176* represents the IRP base assumption.

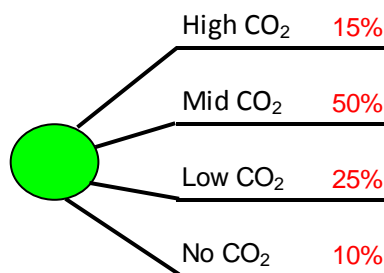


Figure 6-1 – Environmental Uncertainty from the 2016 IRP Decision Tree

This issue asks for a description of how the preferred plan of the Company's last and current annual or triennial Integrated Resource Plans (IRPs) positions the utility for full or partial compliance with the CPP. Subsequent to Empire's 2013 IRP filing, Empire has retired three small coal units and a small natural gas turbine and replaced the lost capacity by converting an existing unit to an efficient natural gas-fired combined cycle unit. This unit (Riverton Unit 12) became commercially available on May 1, 2016. Additionally, more than 15% of the energy Empire generates comes from renewable resources of wind and hydro while approximately 50% comes from coal. As a result, Empire appears to be well positioned for future greenhouse gas regulations.

Empire continues to monitor the status of the CPP. As mentioned above in the Resource Acquisition Strategy Update section, special studies and analysis are in progress to consider additional renewable resource additions. Carbon pricing will be considered with other risk factors in the special study. No results are available at this time. Empire will provide updates in subsequent IRP filings to the extent any material changes have occurred.

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

Empire is in the early stages of evaluating the potential benefits of joint DSM programs, marketing, and outreach across electric, gas, and water utilities. The recent acquisition and merger with Liberty Utilities provides more robust opportunities to reduce costs and consolidate resources and efforts while reaching more customers. Empire has participated in Peer Exchanges over the past several years to work with other utilities and across platforms to find cost-effective measures and plans to continue collaborating with other area utilities.

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.

Empire expects to gather information and perform a more in-depth analysis during the 2019 IRP which coincides with the response to special contemporary G and the utilization of a MEEIA portfolio to recover the costs of these programs.

G. Evaluate and describe whether Empire should submit a MEEIA demand-side portfolio to the Commission for approval.

The timing of Empire's next proposed MEEIA demand-side portfolio is dictated by the terms outlined in the Amended Stipulation and Agreement as to Division of Energy and Renew Missouri in Case No. EM-2016-0213 (Attachment C).

Section (1) of Attachment C states, “Empire will work with DE, the Staff of the Commission (‘Staff’), the Office of Public Counsel (‘OPC’) and other parties through the existing DSM Advisory Group to review and consider the viability of adopting additional energy efficiency programs for its customers. Within one year of the Commission’s finding of substantial compliance of the Empire Integrated Resource Plan that follows Commission approval of a Statewide Technical Reference Manual (TRM), Empire will develop and submit an application for approval of a portfolio of DSM programs under the Missouri Energy Efficiency Investment Act (MEEIA), so long as any such portfolio is a part of Empire’s adopted preferred resource plan in its Integrated Resource Plan, or has been analyzed through the integration process required by 4 CSR 240-22.060, and the portfolio and any DSIM submitted in the application is fully compliant with the MEEIA statute and applicable regulations.”

During 2016 the Vermont Energy Investment Corporation (VEIC) launched a statewide collaborative effort alongside the Missouri Department of Economic Development, Division of Energy (DED-DE) to develop a formal Missouri-wide Technical Reference Manual which will provide gas and electric utilities a transparent, consistent set of standard energy efficiency measure characterizations for tracking and documenting energy efficiency savings and cost recovery.

In its January 2017 Missouri Technical Reference Manual Project Update, the DED-DE stated the VEIC will continue to engage with the TRM Technical Advisory Committee (TAC) in the final development and delivery of the Missouri TRM through the end of March, 2017. Empire has taken an active role in the TRM project by monitoring and participating in both the TAC and Technical Oversight Committee (TOC) meetings.

Demand-side resources will be reevaluated during the next IRP currently scheduled for 2019. By 2019, Empire expects a statewide technical resource manual to be available in Missouri, which could help facilitate the analysis, reporting and evaluation of demand-side resources.

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 CO2 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 is 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.

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. However, energy storage is still costly at this time. Further technology advancements will likely be needed before it becomes feasible for widespread distributed installations.

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 F, 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 utility's delivery infrastructure in order to ensure and advance system resiliency, reliability, and sustainability.

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, approximately 20% 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. The performance of this circuit will be evaluated in 2017.

K. Separately describe and document how the utility'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 (see 4 CSR 240-22.010)

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 physically 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 are planned to be implemented in 2017. Expansion will continue to additional nodes and rings each year as appropriate. **_____** has been sent 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 **_____** in rebates and incentives annually providing thousands of Empire customers to 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 F and G, 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 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 13 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.

As mentioned above in the Resource Acquisition Strategy Update section, special studies and analysis are in progress to consider additional renewable resource additions. No results are available at this time. Empire will provide updates in subsequent IRP notices or filings to the extent any material changes have occurred.

L. 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 garden.

***M. Study feasibility of providing all customers with interval meter data.
Review the options available to provide customers with real-time,
building level data, sub-meter, line and device level data.***

Providing interval meter data to customers is not possible with the current technology deployed in Empire's service territory, except for 100 industrial customers with complex metering devices. Deployment of AMI will be essential to providing interval meter data to the majority of customers. As addressed in 2017 Special Contemporary issue "A", AMI is considered to provide many benefits, including real time usage information. Initial studies have been performed to determine feasibility of a full AMI implementation and Empire is investigating the time frame implementation could reasonably begin.

N. Review plans to make Time of Use rates available to all customers.

As described in Volume 5, Section 4.1 of the 2016 IRP, under Time-of-Use "[c]ustomers pay a higher price during the designated peak period and lower prices during off-peak. The designated peak and off-peak periods are typically defined by the season, day and time of day." Time-of-use also requires interval metering and supporting systems (e.g. a Meter Data Management System or MDMS).

As discussed in special contemporary issues A, AMI implementation is expected to occur over the next three years, 2017-2019. Once the technology is in place, analysis will be conducted to consider time-of-use as well as other possible rate structures to facilitate cost effective demand-side management measures from a 4 CSR 240-22 IRP rules perspective.

O. Discuss plans to increase deployment of distributed generation resources, including, but not limited to, net metering limitations, interconnection procedures, and billing practices for solar customers.

A recent feasibility study was performed to determine the costs and benefits to deploying utility scale solar, which revealed a few benefits, however did not have a positive benefit to cost ratio. Net metering is continuing to being adopted by customers in the Empire service territory at an average of 25 new solar customers per month. At this time, increased deployment of distributed generation resources will continue to be evaluated for feasibility.

P. 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 emerging energy efficiency technologies***
- (2) Foreseeable energy storage technologies; and***
- (3) Foreseeable distributed generation, including, but not limited to, distributed solar generation, combined head and power (CHP) and micro-grid formation.***

Empire will include the items listed in special contemporary P 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.