THE EMPIRE DISTRICT ELECTRIC COMPANY

ELECTRIC UTILITY PLANT

DEPRECIATION RATE STUDY

AT DECEMBER 31, 2019

http://www.utilityalliance.com

LIFE ANALYSIS

The retirement rate actuarial analysis method was applied to all accounts for EDE. For each account, an actuarial retirement rate analysis was made with placement and experience bands of varying width. The historical observed life table was plotted and compared with various Iowa Curves to obtain the most appropriate match. A selected curve for each account is shown in the Life Analysis Section of this report. The observed life tables for all analyzed placement and experience bands are provided in work papers.

For each account on the overall band (i.e., placement from earliest vintage year, which varied for each account, through 2019), approved survivor curves from EDE's prior cases, modified by subsequent orders if applicable, were used as a starting point. Then, using the same average life, various dispersion curves were plotted. Frequently, visual matching would confirm one specific dispersion pattern (e.g. L, S, or R) as an obviously better match than others. The next step would be to determine the most appropriate life using that dispersion pattern. Then, after looking at the overall experience band, different experience bands were plotted and analyzed in increments, for instance 1970-2019, and 2000-2019. Next, placement bands of varying width were plotted with each experience band discussed above. Repeated matching usually pointed to a focus on one dispersion family and small range of service lives. The goal of visual matching was to minimize the differential between the observed life table and Iowa Curve in top and mid-range of the plots. These results are used in conjunction with all other factors that may influence asset lives.

Terminal Retirement Date

The terminal retirement date refers to the year in which a generating unit will be retired from service. The retirement can be for a number of reasons such as the physical end of the generating unit but will generally be driven by economic

retirement of the unit. EDE personnel provided their estimated retirement dates for each generating unit. These dates are based on the current plans and investment in the generating units. Retirement dates for generating units can be found in Appendix D. As new investment is committed to these units or decisions made that units are not economically viable, these lives may change. At this time, these retirement dates are the best estimate of the current lives remaining in the generating assets.

Interim Retirement Curve

Historical data used to develop interim retirement curves represent an aggregate of many property units in a group. Some of those assets may be long lived, and others may have a short life. The average of those is represented by an interim retirement curve for the group. A group can be a plant account or a functional group. The interim retirement curve is "truncated" (i.e., cut off) at the age the unit will retire. In other words, if one finds through the analysis that 10 percent of the property in an account will be retired and replaced prior to the end of the life of the unit, the interim retirement curve will model those retirements across the rest of the life of the unit. If a pump is only going to last 10 years but the unit is projected to last 20 years, the shorter life of the pump should affect the depreciation expense charged over the next 10 years. When analyzing a large pool of assets like power plant accounts, these shorter-lived items can be accurately modeled together statistically. Thus, given that interim retirements will occur, this statistical analysis enables one to measure the interim retirement curves applicable to property groups. Some examples of "long lived" property that are projected to last until the retirement of a unit are: roads, bridges, railroad track, structural steel (and misc. steel), cooling towers, buildings, cranes, ponds, basins, canals, foundations, stacking and reclaiming equipment, surge silos, crushers, transfer towers, fly ash and bottom ash systems, precipitators, bag houses, stack, turbine (except blades) and piping, generator cooling system, vacuum systems,

PRODUCTION PLANT

Special Circumstances:

In 2014-2017, Riverton steam generating facilities were retired. Asbury was retired in early 2020. The retirement of Asbury was treated as a known change and incorporated in the depreciation study. For Production facilities, all jurisdictions use the life span (remaining life) depreciation system. The current depreciation rates for production in Missouri, Oklahoma, and Kansas incorporated interim retirement ratios to estimate retirements that are projected to occur between the current date and the estimated retirement date of the generating facility. Arkansas' current production depreciation rates incorporate Iowa Curves to estimate retirement activity of each generating unit.

In modeling retirement activity for this study, Alliance Consulting recommends the use of Iowa Curves. In our experience, Iowa Curves are the more widely used of the two approaches and have the advantage of incorporating the age of each asset in the depreciation group. The Missouri Public Service Commission has approved the incorporation of Iowa Curves in computing depreciation rates for Ameren in case ER-2014-0258 and Kansas City Power and Light in Case ER 2014-0370 as well as life span remaining life depreciation. The Oklahoma Corporation Commission has approved the use of Iowa Curves in PUD Case 201700496 for Oklahoma Electric and Gas. The Kansas Corporation Commission approved the use of Iowa Curves for Kansas City Power and Light in Docket 18-KCPE-480-RTS.

In performing actuarial analysis on accounts 311-316, the initial data set included all retirements except life span retirements of Riverton and Asbury. After reviewing the results, the interim survivor curves showed a much shorter life than is usually seen in generation assets. We concluded that the retirements near the end of the economic life of those generating units were atypical of the existing steam generation plant at Iatan and Plum Point. It was not possible to remove all life data related to Riverton and Asbury in the history since no segregated source

data before 2005 was available. Thus, interim net salvage from 2005-2019 was used to estimate net salvage for accounts 311-316.

The Iatan Plant is located in Weston, MO and was placed in service in 1980. EDE owns a 12 percent share of Iatan 1 and Iatan 2, or approximately 85 MW and 105 MW respectively. At the end of 2019, the age of Iatan 1 was 39 years and the remaining life is estimated to be 21 years based on the forecast retirement of the unit in 2040. Iatan 2 began commercial operation in 2010 and has an estimated remaining life of 51 years based on the forecast retirement of the unit in 2070. The retirement dates used for Iatan 1 and Iatan 2 in our analysis is consistent with the lives used by the primary owner of the plants, Kansas City Power & Light Company.

The Plum Point Plant is located near Osceola, AR and was placed in service in 2010. EDE owns a 7.52 percent share of Plum Point, or approximately 50 MW. At the end of 2019, the age of the facility was 9 years and the remaining life is estimated to be 41 years based on the forecast retirement of the unit in 2060.

Hydro Production, FERC Accounts 331.00-336.00

Hydroelectric power was once the principal source of power in the United States. EDE owns the Ozark Beach hydraulic production plant, which consists of four generating units installed in 1931. The current licensing period for Ozark Beach ends in 2053. The prior study used an estimated final retirement date of 2053, which corresponds to the expiration of the renewed licensing period. At the end of 2019, the age of the facility was 88 years and the remaining life is estimated to be 34 years based on the forecast retirement of the unit in 2053.

Since the last depreciation study, capital has been spent to keep the facility operating until the end of its forecast retirement date. Additional expenditures may be necessary, which are not captured in the proposed accrual rate for this function.

Other Production

The Other Production function consists of simple cycle and combined cycle generation. The various plant sites are described below.

Energy Center

The Energy Center is located in LaRussell, MO. Units 1 and 2 are combustion turbines and were installed in 1978 and 1981, respectively, and are forecast to be in service for 45 years. Units 3 and 4 are FT8 combustion turbines. They were installed in 2003 and are forecast to be in service for 40 years. At the end of 2019, the age of Energy Center Units 1 and 2 was 41 and 38 years respectively. The remaining life of Energy Center 1 and 2 is estimated to be 7 years for both based on the forecast retirement of the unit in 2026. At the end of 2019, the age of Energy Center Units 3 and 4 (FT8) was 16 years. The remaining life of Energy Center FT8 is estimated to be 24 years for both units based on the forecast retirement of the unit in 2043.

Riverton

The Riverton Plant is located in Riverton, KS. The existing simple cycle combustion turbines at Riverton were installed in 1988. Units 10 and 11 are forecast to be in service for 45 years. Riverton 12 was placed into service as a simple cycle combustion turbine in 2007 but was subsequently converted into a combined cycle plant in 2016. At the end of 2019, the age of Riverton Units 10 and 11 was 31 years and the remaining life is estimated to be 14 years based on the forecast retirement of the unit in 2033. At the end of 2019, Riverton 12 was 12 years old, and the remaining life is estimated to be 38 years based on the forecast retirement of the unit in 2057.

State Line

The State Line plant is located west of Joplin, MO and consists of a combustion turbine installed in 1995 and a combined cycle unit installed in 2001. of which EDE owns a 300MW share. The forecast lifespan for State Line combustion turbine is 45 years and the forecast lifespan for State Line combined cycle is 50 years. At the end of 2019, the age of State Line 1 CT is 24 years and the remaining life is estimated to be 21 years based on the forecast retirement of the unit in 2040. At the end of 2019, the State Line CC was 18 years old and the remaining life is estimated to be 32 years based on the forecast retirement of the unit in 2051.

Various replacement activities are occurring at the other production units. At State Line CC, the Company is replacing rotors and combustion assets as well as the stack damper with extra insulation on the lower stack. EDE has a long-term service agreement ("LTSA") in place for its turbine assets. There are no LTSAs in Energy Center, Hydro, or Steam Production. Items not covered are peripheral components or components that fail due to abuse. Assets covered under the LTSA are retired and recapitalized. This methodology has been in place since inception of the LTP contract (2001) and is based on the philosophy at that time.