BEFORE THE CORPORATION COMMISSION OF OKLAHOMA

APPLICATION OF THE EMPIRE DISTRICT ELECTRIC COMPANY, A KANSAS CORPORATION, FOR AN ADJUSTMENT IN ITS RATES AND CHARGES FOR ELECTRIC SERVICE IN THE STATE OF OKLAHOMA	CASE NO. PUD 201600468

RESPONSIVE TESTIMONY OF

DAVID J. GARRETT

PART II – DEPRECIATION

ON BEHALF OF

OKLAHOMA INDUSTRIAL ENERGY CONSUMERS

MARCH 13, 2017

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I. INTRODUCTION

Q. State your name and occupation.

A. My name is David J. Garrett. I am a consultant specializing in public utility regulation. I am the managing member of Resolve Utility Consulting, PLLC. I focus my practice on the primary capital recovery mechanisms for public utility companies: cost of capital and depreciation.

Q. Summarize your educational background and professional experience.

A. I received a B.B.A. with a major in Finance, an M.B.A. and a Juris Doctor from the University of Oklahoma. I worked in private legal practice for several years before accepting a position as assistant general counsel at the Oklahoma Corporation Commission in 2011. At the Oklahoma Commission, I worked in the Office of General Counsel in regulatory proceedings. In 2012, I began working for the Public Utility Division as a regulatory analyst providing testimony in regulatory proceedings. After leaving the Oklahoma Commission, I formed Resolve Utility Consulting, PLLC, where I have represented various consumer groups, state agencies, and municipalities in utility regulatory proceedings, primarily in the areas of cost of capital and depreciation. I am a Certified Depreciation Professional with the Society of Depreciation Professionals. I am also a Certified Rate of Return Analyst with the Society of Utility and Regulatory Financial Analysts. A more complete description of my qualifications and regulatory experience is included in my curriculum vitae.[1]

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[1] Exhibit DG 2-1.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of Oklahoma Industrial Energy Consumers ("OIEC"). OIEC is an unincorporated association of companies with facilities in Oklahoma that require significant energy usage.[2]

Q. Describe the purpose and scope of your testimony in this proceeding.

A. In this case I am testifying on the two primary capital recovery mechanisms in the rate base rate of return model – cost of capital and depreciation – in response to the application of Empire District Electric Company ("Empire" or the "Company"). Together these issues are voluminous, so I have filed two separate responsive testimony documents. Part I of my responsive testimony includes cost of capital and related issues. Part II of my responsive testimony (this document) includes depreciation expense and related issues. In this testimony, I am responding to Empire's depreciation study sponsored by Company witness Mr. Thomas J. Sullivan.

II. EXECUTIVE SUMMARY

Q. Summarize the key points of your testimony.

A. In the context of utility ratemaking, "depreciation" refers to a cost allocation system designed to measure the rate by which a utility may recover its capital investments in a systematic and rational manner. I employed a well-established depreciation system and used actuarial analysis to statistically analyze the Company's depreciable assets in order to

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[2] http://www.oiec.org/.

develop reasonable depreciation rates in this case. The table below compares OIEC's and Empire's proposed depreciation expense by plant function for the Oklahoma jurisdiction.

Figure 1:
OIEC Summary Depreciation Adjustment

Plant Function	Plant 6/30/2016	Empire Proposed Expense	OIEC Proposed Expense	**OIEC Adjustment**
Production	$ 36,669,999	$ 1,103,107	$ 873,302	$ (229,806)
Transmission	9,213,329	214,851	183,668	(31,183)
Distribution	24,631,970	771,684	655,458	(116,226)
General	2,305,665	138,205	131,311	(6,894)
Total Depreciable Plant	72,820,964	2,227,847	1,843,738	(384,109)
Riverton Amortization				(55,748)
Total Adjustment (OK Juris.)				**$ (439,856)**

OIEC's total adjustment reduces the Company's proposed annual depreciation expense by about $14 million,[3] and reduces the Oklahoma jurisdictional proposed expense by $439,856.

Q. Summarize the primary factors driving OIEC's depreciation adjustment.

A. There are several primary factors driving OIEC's depreciation adjustment in this case. These factors, along with their estimated dollar impact on the final adjustment are as follows: (1) removing proposed terminal net salvage on production plants, removing future, unapproved plant additions from the Company's calculated depreciation rates on the production accounts, and leaving the current lifespan estimates for the production units unchanged – $229,806; (2) proposing different Iowa curve shapes and average lives for various transmission, distribution, and general accounts – $154,303; and (3) amortizing the

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[3] Exhibit DG 2-4.

unrecovered costs of Riverton Units 7, 8, and 9 over the estimated remaining life of Riverton 12 – $55,748.

Q. Describe why it is important not to overestimate depreciation rates.

A. The issue of depreciation is essentially one of timing. Under the rate base rate of return model, the utility is allowed to recover the original cost of its prudent investments required to provide service. Depreciation systems are designed to allocate those costs in a systematic and rational manner – specifically, over the service life of the utility's assets. If depreciation rates are overestimated (i.e., service lives are underestimated), it encourages economic inefficiency. Unlike competitive firms, regulated utility companies are not always incentivized by natural market forces to make the most economically efficient decisions. If a utility is allowed to recover the cost of an asset before the end of its useful life, this could incentivize the utility to unnecessarily replace the asset in order to increase rate base, which results in economic waste. Thus, from a public policy perspective, it is preferable for regulators to ensure that assets are not depreciated before the end of their true useful lives. While underestimating the useful lives of depreciable assets could financially harm current ratepayers and encourage economic waste, unintentionally overestimating depreciable lives (i.e., underestimating depreciation rates) does not harm the Company. This is because if an asset's life is overestimated, there are a variety of measures that regulators can use to ensure the utility is not financially harmed. One such measure would be the use of a regulatory asset account. In that case, the Company's original cost investment in these assets would remain in the Company's rate base until they are recovered. Moreover, since the Company's awarded and earned returns on equity are far above its true cost of equity, the Company's shareholders further benefit from the excess wealth transfer from ratepayers while these costs are in rate base. Thus, the process of depreciation strives for a perfect match between actual and estimated useful life. When these estimates are not exact, however, it is better that useful lives are overestimated rather than underestimated.

III. LEGAL STANDARDS

Q. Discuss the standard by which regulated utilities are allowed to recover depreciation expense.

A. In *Lindheimer v. Illinois Bell Telephone Co.*, the U.S. Supreme Court stated that "depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy, and obsolescence."[4] The *Lindheimer* Court also recognized that the original cost of plant assets, rather than present value or some other measure, is the proper basis for calculating depreciation expense.[5] Moreover, the *Lindheimer* Court found:

> [T]he company has the burden of making a convincing showing that the amounts it has charged to operating expenses for depreciation have not been excessive. That burden is not sustained by proof that its general accounting system has been correct. The calculations are mathematical, but the predictions underlying them are essentially matters of opinion.[6]

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[4] *Lindheimer v. Illinois Bell Tel. Co.*, 292 U.S. 151, 167 (1934).

[5] *Id.* (Referring to the straight-line method, the *Lindheimer* Court stated that "[a]ccording to the principle of this accounting practice, the loss is computed upon the actual cost of the property as entered upon the books, less the expected salvage, and the amount charged each year is one year's pro rata share of the total amount."). The original cost standard was reaffirmed by the Court in *Federal Power Commission v. Hope Natural Gas Co.*, 320 U.S. 591, 606 (1944). The *Hope* Court stated: "Moreover, this Court recognized in [*Lindheimer*], supra, the propriety of basing annual depreciation on cost. By such a procedure the utility is made whole and the integrity of its investment maintained. No more is required."

[6] *Id.* at 169.

Thus, the Commission must ultimately determine if the Company has met its burden of proof by making a convincing showing that its proposed depreciation rates are not excessive.

Q. Should depreciation represent an allocated cost of capital to operation, rather than a mechanism to determine loss of value?

A. Yes. While the *Lindheimer* case and other early literature recognized depreciation as a necessary expense, the language indicated that depreciation was primarily a mechanism to determine loss of value.[7] Adoption of this "value concept" would require annual appraisals of extensive utility plant, and is thus not practical in this context. Rather, the "cost allocation concept" recognizes that depreciation is a cost of providing service, and that in addition to receiving a "return on" invested capital through the allowed rate of return, a utility should also receive a "return of" its invested capital in the form of recovered depreciation expense. The cost allocation concept also satisfies several fundamental accounting principles, including verifiability, neutrality, and the matching principle.[8] The definition of "depreciation accounting" published by the American Institute of Certified Public Accountants ("AICPA") properly reflects the cost allocation concept:

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[7] *See* Frank K. Wolf & W. Chester Fitch, *Depreciation Systems* 71 (Iowa State University Press 1994).

[8] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices* 12 (NARUC 1996).

> Depreciation accounting is a system of accounting that aims to distribute cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation.[9]

Thus, the concept of depreciation as "the allocation of cost has proven to be the most useful and most widely used concept."[10]

IV. ANALYTIC METHODS

Q. Discuss the definition and purpose of a depreciation system, as well as the depreciation system you employed for this project.

A. The legal standards set forth above do not mandate a specific procedure for conducting depreciation analyses. These standards, however, direct that analysts use a system for estimating depreciation rates that will result in the "systematic and rational" allocation of capital recovery for the utility. Over the years, analysts have developed "depreciation systems" designed to analyze grouped property in accordance with this standard. A depreciation system may be defined by several primary parameters: 1) a method of allocation; 2) a procedure for applying the method of allocation; 3) a technique of applying the depreciation rate; and 4) a model for analyzing the characteristics of vintage property groups.[11] In this case, I used the straight line method, the average life procedure, the whole life technique, and the broad group model for the company's mass property accounts. This system would be denoted as an "SL-AL-WL-BG" system. In many cases, I use the

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[9] American Institute of Accountants, *Accounting Terminology Bulletins Number 1: Review and Résumé* 25 (American Institute of Accountants 1953).

[10] Wolf *supra* n. 7, at 73.

[11] *See* Wolf *supra* n. 7, at 70, 140.

remaining life technique, however, in this case I used the whole life technique to analyze the Company's mass property accounts because it is the technique proposed by the Company, and is also a reasonable technique to use. This depreciation system conforms to the legal standards set forth above, and is commonly used by depreciation analysts in regulatory proceedings. I provide a more detailed discussion of depreciation system parameters, theories, and equations in Appendix A.

Q. Generally describe the actuarial process you used to analyze the Company's depreciable property.

A. The study of retirement patterns of industrial property is derived from the actuarial process used to study human mortality. Just as actuaries study historical human mortality data in order to predict how long a group of people will live, depreciation analysts study historical plant data in order to estimate the average lives of property groups. The most common actuarial method used by depreciation analysts is called the "retirement rate method." In the retirement rate method, original property data, including additions, retirements, transfers, and other transactions, are organized by vintage and transaction year.[12] The retirement rate method is ultimately used to develop an "observed life table," ("OLT") which shows the percentage of property surviving at each age interval. This pattern of property retirement is described as a "survivor curve." The survivor curve derived from the observed life table, however, must be fitted and smoothed with a complete curve in

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[12] The "vintage" year refers to the year that a group of property was placed in service (aka "placement" year). The "transaction" year refers to the accounting year in which a property transaction occurred, such as an addition, retirement, or transfer (aka "experience" year).

order to determine the ultimate average life of the group.[13] The most widely used survivor curves for this curve-fitting process were developed at Iowa State University in the early 1900s and are commonly known as the "Iowa curves."[14] A more detailed explanation of how the Iowa curves are used in the actuarial analysis of depreciable property is set forth in Appendix C.

Q. Describe the Company's depreciable assets in this case.

A. The Company's depreciable assets can be divided into two main groups: life span property (i.e., production plant) and mass property (i.e., transmission and distribution plant). The analytical process is slightly different for each type of property, as discussed further below.

V. LIFE SPAN PROPERTY ANALYSIS

Q. Describe the approach to analyzing life span property.

A. For life span property, there are essentially three steps to the analytical process. First, I reviewed the Company's proposed life spans for each of its production units and compared them to life span estimates of other similar production units in other jurisdictions. I also analyzed the net salvage rate proposed for each account.

Q. Describe life span property.

A. "Life span" property accounts usually consist of property within a production plant. The assets within a production plant will be retired concurrently at the time the plant is retired,

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[13] See Appendix C for a more detailed discussion of the actuarial analysis used to determine the average lives of grouped industrial property.

[14] *See* Appendix B for a more detailed discussion of the Iowa curves.

regardless of their individual ages or remaining economic lives. For example, a production plant will contain property from several accounts, such as structures, fuel holders, and generators. When the plant is ultimately retired, all of the property associated with the plant will be retired together, regardless of the age of each individual unit. Analysts often use the analogy of a car to explain the treatment of life span property. Throughout the life of a car, the owner will retire and replace various components, such as tires, belts, and brakes. When the car reaches the end of its useful life and is finally retired, all of the car's individual components are retired together. Some of the components may still have some useful life remaining, but they are nonetheless retired along with the car. Thus, the various accounts of life span property are scheduled to retire concurrently as of the production unit's probable retirement date.

Q. Please summarize your adjustments to the Company's proposed depreciation rates for its production lifespan accounts.

A. My adjustments to the Company's proposed depreciation rates for its production accounts can be categorized into three issues: (1) terminal net salvage; (2) future plant additions; and (3) lifespan adjustments. I will discuss each issue in turn.

A. Terminal Net Salvage

Q. Describe terminal net salvage.

A. When a production plant reaches the end of its useful life, a utility may decide to decommission the plant. In that case, the utility may sell some of the remaining assets. The proceeds from this transaction are called "gross salvage." The corresponding expense associated with decommissioning the plant is called "cost of removal." The term "net salvage" equates to gross salvage less the cost of removal. When net salvage refers to production plants, it is often called "terminal net salvage," because the transaction will occur at the end of the plant's life.

Q. Describe how utilities estimate and justify the proposal of terminal net salvage recovery.

A. Typically, when a utility is requesting the recovery of a substantial amount of terminal net salvage costs, it supports those costs with site-specific decommissioning studies. Terminal net salvage costs are unlike other costs requested in a rate case. Specifically, while other proposed costs might be based on a recent test year involving actual expenses incurred by the utility, decommissioning costs are often estimated to occur many years or decades in the future. Moreover, the utility may never even incur the decommissioning costs they are proposing to recover. For example, a utility may seek to recover $10 million in a current rate case for the complete demolition of a production plant to occur 10 years in the future. Thus, the utility would be requesting an additional $1 million per year in rates in addition to the other depreciation costs associated with the plant. If instead, the utility decides to repower the plant at a much lesser cost than a complete demolition, the utility would have recovered millions of dollars from rate payers for costs that never occurred. Thus, decommissioning costs are not as "known and measurable" as other costs proposed in a rate case. Furthermore, decommissioning studies are often overestimated, as they usually do not contemplate less expensive alternatives to complete demolition and often include substantial contingency factors that arbitrarily increase the cost estimate. Nonetheless, decommissioning studies provide a good starting point and some measurable basis upon which to estimate the utility's terminal net salvage. More importantly, decommissioning studies, at the very least, might be helpful to the utility in meeting its burden of proof with regard to terminal net salvage recovery.

Q. Did Empire provide decommissioning studies in this case to support its proposed terminal net salvage costs?

A. No. While Empire provided a decommissioning study performed on its recently-retired Riverton Units 7-9,[15] the Company did not provide any decommissioning studies to support the proposed terminal net salvage rates of its production units in service.[16]

Q. Did Empire provide any other adequate support for its proposed terminal net salvage rates?

A. No. When asked in discovery to provide all justification and support for the proposed net salvage rates, Mr. Sullivan stated that the proposed net salvage amounts "represent minimal allowances that we deem reasonable absent specific demolition studies."[17]

Q. Has the Company met its burden of proof regarding the recovery of terminal net salvage in this case.?

A. No. Empire has not provided adequate support for the proposed recovery of $2.7 million of production net salvage.[18] While decommissioning studies conducted by engineering firms typically include detailed estimates of material and labor by specific task, the Company has merely stated that its proposed salvage rates are what they "deem

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[15] *See* Empire's response to Data Request OIEC 4.3.

[16] *Id*.

[17] *See* Empire's response to Data Request OIEC 9.1.

[18] *See* Mr. Sullivan's workpapers in response to Data Request OIEC 1.15, Table 5-1.

reasonable." Therefore, I recommend that the Commission disallow the terminal net salvage costs proposed by the Company in this case.

Q. If the Commission adopts your recommendation, does it mean that the Company will never be able to recover its decommissioning costs?

A. No. As I stated above, if the Company wants to recover decommissioning costs, the Company should prepare a complete decommissioning study to support the recovery of any proposed terminal net salvage and submit such study to the Commission for review and consideration in a Company-filed rate proceeding. At that time, the Commission can evaluate the Company's decommissioning study and determine whether to allow recovery of those costs.

B. Future Plant Additions

Q. Did Mr. Sullivan incorporate unapproved future plant additions in the calculation of his proposed depreciation rates for the production accounts?

A. Yes. Mr. Sullivan's workpapers reveal that in calculating his proposed rates for the production unit accounts, he included the specific amounts of assumed plant additions by as much as 55 years into the future (year 2070). For some plants, these assumptions include more than $4 million dollars of unapproved plant additions.[19]

Q. Is Mr. Sullivan's approach to calculating production depreciation rates a commonly-accepted practice in the industry?

A. No. I reviewed numerous depreciation studies filed by various experts across the country, as well as the responsive testimonies of numerous intervening witnesses in other utility rate

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[19] *See* Mr. Sullivan's workpapers for unit production accounts, Iatan 2.

proceedings, and I have never seen depreciation rates for production units calculated in this manner.

Q. Is the cost recovery of plant that has not been deemed prudent or "used and useful" appropriate?

A. No. Under the widely-accepted "used and useful" standard, or any related "prudent investment standard" the utility should be allowed to recover only those costs for plant in service that is considered used and useful for service to the public. Of course, unapproved plant additions up to 55 years in the future do not meet this standard. Yet, Mr. Sullivan's proposed depreciation rates for the Company's production accounts mathematically incorporate these unapproved future plant additions. Therefore, if the Commission were to adopt Mr. Sullivan's proposed rates, it would be effectively allowing the cost recovery of unapproved plant additions that may never occur.

Q. Has the Oklahoma Commission ever specifically adopted depreciation rates that incorporate specific amounts of future, unapproved plant additions?

A. Not to my knowledge. This means that if the Commission were to adopt Mr. Sullivan's proposed rates, it would not only be departing from its own precedent, but it would also be setting a precedent that is likely inconsistent with the vast majority of jurisdictions around the country.

C. Lifespan Adjustments

Q. Is Mr. Sullivan recommending decreased lifespans for some of the Company's production units.

A. Yes. Mr. Sullivan is proposing to decrease the lifespans of Energy Center 1 and 2, Riverton 10 and 11, and State Line 1 by 5 years (from 50 years to 45 years).[20] Mr. Sullivan is also proposing to decrease the lifespans for Energy Center 3 and 4 by 10 years (from 50 to 40 years).

Q. Has Mr. Sullivan provided adequate support for these proposed lifespan decreases?

A. No. When asked in discovery to "provide all justification and support" for these proposed lifespan decreases, Mr. Sullivan responded that the plant lives were adjusted to "bring them in line with the ranges typically expected for the type of plant in question" and that the various proposed lifespan recommendations were based on lifespan ranges that "we typically assume."[21] Mr. Sullivan, however, provided no other analysis, documentation, or support for the proposed lifespan decreases.

Q. Do you agree with the Company's position regarding the proposed lifespan changes?

A. No. The Company has not provided adequate support to deviate from the currently approved lifespans of the production units discussed above. Rather, Mr. Sullivan has simply stated a range of lifespans that he typically assumes for various types of production units. No other analyses or engineering studies were provided.

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[20] Direct Testimony of Thomas J. Sullivan at p.

[21] *See* Empire's response to Data Request OIEC 6.3.

Q. Please summarize the foregoing adjustments to the Company's proposed depreciation rates for its production units.

A. I have made three adjustments to the Company's proposed depreciation rates for its production units, which affect all of the production accounts, as follows: (1) I removed terminal net salvage due to lack of support through site-specific decommissioning studies; (2) I recalculated the Company's proposed production rates without including future unapproved plant additions; and (3) I allocated the depreciable costs over the currently-approved lifespans of the Company's production units.

Q. Has the Company met its burden of proof by making a convincing showing that its proposed depreciation rates for its production units are not excessive?

A. No. By failing to provide site-specific decommissioning studies in support of its proposed terminal net salvage rates, incorporating unapproved plant additions by as much as 55 years into the future, and providing inadequate support for its proposed lifespan changes, the Company has failed to meet its burden of proof as mandated by the *Lindheimer* Court discussed above. Therefore, the Commission should reject the Company's proposed depreciation rates.

VI. MASS PROPERTY ANALYSIS

Q. Describe mass property.

A. Unlike life span property accounts, "mass" property accounts usually contain a large number of small units that will not be retired concurrently. For example, poles, conductors, transformers, and other transmission and distribution plant are usually classified as mass property. Estimating the service life of any single unit contained in a mass account would not require any actuarial analysis or curve-fitting techniques. Since we must develop a single rate for an entire group of assets, however, actuarial analysis is required to calculate the average remaining life of the group.

Q. How did you determine the depreciation rates for the mass property accounts?

A. To develop depreciation rates for the Company's mass property accounts, I obtained the Company's historical plant data to develop observed life tables for each account. I used Iowa curves to smooth and complete the observed data to calculate the average remaining life of each account. Finally, I analyzed the Company's proposed net salvage rates for each mass account by reviewing the historical salvage data. After estimating the remaining life and salvage rates for each account, I calculated the corresponding depreciation rates. Further details about the actuarial analysis and curve-fitting techniques involved in this process are presented in the attached appendices.

A. <u>Service Life Estimates</u>

Q. Generally describe your approach in estimating the service lives of mass property.

A. I used all of the Company's property data and created an observed life table ("OLT") for each account. The data points on the OLT can be plotted to form a curve (the "OLT curve"). The OLT curve is not a theoretical curve, rather, it is actual observed data from the Company's records that indicate the rate of retirement for each property group. An OLT curve by itself, however, is rarely a smooth curve, and is often not a "complete" curve (i.e., it does not end at zero percent surviving). In order to calculate average life (the area under a curve), a complete survivor curve is needed. The Iowa curves are empirically-derived curves based on the extensive studies of the actual mortality patterns of many different types of industrial property. The curve-fitting process involves selecting the best

Iowa curve to fit the OLT curve. This can be accomplished through a combination of visual and mathematical curve-fitting techniques, as well as professional judgment. The first step of my approach to curve-fitting involves visually inspecting the OLT curve for any irregularities. For example, if the "tail" end of the curve is erratic and shows a sharp decline over a short period of time, it may indicate that this portion of the data is less reliable, as further discussed below. After inspecting the OLT curve, I use a mathematical curve-fitting technique which essentially involves measuring the distance between the OLT curve and the selected Iowa curve in order to get an objective, mathematical assessment of how well the curve fits. After selecting an Iowa curve, I observe the OLT curve along with the Iowa curve on the same graph to determine how well the curve fits. I may repeat this process several times for any given account to ensure that the most reasonable Iowa curve is selected.

Q. Do you always select the mathematically best-fitting curve?

A. Not necessarily. Mathematical fitting is an important part of the curve-fitting process because it promotes objective, unbiased results. While mathematical curve fitting is important, however, it may not always yield the optimum result; therefore, it should not necessarily be adopted without further analysis. In fact, for some of the accounts in this case I selected Iowa curves that were not the mathematical best fit, and in almost every such instance, this decision resulted in a shorter curves (higher depreciation rates) being chosen, as further illustrated below.

Q. Should every portion of the OLT curve be given equal weight?

A. Not necessarily. Many analysts have observed that the points comprising the "tail end" of the OLT curve may often have less analytical value than other portions of the curve. "Points at the end of the curve are often based on fewer exposures and may be given less weight than points based on larger samples. The weight placed on those points will depend on the size of the exposures."[22] In accordance with this standard, an analyst may decide to truncate the tail end of the OLT curve at a certain percent of initial exposures, such as one percent. Using this approach puts a greater emphasis on the most valuable portions of the curve. For my analysis in this case, I not only considered the entirety of the OLT curve, but also conducted further analyses that involved fitting Iowa curves to the most significant part of the OLT curve for certain accounts. In other words, to verify the accuracy of my curve selection, I narrowed the focus of my additional calculation to consider the top 99% of the "exposures" (i.e., dollars exposed to retirement) and to eliminate the tail end of the curve representing the bottom 1% of exposures.

B. Detailed Analysis of Select Accounts

Q. Discuss your analysis of material accounts.

A. My analysis in this case included a review of all the Company's depreciable accounts. I approached my analysis of all mass property accounts the same way using the methods described in this testimony. For several accounts, however, I conducted additional analysis. The selected accounts discussed in this section are those involving either a

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[22] Wolf *supra* n. 7, at 46.

significant amount of depreciation expense, or those that provide particularly good illustrations of the differences in my curve selection process and the Company's process. For some of these accounts, I conducted additional analyses that included both visual and mathematical curve fitting techniques not only for the entirety of the OLT curve, but also for the most significant portion of the curve which includes the top 99% of the dollars exposed to retirement, when applicable. By conducting additional analysis on the most significant portions of the OLT, I ensured that the Iowa curves I selected provide a good fit to the Company's data.

Q. Discuss the general differences between your service life estimates and the Company's service life estimates for these accounts

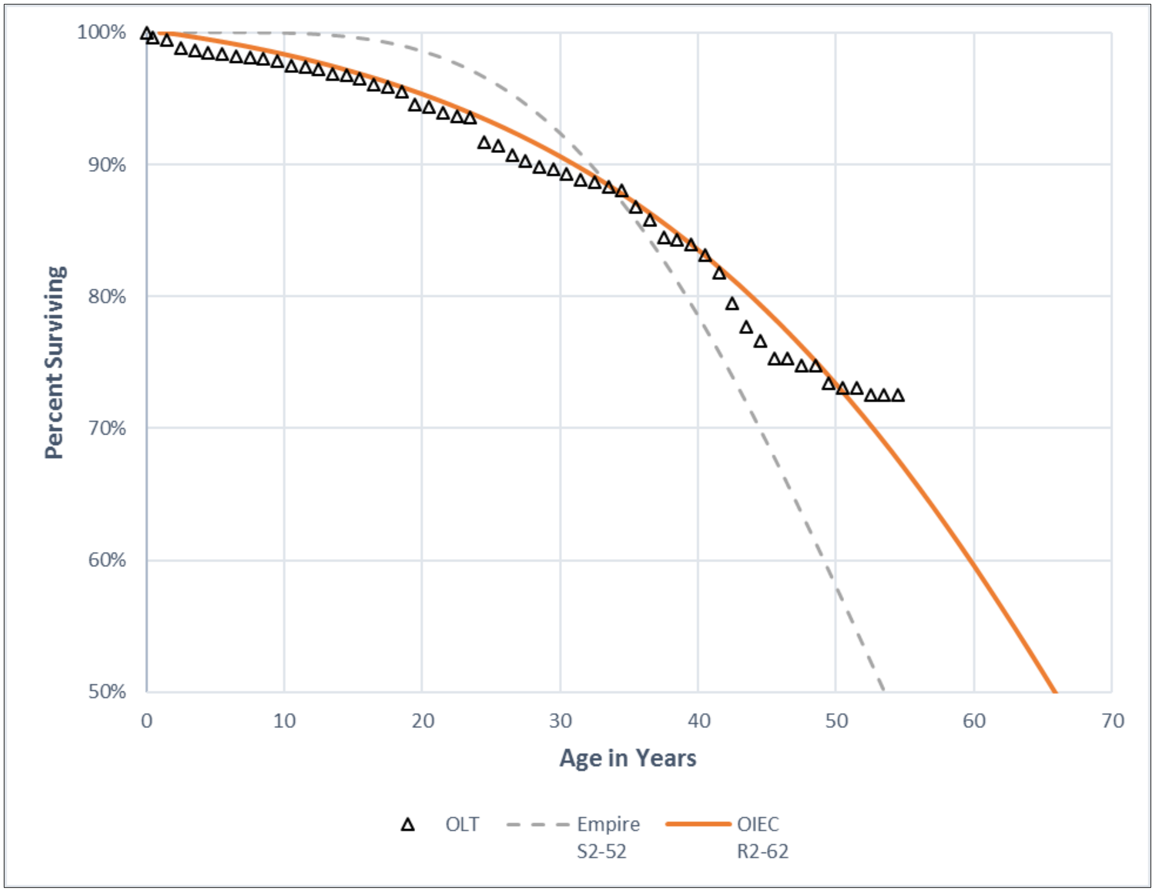
A. While the Company and I used similar curve-fitting approaches in this case, the curves I selected for these accounts provide a better mathematical fit to the observed data, and thus provide a more reasonable and accurate representation of the mortality characteristics for each account. In each of the following accounts, the Company has selected a curve that underestimates the average remaining life of the assets in the account, which results in unreasonably high depreciation rates. The analysis of each selected account is discussed below.

1. <u>Account 353 – Transmission Station Equipment</u>

Q. Describe your service life estimate for this account, and compare it with the Company's estimate.

A. The observed survivor curve for Account 315 is ideal for Iowa-curve fitting techniques because OLT for this account follows a relatively smooth pattern. The observed survivor curve is derived from the OLT calculated from the Company's aged plant data. Thus, as set forth above, the OLT curve is not an estimate or a theoretical curve, rather, it represents actual data. The Company chose the Iowa R2-62 curve to represent the mortality characteristics of this account. The graph below shows the OLT curve (black triangles) along with Company's selected curve. The graph also shows the Iowa S2-52 curve that I selected for this account.

Figure 2:
Account 353 – Transmission Station Equipment



Q. Does the Iowa S2-52 curve you selected provide a better mathematical fit to the observed data than the Company's curve?

A. Yes. While it is visually clear that my curve provides a better fit, this conclusion can also be verified mathematically. Mathematical curve fitting essentially involves measuring the distance between the OLT curve and the selected Iowa curve. The best mathematically-fitted curve is the one that minimizes the distance between the OLT curve and the Iowa curve, thus providing the closest fit. The "distance" between the curves is calculated using the "sum-of-squared differences" ("SSD") technique. Specifically, the SSD for the Company's curve is 0.4738, while the SSD for the better-fitting S2-52 curve is only 0.0141. Thus, the curve I selected for this account provides a better fit to the OLT and results in a more reasonable depreciation rate.[23]

2. <u>Account 362 – Distribution Station Equipment</u>

Q. Describe your service life estimate for this account, and compare it with the Company's estimate.

A. The OLT curve for Account 362 is also ideal for Iowa curve-fitting techniques in that it follows the pattern of a typical survivor curve for utility industrial property. The curve I selected for this account is the R1.5-53, and the curve the Company selected is the R1-69 curve. The graph below shows these two curves juxtaposed with the OLT curve. As shown in the graph, the Company's curve shape is close to the curve shape I selected, but because the average life of 53 years selected by the Company is too short, we can see that the R1.5-53 curve does not provide a good fit to the Company's observed historical data. Specifically, at about the 15-year age interval, Mr. Sullivan is suggesting that the rate of retirement begins a steady decline, such that by about the age interval of 45 years, there is only about 65% surviving in the account. Clearly, however, the Company's actual

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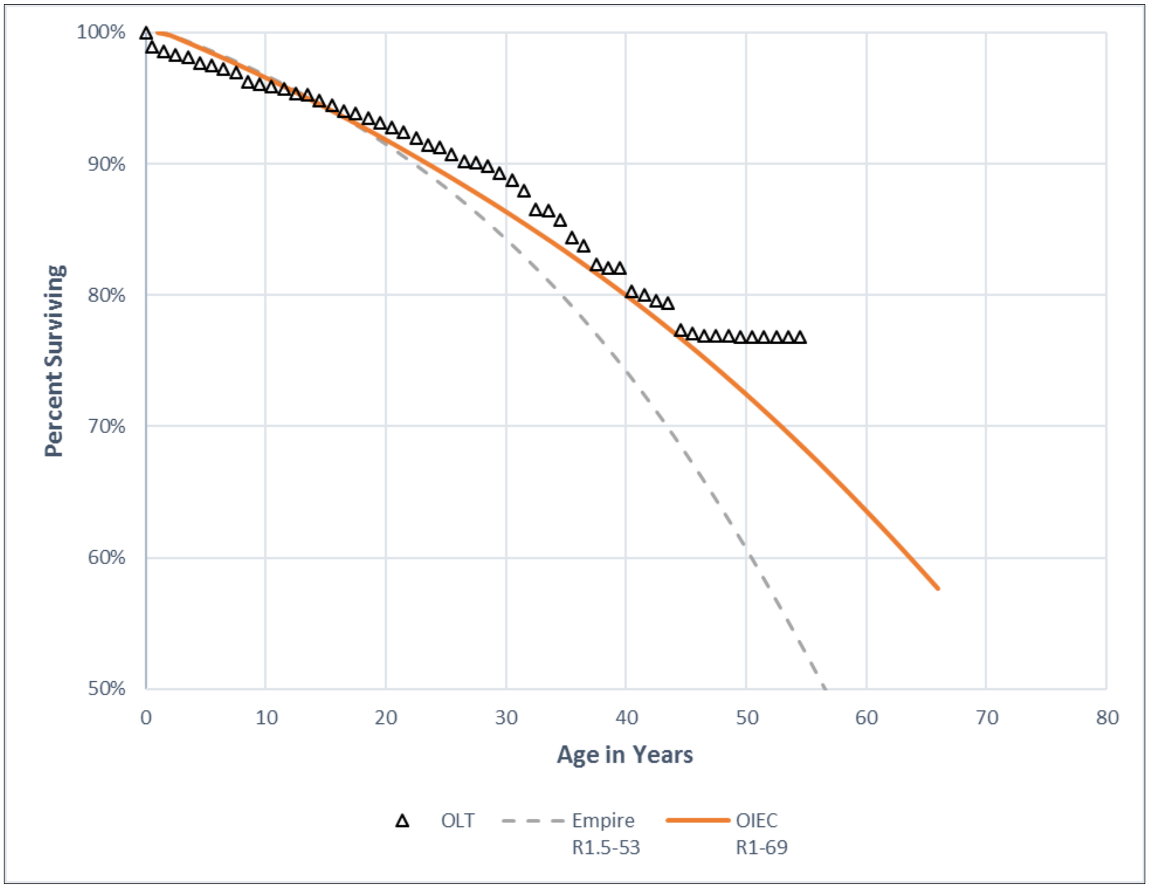
[23] Exhibit DG 2-6.

retirement data, as described in the OLT curve, shows a different result. At the age interval of 45 years, 77% of the assets are surviving in this account.

Figure 3:
Account 362 – Distribution Station Equipment



Thus, the R1.5-53 curve selected by the Company does not provide a good fit to the OLT curve, especially in comparison to the R1-69 curve I selected.

Q. **Does your selected curve provide a better mathematical fit to the observed data?**

A. Yes. While it is visually clear that the curve I selected provides a better fit to the OLT curve than the Company's selected curve, this conclusion can be verified mathematically. Specifically, the SSD for the Company's curve is 0.4911, while the SSD for the better-fitting R1-69 curve is only 0.0577. Thus, the curve I selected for this account provides a better fit to the OLT and results in a more reasonable depreciation rate.[24]

3. Account 364 – Poles, Towers and Fixtures

Q. Describe your service life estimate for this account, and compare it with the Company's estimate.

A. For this account, I selected the R4-59 curve and the Company selected the R3-50 curve. The graph below shows these two curves along with the OLT curve. As shown in the graph, the Company's curve shape and average life do not equate to a good fit to the observed data. Specifically, the R3 curve shape selected by the Company does not have a high enough mode. Notice how the Company's curve begins to steadily decline at the age interval of about 20 years. The OLT curve however, shows that the actual percentage surviving in this account does not noticeably decline until about the age interval of about 35 years. The higher-modal Iowa curve of R4 along with the longer average life of 59 years provides a much better match to the observed historical retirement rate for this account, and thus provides a better prediction of future retirements.

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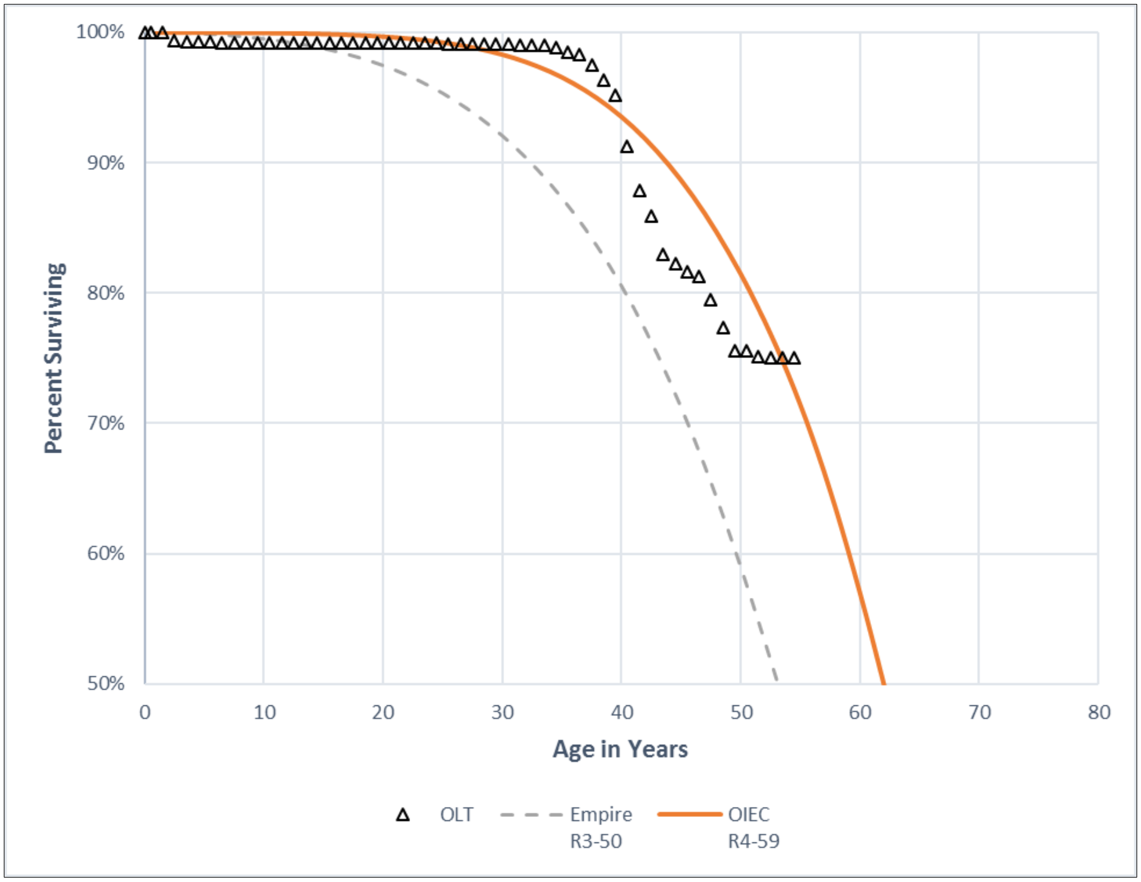
[24] Exhibit DG 2-10.

Figure 4:
Account 364 – Poles, Towers and Fixtures



Q. Does your selected curve provide a better mathematical fit to the observed data than the Company's curve?

A. Yes. Once again, the Company's curve is too short, which understates the average service life for this group of assets and overstates depreciation expense. Specifically, the SSD for the Company's curve is 0.8361, while the SSD for the better-fitting R4-59 curve is only 0.0297.[25] Thus, the curve I selected for this account provides a better fit to the OLT and results in a more reasonable depreciation rate.

---

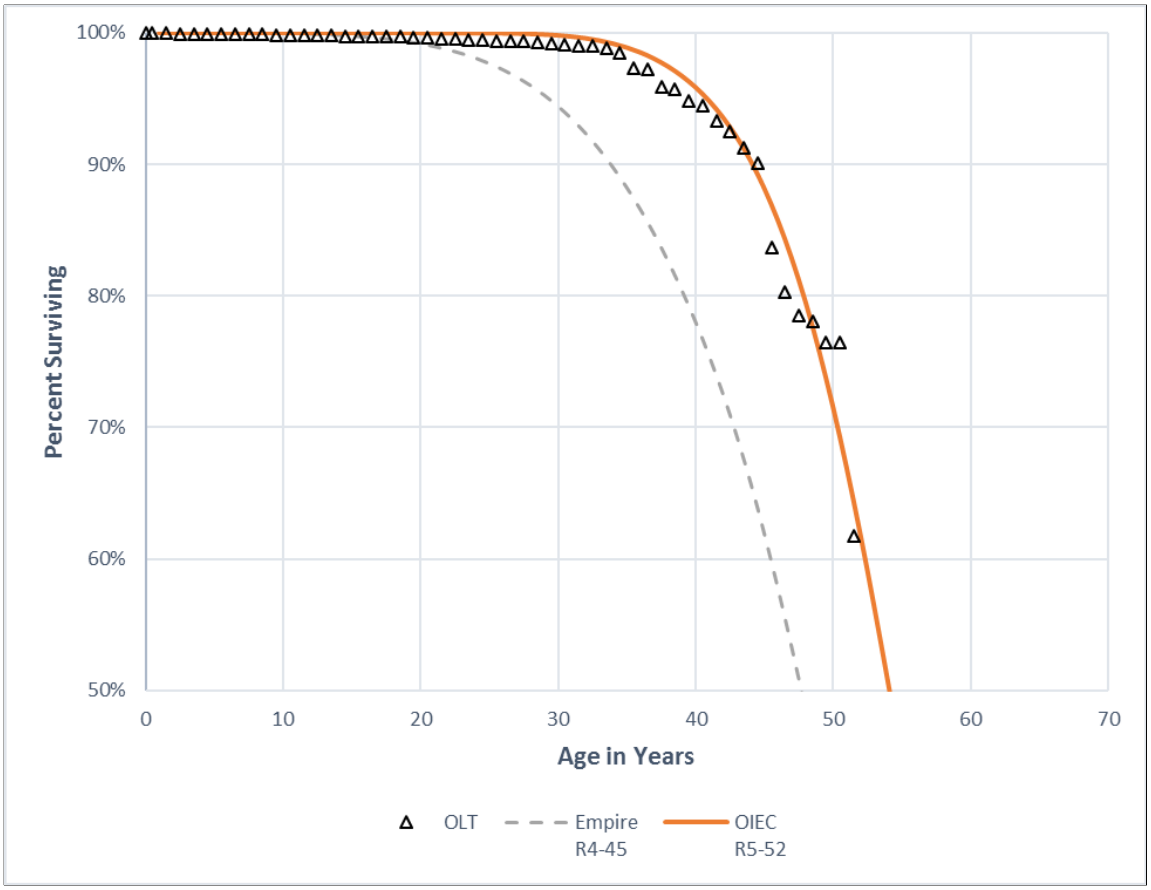
[25] Exhibit DG 2-11.

4. Account 369 – Services

Q. Describe your service life estimate for this account, and compare it with the Company's estimate.

A. The Company selected the R4-45 curve for this account, while I selected the R5-52 curve. The graph below shows these two curves along with the OLT curve.

Figure 5:
Account 369 – Services



The Company's selected curve for this account does not provide a good fit to the observed data. Specifically, the Company's curve is too short, which understates average life and overstates depreciation expense. As with the previous account, the OLT curve for this account is also reflective of a higher-modal curve shape. Higher modal curves do not experience a steady decline in percent surviving in earlier age intervals, but instead, experience a sharper decline in percent surviving as the curve approaches average life. As shown in the graph below, the Company's R4-45 curve does not provide a good fit to the actual, observed data for this account, especially when compared to the curve I selected.

Q. Does your selected curve provide a better mathematical fit to the observed data than the Company's curve?

A. Yes. While it is visually clear that the curve I selected provides a better fit to the OLT curve than the Company's selected curve, this conclusion can be verified mathematically. Specifically, the SSD for the Company's curve is 1.7392, while the SSD for the R5-52 is only 0.0439. Thus, the curve I selected for this account provides a better fit to the OLT and results in a more reasonable depreciation rate.[26]

5. Account 390 – Structures and Improvements

Q. Describe your service life estimate for this account, and compare it with the Company's estimate.

A. The Company selected the L3-28 curve for this account, while I selected the L0-55 curve. The graph below shows these two curves along with the OLT curve.

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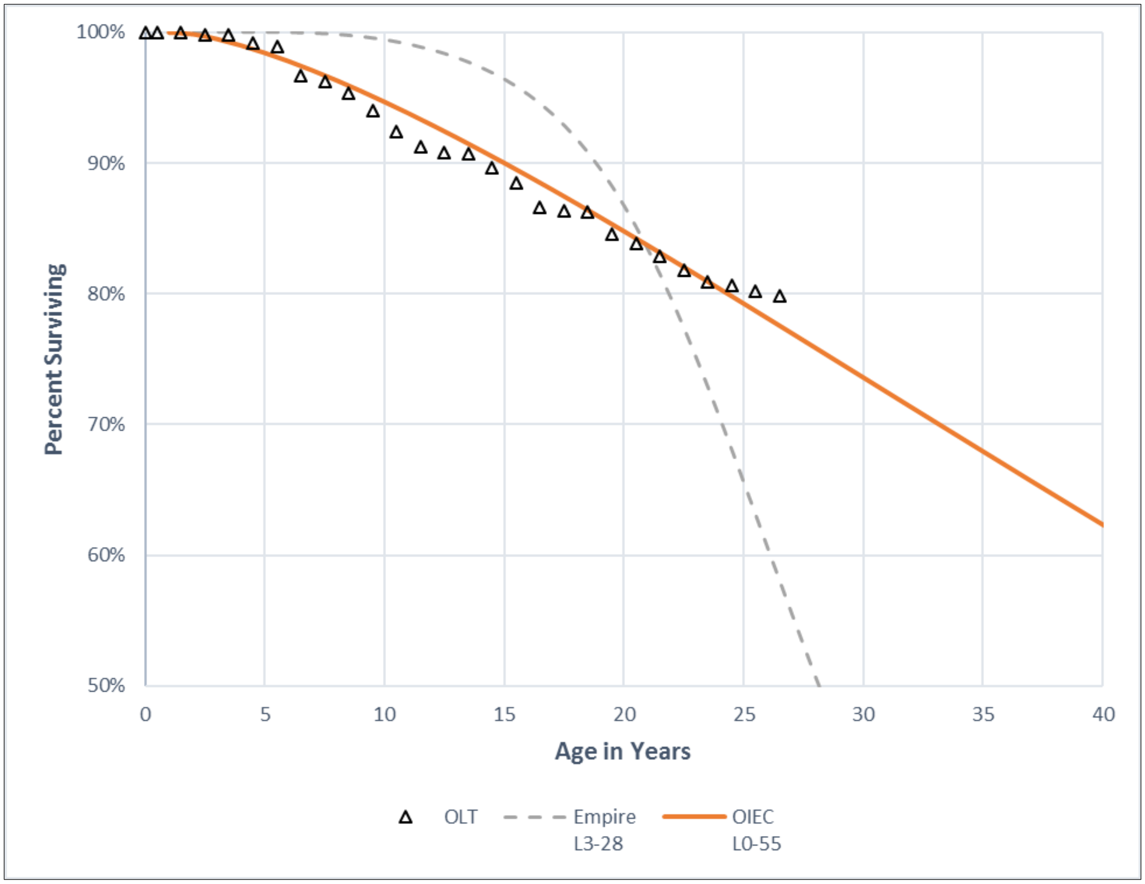
[26] Exhibit DG 2-16.

Figure 6:
Account 390 – Structures and Improvements



The Company's selected curve for this account does not provide a good fit to the observed data. In addition, based on my experience, a 28-year average life is much shorter than what other utilities propose for this account. Specifically, the Company's curve is too short, which understates average life and overstates depreciation expense. The L3 curve shape proposed by the Company is not at all reflective of the actual observed retirement pattern for this account, which is almost linear.

Q. Does your selected curve provide a better mathematical fit to the observed data than the Company's curve?

A. Yes. While it is visually clear that the curve I selected provides a much better fit to the OLT curve than the Company's selected curve, this conclusion can be verified mathematically. Specifically, the SSD for the Company's curve is 3.0697, while the SSD for the L0-55 curve is only 1.2075. Thus, the curve I selected for this account provides a better fit to the OLT and results in a more reasonable depreciation rate.[27]

VII. RIVERTON AMORTIZATION

Q. Describe Riverton Units 7, 8, and 9.

A. The Company retired these Riverton units in 2015, leaving an undepreciated balance of $7.5 million.

Q. Describe the Company's adjustment for the undepreciated portion of Empire's investment in these Riverton units.

A. The Company proposes to amortize the undepreciated portion of the retired Riverton units over a five-year period. In his testimony, Mr. Sullivan states in support of the five-year amortization proposal that "[i]t is always preferable to recover costs from the ratepayers who are receiving the benefits of the facilities." This would result in an annual, total-company amortization expense of $2.3 million.[28]

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[27] Exhibit DG 2-17.

[28] *See* Direct Testimony of Thomas J. Sullivan, p. 5, lines 8-23.

Q. Do you agree with the Company's position?

A. No. In light of the substantial potential rate increase facing Empire's Oklahoma ratepayers, I think it would be more appropriate to amortize the unrecovered investment in these Riverton units over a longer period. The five-year amortization period proposed by the Company is arbitrary. Further, I do not agree with the narrative proposed by Mr. Sullivan (and utility depreciation witnesses in general), suggesting that "intergenerational inequity" or "intergenerational subsidy" results when the entire stranded cost of retired plant is not imposed on current ratepayers, especially when that plant is closed in connection with environmental regulations and a new plant is installed to replace it.

Q. What do you propose in regards to the undepreciated portion of the Company's investment in the retired Riverton units?

A. I propose the undepreciated portion of Empire's investment in Riverton Units 7, 8 and 9 be amortized over the proposed life of Riverton 12. According to Company witness Brad P. Beecher, a component of Empire's environmental compliance plan included "investment in the conversion of its Riverton 12 generating unit to a combined cycle."[29] In addition, "Empire's compliance plan also originally called for the eventual retirement of Riverton Units 7, 8, and 9. . . ."[30] Therefore, the retirement of Riverton 7, 8 and 9 and the conversion of Riverton 12 were part of the same environmental compliance plan. This environmental compliance plan was implemented to improve the air quality and environment of Empire's current customers and for Empire's future customers as well. Furthermore, future

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[29] Direct Testimony of Brad P. Beecher at p. 5, lines 17-22.

[30] *Id.*

customers will receive the primary benefit of the plan's "final component," which is the upgraded Riverton 12 plant.[31] In other words, it is future customers, not current customers, who are the primary beneficiaries of the environmental compliance plan, and should therefore share in the costs imposed by such plan. The estimated service life of Riverton 12 is 50 years. It was installed in 2007, and the combined cycle conversion occurred in 2016. It has a remaining life of 42 years as of the study date. Therefore, I propose to amortize the undepreciated portion of the retired Riverton Units 7, 8, and 9 over 42 years. This results in an adjustment of $55,748 for the Oklahoma jurisdiction.[32]

Q. Discuss your opinion regarding the concept of "intergenerational inequity," and how it relates to the Company's cost of capital.

A. The term "intergenerational inequity" describes the idea that customers who receive the benefit of prudent plant investments should pay for those investments through depreciation expense – an idea that doesn't appear unreasonable on its face. This issue, however, is not that simple. In reality, intergenerational inequity describes a clever narrative almost exclusively pushed by utility witnesses in order to persuade regulators into awarding utilities with higher depreciation rates. When utilities recover the cost of their investments before the end of their true useful lives through accelerated depreciation rates, they are incentivized to retire these assets, as they are no longer included in rate base. If utilities were truly concerned about the "inequity" of its customers, then they would not routinely propose awarded returns on equity that far exceed their actual costs of equity for the sole

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[31] *Id.*

[32] Exhibit DG 2-18.

benefit of shareholders, as Empire has done in this case. In reality, the primary concern of any publicly-traded company, including utilities, is to maximize the wealth of its equity investors. Therefore, we can be sure that arguments centered around "intergenerational inequity" do not arise from a deeply held concern to avoid inequity to future customers, but instead arise from a deeply held financial incentive to maximize rate base.

There are several areas of overlap between the issues of depreciation and cost of capital in rate proceedings, and the "intergenerational inequity" narrative is at the center of one such area: Growth. It is well known in the field of finance that utility stocks are low-growth, "income" stocks. Unlike competitive, unregulated firms, regulated utility operating companies cannot create avenues for sustainable, qualitative growth opportunities. For example, in order to grow its earnings, a competitive firm might launch a new product line to capture another competitor's market share, franchise its brand and business model to accelerate early growth, target a new market share through advertising, or merge with another firm. A utility operating company cannot initiate any of these strategies to create real, qualitative growth opportunities.[33] Instead, the real growth of regulated utilities is primarily constrained by customer growth and load growth, which are generally about 1%. In this case Empire's total sales actually <u>decreased</u> from the last rate filing.[34] Even if there were no load growth, we can assume that utility earnings will grow over the long-term at a rate at least equal to projected long-term inflation, which is about

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[33] Note that while utility holding companies may merge or acquire other utilities, the cost of capital models are conducted on the regulated utility operating companies. Therefore, we should not consider mergers as qualitative or quantitative growth opportunities for regulated utility operating companies.

[34] *See* Empire's response to AG DR 1.4 (Attachment). Note, even if a utility is experiencing a short-term decrease in a qualitative growth determinant such as load, sales, or total customers, we would not want to assume negative growth rates when estimating the cost of capital and setting the fair awarded rate of return.

2%. If we add a reasonable projected load growth rate of 1% to that figure, it is fair to say that the long-term growth rate for utility operating companies in general is about 3%.[35]

While utilities typically provide accurate load growth projections in their integrated resource plans (about 1% - 2%), utility cost of capital witnesses routinely propose long-term growth rates that exceed projected long-term nominal GDP growth – an unrealistic assumption. Growth rate projections used by utility witnesses are based on short-term projected growth rates published by various institutional analysts. These analysts apparently base their growth rate projections solely on "quantitative" aspects of growth that would affect the reported growth in earnings over the short-term. Setting aside the fact that analysts' short-term growth rate projections should not be used in the DCF Model as an input for the *long-term* growth rate, there are other aspects regarding analysts' growth rates that we should consider in the context of utility ratemaking.

Although it would not be inappropriate for institutional analysts to focus their growth rate projections primarily on quantitative determinants of growth, such an approach is problematic when the growth rate is used to estimate the cost of equity of a regulated utility. This is because quantitative projections of utilities' earnings growth are primarily influenced by two factors that are not indicative of real growth for a regulated utility: (1) the awarded rate of return and (2) increases to rate base.

First, allowing the quantitative projected growth rate to be influenced by the awarded rate of return creates a "circular reference" problem, as discussed in Part I of my

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[35] Note that I use a projected long-term growth rate of 4.1% in the DCF model in Part I of my testimony, as a maximum possible growth rate equal to projected long-term nominal GDP growth.

testimony.[36] The second reason it is inappropriate to consider analysts' qualitative growth rate projections as reflective of real, qualitative determinants of growth is the fact that quantitative growth estimates will also be heavily influenced by increases to rate base that may have little or no corresponding increases in load growth. Recently, we've seen this occur with many utilities retiring old, but otherwise functional coal plants in response to environmental regulations. Under these circumstances, utilities have been able to increase their rate bases by a far greater extent than what any concurrent increase in demand would have required. In other words, utilities "grew" their earnings by simply retiring old assets and replacing them with new assets. If a competitive, unregulated firm announced plans to close production plants and replace them with new plants, it would not be considered a factor that would increase growth unless this decision allowed the Company to increase its market share and earnings. In the case of utilities, the decision to replace old plant with new plant did not increase market share or attract new customers, and earnings were quantitatively increased primarily because of the structure of the rate base rate of return model. Therefore, mere increases to rate base should not be viewed as drivers of qualitative growth. Instead, regulators should focus on inflation and load growth as qualitative growth determinants, and should limit long-term growth inputs in the DCF Model to projected nominal GDP growth.

Regardless, utilities have a natural financial incentive to accelerate depreciation rates, which is driven by the need to increase quantitative earnings growth. In other words, just because we should not consider rate base increases as a qualitative growth determinant

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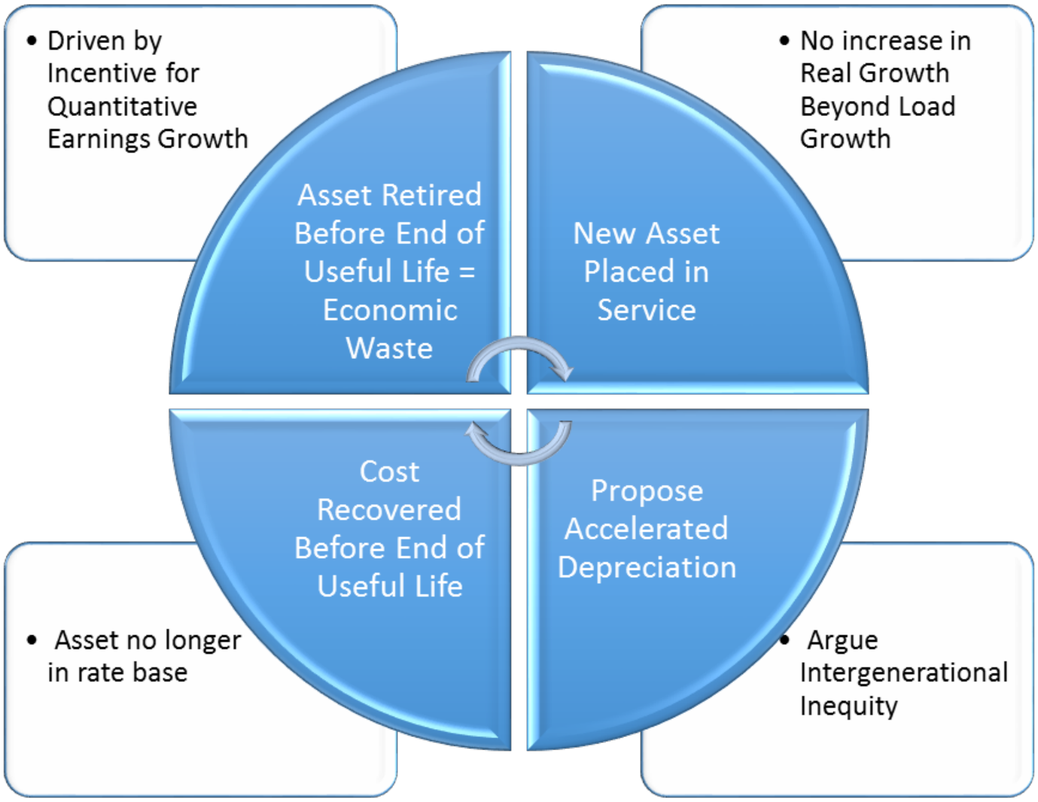
[36] *See* Responsive Testimony of David J. Garrett (Part I – Cost of Capital) filed in this case at Section VII(C).

from an analytical perspective, it does not negate the fact that utilities have a strong financial incentive to increase and grow their earnings by increasing rate base. This incentive highlights one of the primary areas of overlap between cost of capital and depreciation. The following diagram illustrates the relationship between accelerated depreciation rates and cost recovery, economic waste, and qualitative earnings growth.

Figure 7:
The Financial Incentive to Accelerate Depreciation Rates



As illustrated in this diagram, the intergenerational inequity narrative is driven by utilities' financial incentive to increase earnings growth, not by a concern for the equity of future ratepayers. This diagram also highlights the risk that accelerated depreciation rates can lead to economic waste.

VIII. CONCLUSION AND RECOMMENDATION

Q. Summarize the key points of your testimony.

A. I employed a well-established depreciation system and used actuarial analyses to statistically analyze the Company's depreciable assets in order to develop reasonable depreciation rates in this case. I calculated the depreciation rates for Empire's production accounts with the following adjustments to the Company's position: (1) I removed terminal net salvage due to lack of support through a site-specific decommissioning studies; (2) I recalculated the Company's proposed production rates without including future unapproved plant additions; and (3) I allocated the depreciable costs over the currently-approved lifespans of the Company's production units. For the depreciation rates of the Company's mass property accounts (transmission, distribution, and general), I used visual and mathematical curve-fitting techniques to select better-fitting and more reasonable curves and average lives than those proposed by the Company. As a result, my proposed depreciation rates are more reasonable.

Q. Has Empire met its burden of proof to make a convincing showing that its proposed depreciation rates and expense are not excessive?

A. No. With regard to the production accounts, the Company has not met its burden because it did not provide adequate support for its terminal net salvage rates, it proposed depreciation rates that would have recovered the cost of future, unapproved plant additions, and it did not provide support for its lifespan decreases. With regard to the mass property accounts, the Company has not met its burden because the Iowa curves it selected to describe its accounts understate average life and overstate depreciation rates and expense, as discussed above.

Q. What is OIEC's recommendation to the Commission with regard to depreciation rates and expense?

A. OIEC recommends that the Commission adopt the proposed depreciation rates presented in Exhibit DG 2-3. In addition, OIEC recommends that the Commission adopt our adjustment to the amortization of the undepreciated portion of Empire's investment in the retired Riverton units. These adjustments reduce the Company's proposed annual depreciation expense for the Oklahoma jurisdiction by $439,856.

Q. Does this conclude your testimony?

A. Yes, including any exhibits, appendices, and other items attached hereto. I reserve the right to supplement this testimony as needed with any additional information that has been requested from the Company but not yet provided.

Respectfully Submitted,

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APPENDIX A:

THE DEPRECIATION SYSTEM

A depreciation accounting system may be thought of as a dynamic system in which estimates of life and salvage are inputs to the system, and the accumulated depreciation account is a measure of the state of the system at any given time.[37] The primary objective of the depreciation system is the timely recovery of capital. The process for calculating the annual accruals is determined by the factors required to define the system. A depreciation system should be defined by four primary factors: 1) a method of allocation; 2) a procedure for applying the method of allocation to a group of property; 3) a technique for applying the depreciation rate; and 4) a model for analyzing the characteristics of vintage groups comprising a continuous property group.[38] The figure below illustrates the basic concept of a depreciation system and includes some of the available parameters.[39]

There are hundreds of potential combinations of methods, procedures, techniques, and models, but in practice, analysts use only a few combinations. Ultimately, the system selected must result in the systematic and rational allocation of capital recovery for the utility. Each of the four primary factors defining the parameters of a depreciation system is discussed further below.

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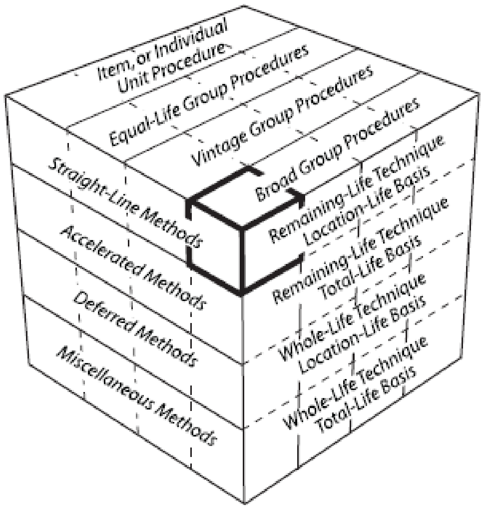
[37] Wolf *supra* n. 7, at 69-70.

[38] *Id.* at 70, 139-40.

[39] Edison Electric Institute, *Introduction to Depreciation* (inside cover) (EEI April 2013). Some definitions of the terms shown in this diagram are not consistent among depreciation practitioners and literature due to the fact that depreciation analysis is a relatively small and fragmented field. This diagram simply illustrates the some of the available parameters of a depreciation system.

Figure 8:
The Depreciation System Cube



1. Allocation Methods

The "method" refers to the pattern of depreciation in relation to the accounting periods. The method most commonly used in the regulatory context is the "straight-line method" – a type of age-life method in which the depreciable cost of plant is charged in equal amounts to each accounting period over the service life of plant.[40] Because group depreciation rates and plant balances often change, the amount of the annual accrual rarely remains the same, even when the straight-line method is employed.[41] The basic formula for the straight-line method is as follows:[42]

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[40] NARUC *supra* n. 8, at 56.

[41] *Id*.

[42] *Id*.

Equation 1:
Straight-Line Accrual

$$Annual\ Accrual = \frac{Gross\ Plant - Net\ Salavage}{Service\ Life}$$

Gross plant is a known amount from the utility's records, while both net salvage and service life must be estimated in order to calculate the annual accrual. The straight-line method differs from accelerated methods of recovery, such as the "sum-of-the-years-digits" method and the "declining balance" method. Accelerated methods are primarily used for tax purposes and are rarely used in the regulatory context for determining annual accruals.[43] In practice, the annual accrual is expressed as a rate which is applied to the original cost of plant in order to determine the annual accrual in dollars. The formula for determining the straight-line rate is as follows:[44]

Equation 2:
Straight-Line Rate

$$Depreciation\ Rate\ \% = \frac{100 - Net\ Salvage\ \%}{Service\ Life}$$

2. Grouping Procedures

The "procedure" refers to the way the allocation method is applied through subdividing the total property into groups.[45] While single units may be analyzed for depreciation, a group plan of depreciation is particularly adaptable to utility property. Employing a grouping procedure allows for a composite application of depreciation rates to groups of similar property, rather than

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[43] *Id*. at 57.

[44] *Id*. at 56.

[45] Wolf *supra* n. 7, at 74-75.

excessively conducting calculations for each unit. Whereas an individual unit of property has a single life, a group of property displays a dispersion of lives and the life characteristics of the group must be described statistically.[46] When analyzing mass property categories, it is important that each group contains homogenous units of plant that are used in the same general manner throughout the plant and operated under the same general conditions.[47]

The "average life" and "equal life" grouping procedures are the two most common. In the average life procedure, a constant annual accrual rate based on the average life of all property in the group is applied to the surviving property. While property having shorter lives than the group average will not be fully depreciation, and likewise, property having longer lives than the group average will be over-depreciated, the ultimate result is that the group will be fully depreciated by the time of the final retirement.[48] Thus, the average life procedure treats each unit as though its life is equal to the average life of the group. In contrast, the equal life procedure treats each unit in the group as though its life was known.[49] Under the equal life procedure the property is divided into subgroups that each has a common life.[50]

3. Application Techniques

The third factor of a depreciation system is the "technique" for applying the depreciation rate. There are two commonly used techniques: "whole life" and "remaining life." The whole life

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[46] *Id*. at 74.

[47] NARUC *supra* n. 8, at 61-62.

[48] *See* Wolf *supr*a n. 7, at 74-75.

[49] *Id*. at 75.

[50] *Id*.

technique applies the depreciation rate on the estimated average service life of group, while the remaining life technique seeks to recover undepreciated costs over the remaining life of the plant.[51]

In choosing the application technique, consideration should be given to the proper level of the accumulated depreciation account. Depreciation accrual rates are calculated using estimates of service life and salvage. Periodically these estimates must be revised due to changing conditions, which cause the accumulated depreciation account to be higher or lower than necessary. Unless some corrective action is taken, the annual accruals will not equal the original cost of the plant at the time of final retirement.[52] Analysts can calculate the level of imbalance in the accumulated depreciation account by determining the "calculated accumulated depreciation," (a.k.a. "theoretical reserve" and referred to in these appendices as "CAD"). The CAD is the calculated balance that would be in the accumulated depreciation account at a point in time using current depreciation parameters.[53] An imbalance exists when the actual accumulated depreciation account does not equal the CAD. The choice of application technique will affect how the imbalance is dealt with.

Use of the whole life technique requires that an adjustment be made to accumulated depreciation after calculation of the CAD. The adjustment can be made in a lump sum or over a period of time. With use of the remaining life technique, however, adjustments to accumulated depreciation are amortized over the remaining life of the property and are automatically included

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[51] NARUC *supra* n. 8, at 63-64.

[52] Wolf *supra* n. 7, at 83.

[53] NARUC *supra* n. 8, at 325.

in the annual accrual.[54] This is one reason that the remaining life technique is popular among practitioners and regulators. The basic formula for the remaining life technique is as follows:[55]

Equation 3:
Remaining Life Accrual

$$Annual\ Accrual = \frac{Gross\ Plant - Accumulated\ Depreciation - Net\ Salvage}{Average\ Remaining\ Life}$$

The remaining life accrual formula is similar to the basic straight-line accrual formula above with two notable exceptions. First, the numerator has an additional factor in the remaining life formula: the accumulated depreciation. Second, the denominator is "average remaining life" instead of "average life." Essentially, the future accrual of plant (gross plant less accumulated depreciation) is allocated over the remaining life of plant. Thus, the adjustment to accumulated depreciation is "automatic" in the sense that it is built into the remaining life calculation.[56]

4. Analysis Model

The fourth parameter of a depreciation system, the "model," relates to the way of viewing the life and salvage characteristics of the vintage groups that have been combined to form a continuous property group for depreciation purposes.[57] A continuous property group is created when vintage groups are combined to form a common group. Over time, the characteristics of the property may change, but the continuous property group will continue. The two analysis models

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[54] NARUC *supra* n. 8, at 65 ("The desirability of using the remaining life technique is that any necessary adjustments of [accumulated depreciation] . . . are accrued automatically over the remaining life of the property. Once commenced, adjustments to the depreciation reserve, outside of those inherent in the remaining life rate would require regulatory approval.").

[55] *Id*. at 64.

[56] Wolf *supra* n. 7, at 178.

[57] *See* Wolf *supra* n. 7, at 139 (I added the term "model" to distinguish this fourth depreciation system parameter from the other three parameters).

used among practitioners, the “broad group” and the “vintage group,” are two ways of viewing the life and salvage characteristics of the vintage groups that have been combined to from a continuous property group.

The broad group model views the continuous property group as a collection of vintage groups that each has the same life and salvage characteristics. Thus, a single survivor curve and a single salvage schedule are chosen to describe all the vintages in the continuous property group. In contrast, the vintage group model views the continuous property group as a collection of vintage groups that may have different life and salvage characteristics. Typically, there is not a significant difference between vintage group and broad group results unless vintages within the applicable property group experienced dramatically different retirement levels than anticipated in the overall estimated life for the group. For this reason, many analysts utilize the broad group procedure because it is more efficient.

APPENDIX B:

IOWA CURVES

Early work in the analysis of the service life of industrial property was based on models that described the life characteristics of human populations.[58] This explains why the word "mortality" is often used in the context of depreciation analysis. In fact, a group of property installed during the same accounting period is analogous to a group of humans born during the same calendar year. Each period the group will incur a certain fraction of deaths / retirements until there are no survivors. Describing this pattern of mortality is part of actuarial analysis, and is regularly used by insurance companies to determine life insurance premiums. The pattern of mortality may be described by several mathematical functions, particularly the survivor curve and frequency curve. Each curve may be derived from the other so that if one curve is known, the other may be obtained. A survivor curve is a graph of the percent of units remaining in service expressed as a function of age.[59] A frequency curve is a graph of the frequency of retirements as a function of age. Several types of survivor and frequency curves are illustrated in the figures below.

1. Development

The survivor curves used by analysts today were developed over several decades from extensive analysis of utility and industrial property. In 1931 Edwin Kurtz and Robley Winfrey used extensive data from a range of 65 industrial property groups to create survivor curves representing the life characteristics of each group of property.[60] They generalized the 65 curves

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[58] Wolf *supra* n. 7, at 276.

[59] *Id*. at 23.

[60] *Id*. at 34.

into 13 survivor curve types and published their results in *Bulletin 103: Life Characteristics of Physical Property*. The 13 type curves were designed to be used as valuable aids in forecasting probable future service lives of industrial property. Over the next few years, Winfrey continued gathering additional data, particularly from public utility property, and expanded the examined property groups from 65 to 176.[61] This resulted in 5 additional survivor curve types for a total of 18 curves. In 1935, Winfrey published *Bulletin 125: Statistical Analysis of Industrial Property Retirements*. According to Winfrey, "[t]he 18 type curves are expected to represent quite well all survivor curves commonly encountered in utility and industrial practices."[62] These curves are known as the "Iowa curves" and are used extensively in depreciation analysis in order to obtain the average service lives of property groups. (Use of Iowa curves in actuarial analysis is further discussed in Appendix C.)

In 1942, Winfrey published *Bulletin 155: Depreciation of Group Properties*. In Bulletin 155, Winfrey made some slight revisions to a few of the 18 curve types, and published the equations, tables of the percent surviving, and probable life of each curve at five-percent intervals.[63] Rather than using the original formulas, analysts typically rely on the published tables containing the percentages surviving. This is because absent knowledge of the integration technique applied to each age interval, it is not possible to recreate the exact original published table values. In the 1970s, John Russo collected data from over 2,000 property accounts reflecting

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[61] *Id.*

[62] Robley Winfrey, *Bulletin 125: Statistical Analyses of Industrial Property Retirements* 85, Vol. XXXIV, No. 23 (Iowa State College of Agriculture and Mechanic Arts 1935).

[63] Robley Winfrey, Bulletin 155: *Depreciation of Group Properties* 121-28, Vol XLI, No. 1 (The Iowa State College Bulletin 1942); *see also* Wolf supra n. 7, at 305-38 (publishing the percent surviving for each Iowa curve, including "O" type curve, at one percent intervals).

observations during the period 1965 – 1975 as part of his Ph.D. dissertation at Iowa State. Russo essentially repeated Winfrey's data collection, testing, and analysis methods used to develop the original Iowa curves, except that Russo studied industrial property in service several decades after Winfrey published the original Iowa curves. Russo drew three major conclusions from his research:[64]

> 1. No evidence was found to conclude that the Iowa curve set, as it stands, is not a valid system of standard curves;
>
> 2. No evidence was found to conclude that new curve shapes could be produced at this time that would add to the validity of the Iowa curve set; and
>
> 3. No evidence was found to suggest that the number of curves within the Iowa curve set should be reduced.

Prior to Russo's study, some had criticized the Iowa curves as being potentially obsolete because their development was rooted in the study of industrial property in existence during the early 1900s. Russo's research, however, negated this criticism by confirming that the Iowa curves represent a sufficiently wide range of life patterns, and that though technology will change over time, the underlying patterns of retirements remain constant and can be adequately described by the Iowa curves.[65]

Over the years, several more curve types have been added to Winfrey's 18 Iowa curves. In 1967, Harold Cowles added four origin-modal curves. In addition, a square curve is sometimes used to depict retirements which are all planned to occur at a given age. Finally, analysts

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[64] *See* Wolf *supra* n. 7, at 37.

[65] *Id*.

commonly rely on several "half curves" derived from the original Iowa curves. Thus, the term "Iowa curves" could be said to describe up to 31 standardized survivor curves.

2. Classification

The Iowa curves are classified by three variables: modal location, average life, and variation of life. First, the mode is the percent life that results in the highest point of the frequency curve and the "inflection point" on the survivor curve. The modal age is the age at which the greatest rate of retirement occurs. As illustrated in the figure below, the modes appear at the steepest point of each survivor curve in the top graph, as well as the highest point of each corresponding frequency curve in the bottom graph.

The classification of the survivor curves was made according to whether the mode of the retirement frequency curves was to the left, to the right, or coincident with average service life. There are three modal "families" of curves: six left modal curves (L0, L1, L2, L3, L4, L5); five right modal curves (R1, R2, R3, R4, R5); and seven symmetrical curves (S0, S1, S2, S3, S4, S5, S6).[66] In the figure below, one curve from each family is shown: L0, S3 and R1, with average life at 100 on the x-axis. It is clear from the graphs that the modes for the L0 and R1 curves appear to the left and right of average life respectively, while the S3 mode is coincident with average life.

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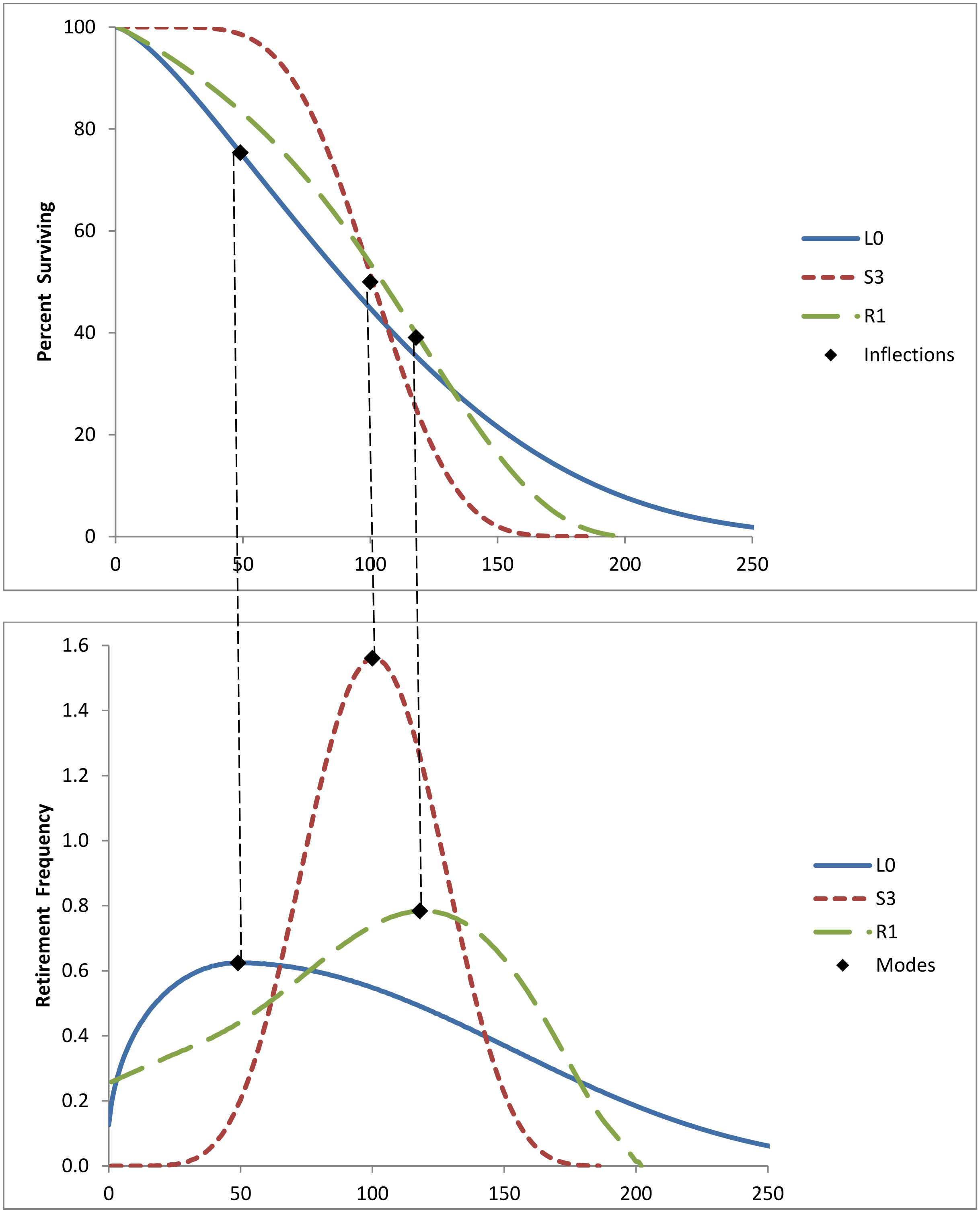
[66] In 1967, Harold A. Cowles added four origin-modal curves known as "O type" curves. There are also several "half" curves and a square curve, so the total amount of survivor curves commonly called "Iowa" curves is about 31 (see NARUC supra n. 8, at 68).

Figure 9:
Modal Age Illustration



The second Iowa curve classification variable is average life. The Iowa curves were designed using a single parameter of age expressed as a percent of average life instead of actual age. This was necessary in order for the curves to be of practical value. As Winfrey notes:

> Since the location of a particular survivor on a graph is affected by both its span in years and the shape of the curve, it is difficult to classify a group of curves unless one of these variables can be controlled. This is easily done by expressing the age in percent of average life."[67]

Because age is expressed in terms of percent of average life, any particular Iowa curve type can be modified to forecast property groups with various average lives.

The third variable, variation of life, is represented by the numbers next to each letter. A lower number (e.g., L1) indicates a relatively low mode, large variation, and large maximum life; a higher number (e.g., L5) indicates a relatively high mode, small variation, and small maximum life. All three classification variables – modal location, average life, and variation of life – are used to describe each Iowa curve. For example, a 13-L1 Iowa curve describes a group of property with a 13-year average life, with the greatest number of retirements occurring before (or to the left of) the average life, and a relatively low mode. The graphs below show these 18 survivor curves, organized by modal family.

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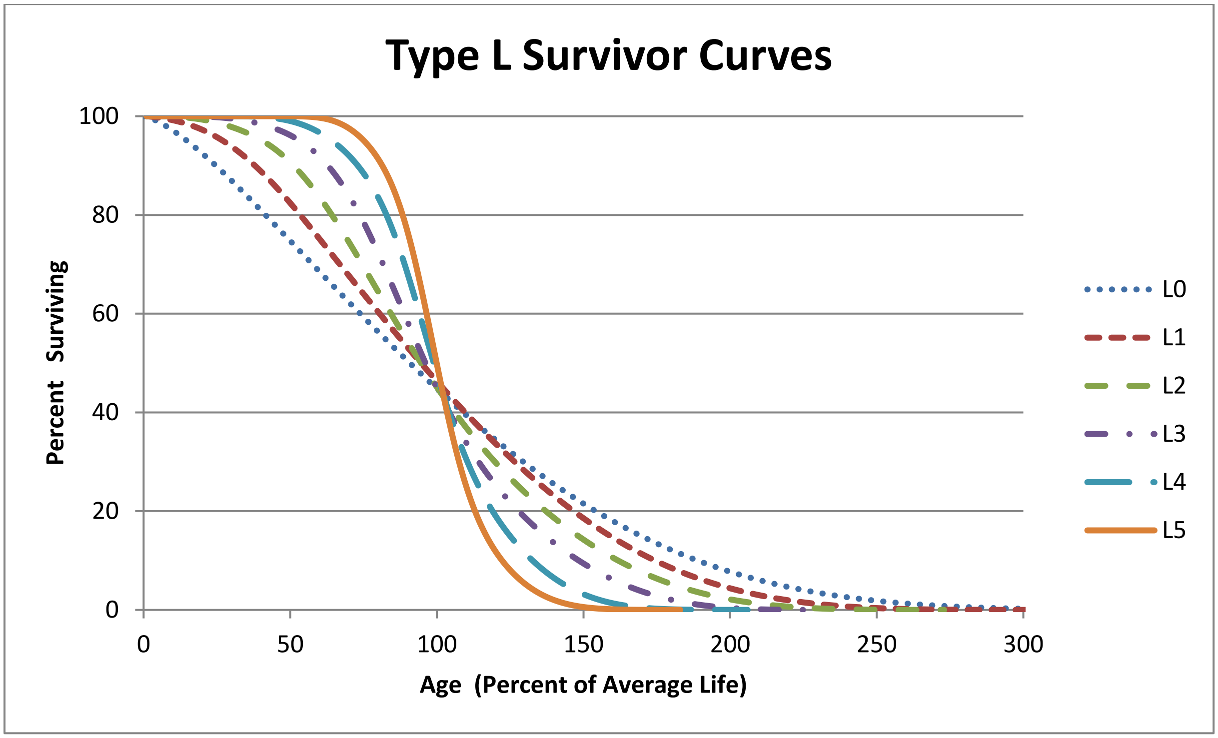
[67] Winfrey, *Bulletin 125: Statistical Analyses of Industrial Property Retirements* 60, Vol. XXXIV, No. 23 (Iowa State College of Agriculture and Mechanic Arts 1935).

Figure 10:
Type L Survivor and Frequency Curves



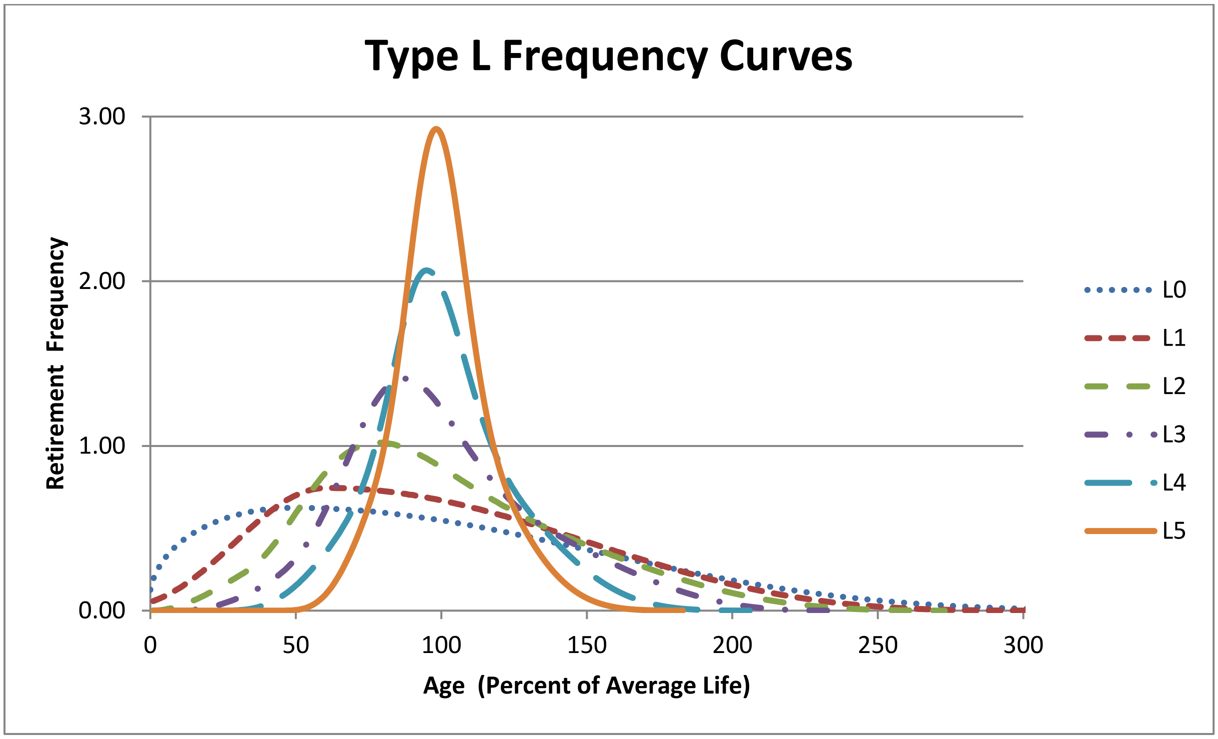
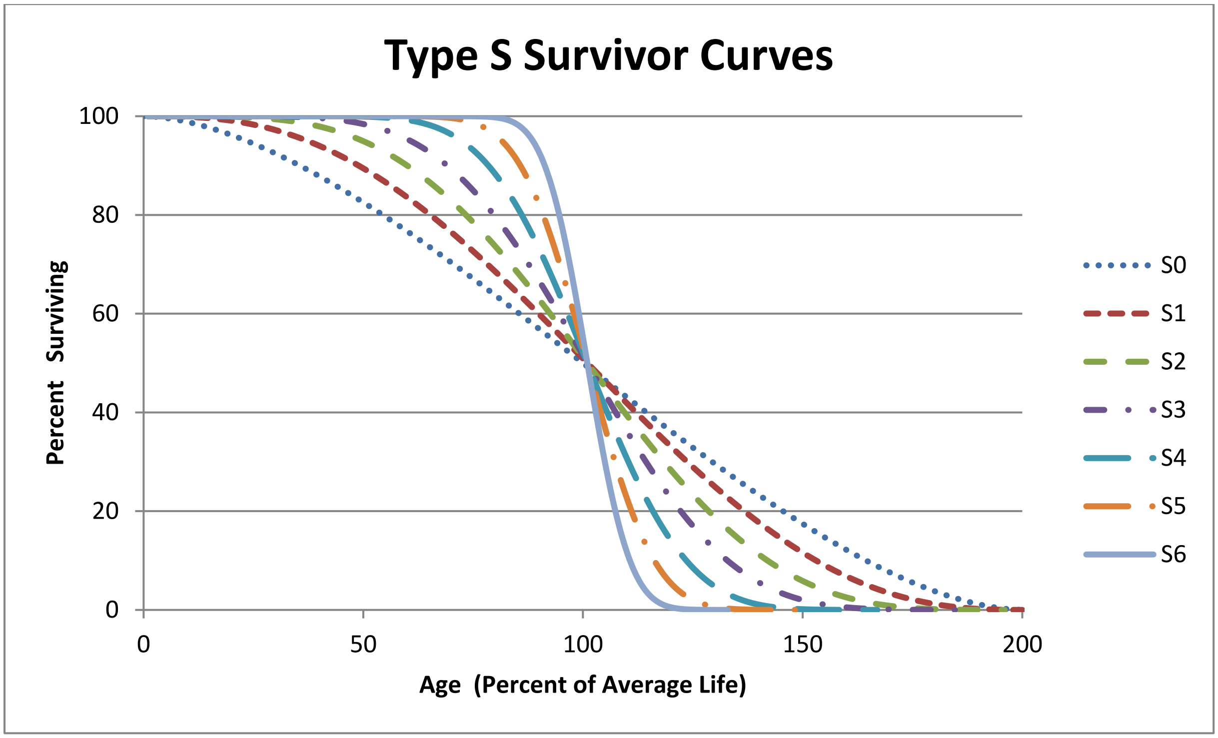


Figure 11:
Type S Survivor and Frequency Curves



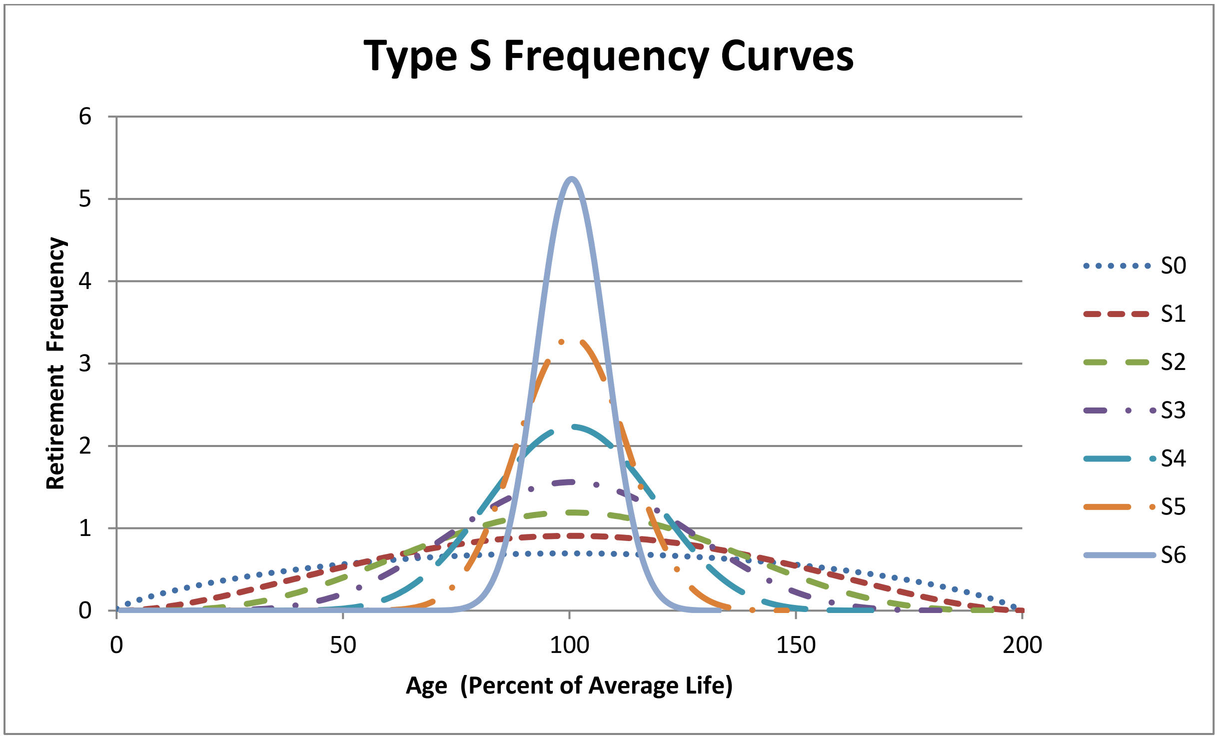
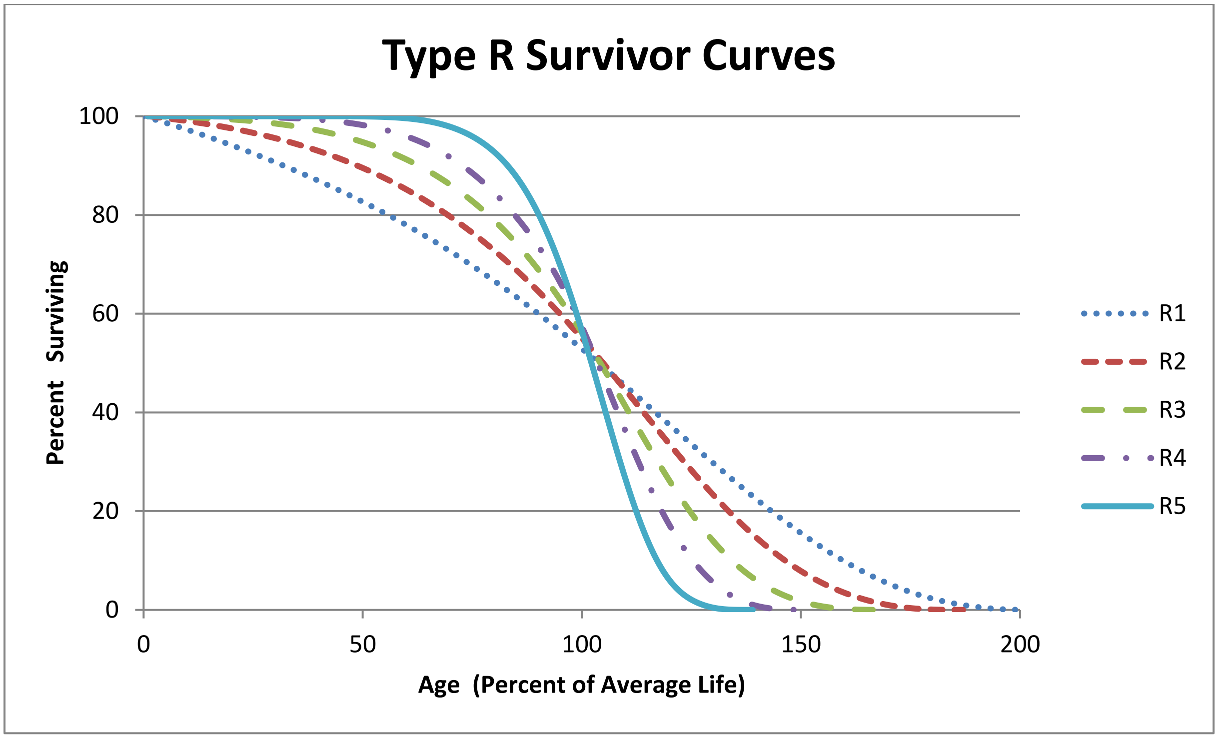
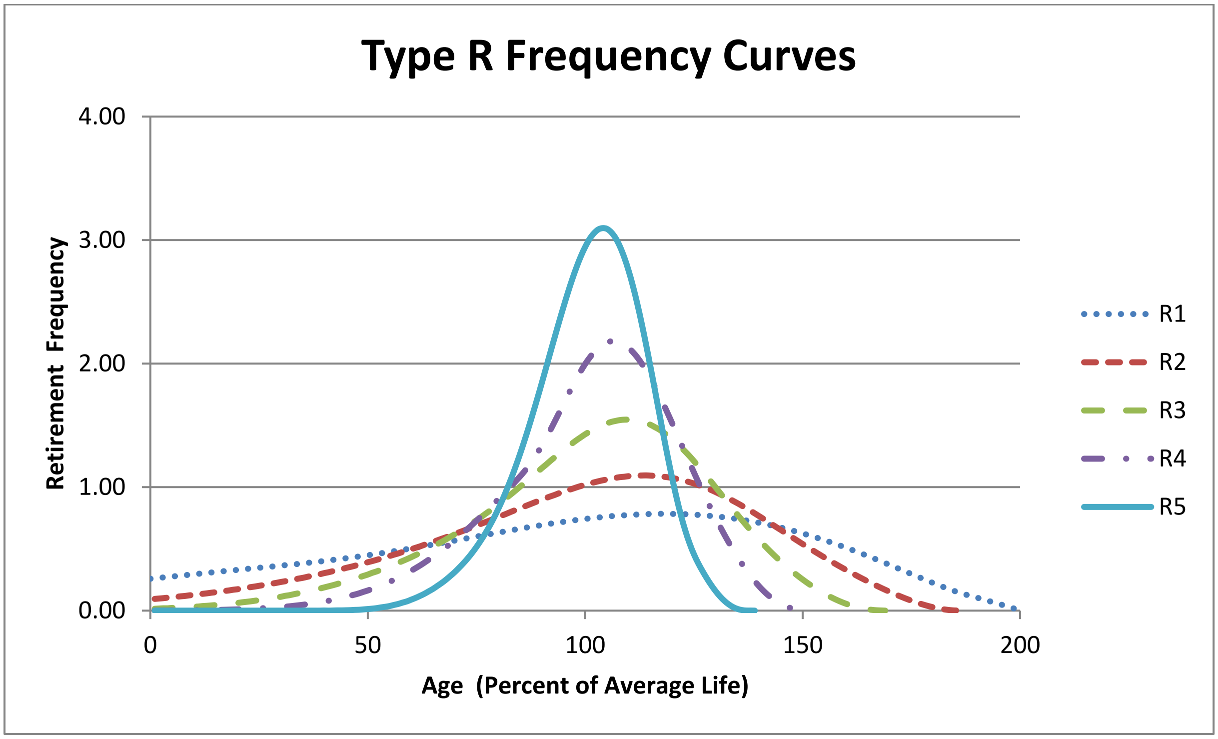


Figure 12:
Type R Survivor and Frequency Curves





As shown in the graphs above, the modes for the L family frequency curves occur to the left of average life (100% on the x-axis), while the S family modes occur at the average, and the R family modes occur after the average.

3. Types of Lives

Several other important statistical analyses and types of lives may be derived from an Iowa curve. These include: 1) average life; 2) realized life; 3) remaining life; and 4) probable life. The figure below illustrates these concepts. It shows the frequency curve, survivor curve, and probable life curve. Age M_x on the x-axis represents the modal age, while age AL_x represents the average age. Thus, this figure illustrates an "L type" Iowa curve since the mode occurs before the average.[68]

First, average life is the area under the survivor curve from age zero to maximum life. Because the survivor curve is measured in percent, the area under the curve must be divided by 100% to convert it from percent-years to years. The formula for average life is as follows:[69]

Equation 4:
Average Life

$$Average\ Life\ = \frac{Area\ Under\ Survivor\ Curve\ from\ Age\ 0\ to\ Max\ Life}{100\%}$$

Thus, average life may not be determined without a complete survivor curve. Many property groups being analyzed will not have experienced full retirement. This results in a "stub" survivor

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[68] From age zero to age M_x on the survivor curve, it could be said that the percent surviving from this property group is decreasing at an increasing rate. Conversely, from point M_x to maximum on the survivor curve, the percent surviving is decreasing at a decreasing rate.

[69] *See* NARUC *supra* n. 8, at 71.

curve. Iowa curves are used to extend stub curves to maximum life in order for the average life calculation to be made (see Appendix C).

Realized life is similar to average life, except that realized life is the average years of service experienced to date from the vintage's original installations.[70] As shown in the figure below, realized life is the area under the survivor curve from zero to age RL_X. Likewise, unrealized life is the area under the survivor curve from age RL_X to maximum life. Thus, it could be said that average life equals realized life plus unrealized life.

Average remaining life represents the future years of service expected from the surviving property.[71] Remaining life is sometimes referred to as "average remaining life" and "life expectancy." To calculate average remaining life at age x, the area under the estimated future potion of the survivor curve is divided by the percent surviving at age x (denoted S_X). Thus, the average remaining life formula is:

Equation 5:
Average Remaining Life

$$Average\ Remaining\ Life\ = \frac{Area\ Under\ Survivor\ Curve\ from\ Age\ x\ to\ Max\ Life}{S_X}$$

It is necessary to determine average remaining life in order to calculate the annual accrual under the remaining life technique.

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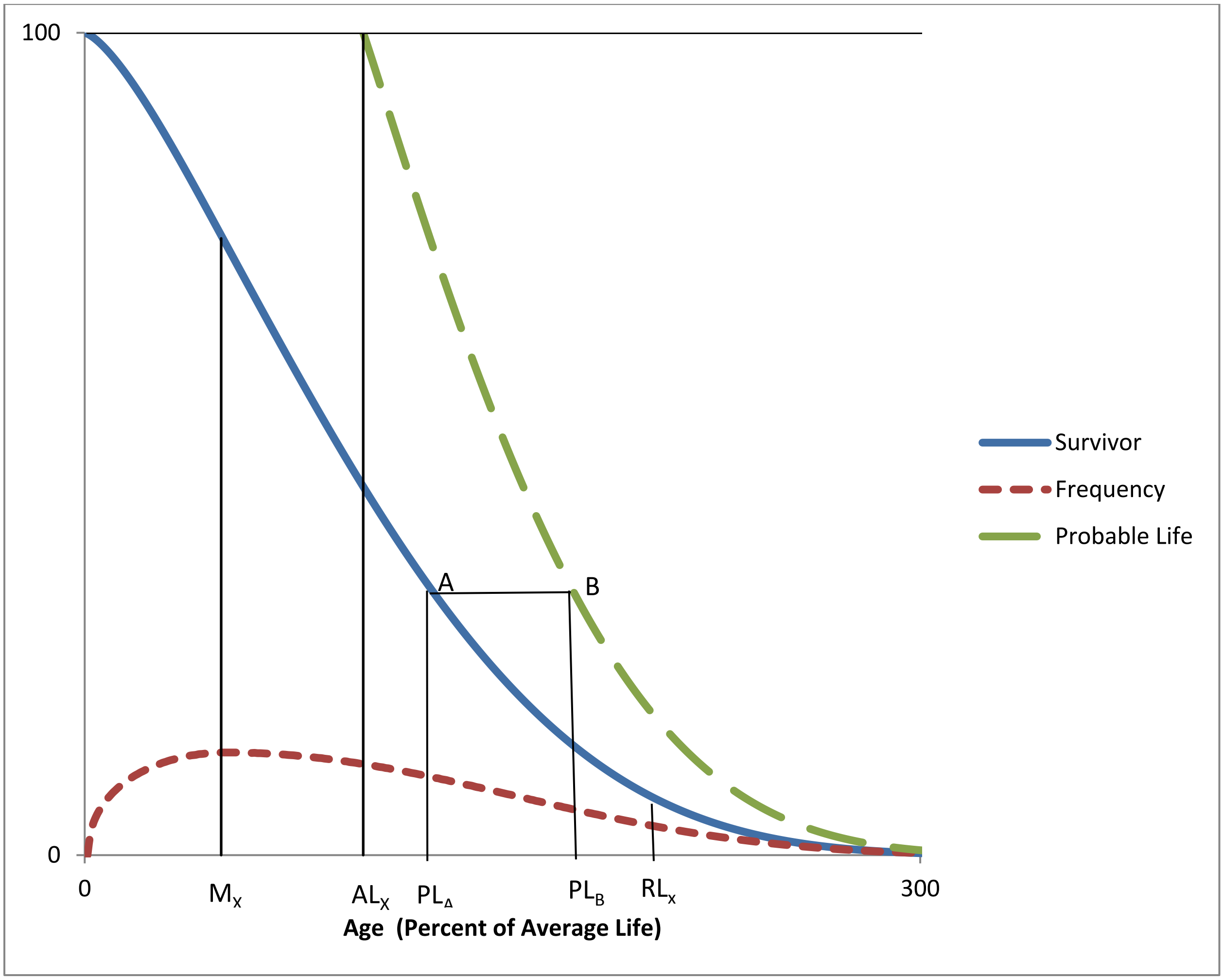
[70] *Id*. at 73.

[71] *Id*. at 74.

Figure 13:
Iowa Curve Derivations



Finally, the probable life may also be determined from the Iowa curve. The probable life of a property group is the total life expectancy of the property surviving at any age and is equal to the remaining life plus the current age.[72] The probable life is also illustrated in this figure. The probable life at age PL_A is the age at point PL_B. Thus, to read the probable life at age PL_A, see the corresponding point on the survivor curve above at point "A," then horizontally to point "B" on

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[72] Wolf *supra* n. 7, at 28.

the probable life curve, and back down to the age corresponding to point "B." It is no coincidence that the vertical line from AL_X connects at the top of the probable life curve. This is because at age zero, probable life equals average life.

APPENDIX C:
ACTUARIAL ANALYSIS

Actuarial science is a discipline that applies various statistical methods to assess risk probabilities and other related functions. Actuaries often study human mortality. The results from historical mortality data are used to predict how long similar groups of people who are alive will live today. Insurance companies rely of actuarial analysis in determining premiums for life insurance policies.

The study of human mortality is analogous to estimating service lives of industrial property groups. While some humans die solely from chance, most deaths are related to age; that is, death rates generally increase as age increases. Similarly, physical plant is also subject to forces of retirement. These forces include physical, functional, and contingent factors, as shown in the table below.[73]

Figure 14:
Forces of Retirement

Physical Factors	Functional Factors	Contingent Factors
Wear and tear Decay or deterioration Action of the elements	Inadequacy Obsolescence Changes in technology Regulations Managerial discretion	Casualties or disasters Extraordinary obsolescence

While actuaries study historical mortality data in order to predict how long a group of people will live, depreciation analysts must look at a utility's historical data in order to estimate the average lives of property groups. A utility's historical data is often contained in the Continuing

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[73] NARUC *supra* n. 8, at 14-15.

Property Records ("CPR"). Generally, a CPR should contain 1) an inventory of property record units; 2) the association of costs with such units; and 3) the dates of installation and removal of plant. Since actuarial analysis includes the examination of historical data to forecast future retirements, the historical data used in the analysis should not contain events that are anomalous or unlikely to recur.[74] Historical data is used in the retirement rate actuarial method, which is discussed further below.

The Retirement Rate Method

There are several systematic actuarial methods that use historical data in order to calculating observed survivor curves for property groups. Of these methods, the retirement rate method is superior, and is widely employed by depreciation analysts.[75] The retirement rate method is ultimately used to develop an observed survivor curve, which can be fitted with an Iowa curve discussed in Appendix B in order to forecast average life. The observed survivor curve is calculated by using an observed life table ("OLT"). The figures below illustrate how the OLT is developed. First, historical property data are organized in a matrix format, with placement years on the left forming rows, and experience years on the top forming columns. The placement year (a.k.a. "vintage year" or "installation year") is the year of placement of a group of property. The experience year (a.k.a. "activity year") refers to the accounting data for a particular calendar year. The two matrices below use aged data – that is, data for which the dates of placements, retirements, transfers, and other transactions are known. Without aged data, the retirement rate actuarial method may not be employed. The first matrix is the exposure matrix, which shows the exposures

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[74] *Id*. at 112-13.

[75] Anson Marston, Robley Winfrey & Jean C. Hempstead, *Engineering Valuation and Depreciation* 154 (2nd ed., McGraw-Hill Book Company, Inc. 1953).

at the beginning of each year.[76] An exposure is simply the depreciable property subject to retirement during a period. The second matrix is the retirement matrix, which shows the annual retirements during each year. Each matrix covers placement years 2003–2015, and experience years 2008-2015. In the exposure matrix, the number in the 2009 experience column and the 2003 placement row is $192,000. This means at the beginning of 2012, there was $192,000 still exposed to retirement from the vintage group placed in 2003. Likewise, in the retirement matrix, $19,000 of the dollars invested in 2003 was retired during 2012.

Figure 15:
Exposure Matrix

	Experience Years Exposures at January 1 of Each Year (Dollars in 000's)									
Placement Years	2008	2009	2010	2011	2012	2013	2014	2015	Total at Start of Age Interval	Age Interval
2003	261	245	228	211	**192**	173	152	131	131	11.5 - 12.5
2004	267	252	236	220	202	**184**	165	145	297	10.5 - 11.5
2005	304	291	277	263	248	232	**216**	198	536	9.5 - 10.5
2006	345	334	322	310	298	284	270	**255**	**847**	8.5 - 9.5
2007	367	357	347	335	324	312	299	286	1,201	7.5 - 8.5
2008	375	366	357	347	336	325	314	302	1,581	6.5 - 7.5
2009		377	366	356	346	336	327	319	1,986	5.5 - 6.5
2010			381	369	358	347	336	327	2,404	4.5 - 5.5
2011				386	372	359	346	334	2,559	3.5 - 4.5
2012					395	380	366	352	2,722	2.5 - 3.5
2013						401	385	370	2,866	1.5 - 2.5
2014							410	393	2,998	0.5 - 1.5
2015								416	3,141	0.0 - 0.5
Total	1919	2222	2514	2796	3070	3333	3586	3827	23,268	

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[76] Technically, the last numbers in each column are "gross additions" rather than exposures. Gross additions do not include adjustments and transfers applicable to plant placed in a previous year. Once retirements, adjustments, and transfers are factored in, the balance at the beginning of the next account period is called an "exposure" rather than an addition.

Figure 16:
Retirement Matrix

	Experience Years									
	Retirments During the Year (Dollars in 000's)									
Placement Years	2008	2009	2010	2011	2012	2013	2014	2015	Total During Age Interval	Age Interval
2003	16	17	18	19	**19**	20	21	23	23	11.5 - 12.5
2004	15	16	17	17	18	**19**	20	21	43	10.5 - 11.5
2005	13	14	14	15	16	17	**17**	18	59	9.5 - 10.5
2006	11	12	12	13	13	14	15	**15**	**71**	8.5 - 9.5
2007	10	11	11	12	12	13	13	14	82	7.5 - 8.5
2008	9	9	10	10	11	11	12	13	91	6.5 - 7.5
2009		11	10	10	9	9	9	8	95	5.5 - 6.5
2010			12	11	11	10	10	9	100	4.5 - 5.5
2011				14	13	13	12	11	93	3.5 - 4.5
2012					15	14	14	13	91	2.5 - 3.5
2013						16	15	14	93	1.5 - 2.5
2014							17	16	100	0.5 - 1.5
2015								18	112	0.0 - 0.5
Total	74	89	104	121	139	157	175	194	1,052	

These matrices help visualize how exposure and retirement data are calculated for each age interval. An age interval is typically one year. A common convention is to assume that any unit installed during the year is installed in the middle of the calendar year (i.e., July 1st). This convention is called the "half-year convention" and effectively assumes that all units are installed uniformly during the year.[77] Adoption of the half-year convention leads to age intervals of 0-0.5 years, 0.5-1.5 years, etc., as shown in the matrices.

The purpose of the matrices is to calculate the totals for each age interval, which are shown in the second column from the right in each matrix. This column is calculated by adding each number from the corresponding age interval in the matrix. For example, in the exposure matrix, the total amount of exposures at the beginning of the 8.5-9.5 age interval is $847,000. This number was calculated by adding the numbers shown on the "stairs" to the left (192+184+216+255=847).

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[77] Wolf *supra* n. 7, at 22.

The same calculation is applied to each number in the column. The amounts retired during the year in the retirements matrix affect the exposures at the beginning of each year in the exposures matrix. For example, the amount exposed to retirement in 2008 from the 2003 vintage is $261,000. The amount retired during 2008 from the 2003 vintage is $16,000. Thus, the amount exposed to retirement in 2009 from the 2003 vintage is $245,000 ($261,000 - $16,000). The company's property records may contain other transactions which affect the property, including sales, transfers, and adjusting entries. Although these transactions are not shown in the matrices above, they would nonetheless affect the amount exposed to retirement at the beginning of each year.

The totaled amounts for each age interval in both matrices are used to form the exposure and retirement columns in the OLT, as shown in the chart below. This chart also shows the retirement ratio and the survivor ratio for each age interval. The retirement ratio for an age interval is the ratio of retirements during the interval to the property exposed to retirement at the beginning of the interval. The retirement ratio represents the probability that the property surviving at the beginning of an age interval will be retired during the interval. The survivor ratio is simply the complement to the retirement ratio (1 – retirement ratio). The survivor ratio represents the probability that the property surviving at the beginning of an age interval will survive to the next age interval.

Figure 17:
Observed Life Table

Age at Start of Interval	Exposures at Start of Age Interval	Retirements During Age Interval	Retirement Ratio	Survivor Ratio	Percent Surviving at Start of Age Interval
A	B	C	D = C / B	E = 1 - D	F
0.0	3,141	112	0.036	0.964	**100.00**
0.5	2,998	100	0.033	0.967	**96.43**
1.5	2,866	93	0.032	0.968	**93.21**
2.5	2,722	91	0.033	0.967	**90.19**
3.5	2,559	93	0.037	0.963	**87.19**
4.5	2,404	100	0.042	0.958	**84.01**
5.5	1,986	95	0.048	0.952	**80.50**
6.5	1,581	91	0.058	0.942	**76.67**
7.5	1,201	82	0.068	0.932	**72.26**
8.5	847	71	0.084	0.916	**67.31**
9.5	536	59	0.110	0.890	**61.63**
10.5	297	43	0.143	0.857	**54.87**
11.5	131	23	0.172	0.828	**47.01**
					38.91
Total	23,268	1,052			

Column F on the right shows the percentages surviving at the beginning of each age interval. This column starts at 100% surviving. Each consecutive number below is calculated by multiplying the percent surviving from the previous age interval by the corresponding survivor ratio for that age interval. For example, the percent surviving at the start of age interval 1.5 is 93.21%, which was calculated by multiplying the percent surviving for age interval 0.5 (96.43%) by the survivor ratio for age interval 0.5 (0.967)[78].

The percentages surviving in Column F are the numbers that are used to form the original survivor curve. This particular curve starts at 100% surviving and ends at 38.91% surviving. An

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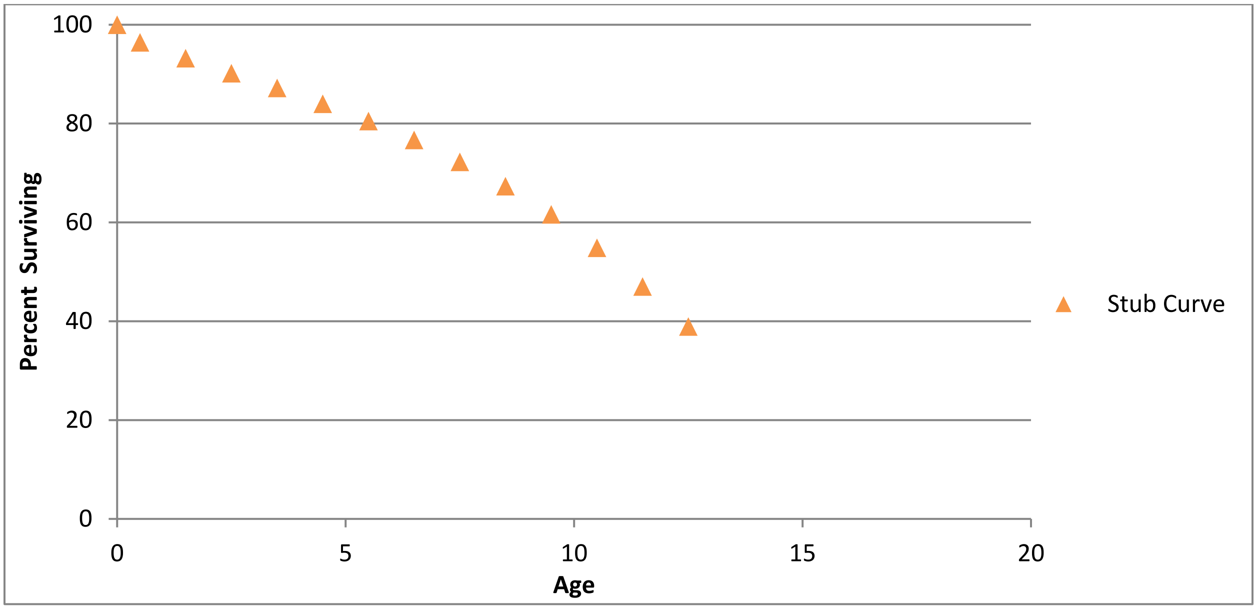
[78] Multiplying 96.43 by 0.967 does not equal 93.21 exactly due to rounding.

observed survivor curve such as this that does not reach zero percent surviving is called a "stub" curve. The figure below illustrates the stub survivor curve derived from the OLT table above.

Figure 18:
Original "Stub" Survivor Curve



The matrices used to develop the basic OLT and stub survivor curve provide a basic illustration of the retirement rate method in that only a few placement and experience years were used. In reality, analysts may have several decades of aged property data to analyze. In that case, it may be useful to use a technique called "banding" in order to identify trends in the data.

Banding

The forces of retirement and characteristics of industrial property are constantly changing. A depreciation analyst may examine the magnitude of these changes. Analysts often use a technique called "banding" to assist with this process. Banding refers to the merging of several years of data into a single data set for further analysis, and it is a common technique associated with the retirement rate method.[79] There are three primary benefits of using bands in depreciation analysis:

1. Increasing the sample size. In statistical analyses, the larger the sample size in relation to the body of total data, the greater the reliability of the result;
2. Smooth the observed data. Generally, the data obtained from a single activity or vintage year will not produce an observed life table that can be easily fit; and
3. Identify trends. By looking at successive bands, the analyst may identify broad trends in the data that may be useful in projecting the future life characteristics of the property.[80]

Two common types of banding methods are the "placement band" method and the "experience band" method." A placement band, as the name implies, isolates selected placement years for analysis. The figure below illustrates the same exposure matrix shown above, except that only the placement years 2005-2008 are considered in calculating the total exposures at the beginning of each age interval.

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[79] NARUC *supra* n. 8, at 113.

[80] *Id.*

Figure 19:
Placement Bands

	Experience Years Exposures at January 1 of Each Year (Dollars in 000's)									
Placement Years	2008	2009	2010	2011	2012	2013	2014	2015	Total at Start of Age Interval	Age Interval
2003	261	245	228	211	192	173	152	131		11.5 - 12.5
2004	267	252	236	220	202	184	165	145		10.5 - 11.5
2005	304	291	277	263	248	232	216	198	198	9.5 - 10.5
2006	345	334	322	310	298	284	270	255	471	8.5 - 9.5
2007	367	357	347	335	324	312	299	286	788	7.5 - 8.5
2008	375	366	357	347	336	325	314	302	1,133	6.5 - 7.5
2009		377	366	356	346	336	327	319	1,186	5.5 - 6.5
2010			381	369	358	347	336	327	1,237	4.5 - 5.5
2011				386	372	359	346	334	1,285	3.5 - 4.5
2012					395	380	366	352	1,331	2.5 - 3.5
2013						401	385	370	1,059	1.5 - 2.5
2014							410	393	733	0.5 - 1.5
2015								416	375	0.0 - 0.5
Total	1919	2222	2514	2796	3070	3333	3586	3827	9,796	

The shaded cells within the placement band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same placement band would be used for the retirement matrix covering the same placement years of 2005 – 2008. This of course would result in a different OLT and original stub survivor curve than those that were calculated above without the restriction of a placement band.

Analysts often use placement bands for comparing the survivor characteristics of properties with different physical characteristics.[81] Placement bands allow analysts to isolate the effects of changes in technology and materials that occur in successive generations of plant. For example, if in 2005 an electric utility began placing transmission poles with a special chemical treatment that extended the service lives of the poles, an analyst could use placement bands to isolate and analyze the effect of that change in the property group's physical characteristics. While placement

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[81] Wolf *supra* n. 7, at 182.

bands are very useful in depreciation analysis, they also possess an intrinsic dilemma. A fundamental characteristic of placement bands is that they yield fairly complete survivor curves for older vintages. However, with newer vintages, which are arguably more valuable for forecasting, placement bands yield shorter survivor curves. Longer "stub" curves are considered more valuable for forecasting average life. Thus, an analyst must select a band width broad enough to provide confidence in the reliability of the resulting curve fit, yet narrow enough so that an emerging trend may be observed.[82]

Analysts also use "experience bands." Experience bands show the composite retirement history for all vintages during a select set of activity years. The figure below shows the same data presented in the previous exposure matrices, except that the experience band from 2011 – 2013 is isolated, resulting in different interval totals.

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[82] NARUC *supra* n. 8, at 114.

Figure 20:
Experience Bands

Placement Years	Experience Years Exposures at January 1 of Each Year (Dollars in 000's)								Total at Start of Age Interval	Age Interval
	2008	2009	2010	2011	2012	2013	2014	2015		
2003	261	245	228	211	192	173	152	131		11.5 - 12.5
2004	267	252	236	220	202	184	165	145		10.5 - 11.5
2005	304	291	277	263	248	232	216	198	173	9.5 - 10.5
2006	345	334	322	310	298	284	270	255	376	8.5 - 9.5
2007	367	357	347	335	324	312	299	286	645	7.5 - 8.5
2008	375	366	357	347	336	325	314	302	752	6.5 - 7.5
2009		377	366	356	346	336	327	319	872	5.5 - 6.5
2010			381	369	358	347	336	327	959	4.5 - 5.5
2011				386	372	359	346	334	1,008	3.5 - 4.5
2012					395	380	366	352	1,039	2.5 - 3.5
2013						401	385	370	1,072	1.5 - 2.5
2014							410	393	1,121	0.5 - 1.5
2015								416	1,182	0.0 - 0.5
Total	1919	2222	2514	2796	3070	3333	3586	3827	9,199	

The shaded cells within the experience band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same experience band would be used for the retirement matrix covering the same experience years of 2011 – 2013. This of course would result in a different OLT and original stub survivor than if the band had not been used. Analysts often use experience bands to isolate and analyze the effects of an operating environment over time.[83] Likewise, the use of experience bands allows analysis of the effects of an unusual environmental event. For example, if an unusually severe ice storm occurred in 2013, destruction from that storm would affect an electric utility's line transformers of all ages. That is, each of the line transformers from each placement year would be affected, including those recently installed in 2012, as well as those installed in 2003. Using experience bands, an analyst could isolate or even eliminate the 2013 experience year from the analysis. In contrast, a placement band would not effectively isolate the

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[83] *Id.*

ice storm’s effect on life characteristics. Rather, the placement band would show an unusually large rate of retirement during 2013, making it more difficult to accurately fit the data with a smooth Iowa curve. Experience bands tend to yield the most complete stub curves for recent bands because they have the greatest number of vintages included. Longer stub curves are better for forecasting. The experience bands, however, may also result in more erratic retirement dispersion making the curve fitting process more difficult.

Depreciation analysts must use professional judgment in determining the types of bands to use and the band widths. In practice, analysts may use various combinations of placement and experience bands in order to increase the data sample size, identify trends and changes in life characteristics, and isolate unusual events. Regardless of which bands are used, observed survivor curves in depreciation analysis rarely reach zero percent. This is because, as seen in the OLT above, relatively newer vintage groups have not yet been fully retired at the time the property is studied. An analyst could confine the analysis to older, fully retired vintage groups in order to get complete survivor curves, but such analysis would ignore some the property currently in service and would arguably not provide an accurate description of life characteristics for current plant in service. Because a complete curve is necessary to calculate the average life of the property group, however, curve fitting techniques using Iowa curves or other standardized curves may be employed in order to complete the stub curve.

Curve Fitting

Depreciation analysts typically use the survivor curve rather than the frequency curve to fit the observed stub curves. The most commonly used generalized survivor curves used in the curve fitting process are the Iowa curves discussed above. As Wolf notes, if “the Iowa curves are adopted as a model, an underlying assumption is that the process describing the retirement pattern is one of the 22 [or more] processes described by the Iowa curves."[84]

Curve fitting may be done through visual matching or mathematical matching. In visual curve fitting, the analyst visually examines the plotted data to make an initial judgment about the Iowa curves that may be a good fit. The figure below illustrates the stub survivor curve shown above. It also shows three different Iowa curves: the 10-L4, the 10.5-R1, and the 10-S0. Visually, it is clear that the 10.5-R1 curve is a better fit than the other two curves.

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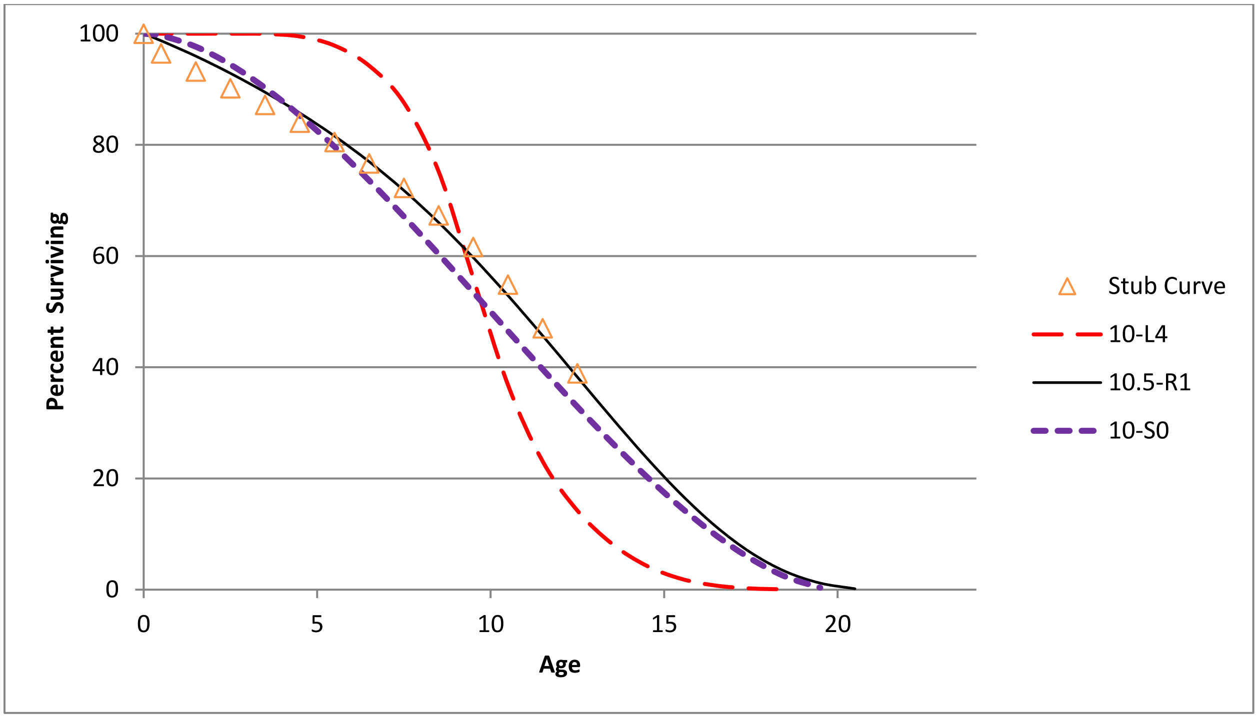
[84] Wolf *supra* n. 7, at 46 (22 curves includes Winfrey's 18 original curves plus Cowles's four "O" type curves).

Figure 21:
Visual Curve Fitting



In mathematical fitting, the least squares method is used to calculate the best fit. This mathematical method would be excessively time consuming if done by hand. With the use of modern computer software however, mathematical fitting is an efficient and useful process. The typical logic for a computer program, as well as the software employed for the analysis in this testimony is as follows:

> First (an Iowa curve) curve is arbitrarily selected. . . . If the observed curve is a stub curve, . . . calculate the area under the curve and up to the age at final data point. Call this area the realized life. Then systematically vary the average life of the theoretical survivor curve and calculate its realized life at the age corresponding to the study date. This trial and error procedure ends when you find an average life such that the realized life of the theoretical curve equals the realized life of the observed curve. Call this the average life.
>
> Once the average life is found, calculate the difference between each percent surviving point on the observed survivor curve and the corresponding point on the Iowa curve. Square each difference and sum them. The sum of squares is used as a measure of goodness of fit for that particular Iowa type curve. This procedure is

> repeated for the remaining 21 Iowa type curves. The "best fit" is declared to be the type of curve that minimizes the sum of differences squared.[85]

Mathematical fitting requires less judgment from the analyst, and is thus less subjective. Blind reliance on mathematical fitting, however, may lead to poor estimates. Thus, analysts should employ both mathematical and visual curve fitting in reaching their final estimates. This way, analysts may utilize the objective nature of mathematical fitting while still employing professional judgment. As Wolf notes: "The results of mathematical curve fitting serve as a guide for the analyst and speed the visual fitting process. But the results of the mathematical fitting should be checked visually and the final determination of the best fit be made by the analyst."[86]

In the graph above, visual fitting was sufficient to determine that the 10.5-R1 Iowa curve was a better fit than the 10-L4 and the 10-S0 curves. Using the sum of least squares method, mathematical fitting confirms the same result. In the chart below, the percentages surviving from the OLT that formed the original stub curve are shown in the left column, while the corresponding percentages surviving for each age interval are shown for the three Iowa curves. The right portion of the chart shows the differences between the points on each Iowa curve and the stub curve. These differences are summed at the bottom. Curve 10.5-R1 is the best fit because the sum of the squared differences for this curve is less than the same sum of the other two curves. Curve 10-L4 is the worst fit, which was also confirmed visually.

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[85] Wolf *supra* n. 7, at 47.

[86] *Id*. at 48.

Figure 22:
Mathematical Fitting

Age	Stub	Iowa Curves			Squared Differences		
Interval	**Curve**	**10-L4**	**10-S0**	**10.5-R1**	**10-L4**	**10-S0**	**10.5-R1**
0.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0
0.5	96.4	100.0	99.7	98.7	12.7	10.3	5.3
1.5	93.2	100.0	97.7	96.0	46.1	19.8	7.6
2.5	90.2	100.0	94.4	92.9	96.2	18.0	7.2
3.5	87.2	100.0	90.2	89.5	162.9	9.3	5.2
4.5	84.0	99.5	85.3	85.7	239.9	1.6	2.9
5.5	80.5	97.9	79.7	81.6	301.1	0.7	1.2
6.5	76.7	94.2	73.6	77.0	308.5	9.5	0.1
7.5	72.3	87.6	67.1	71.8	235.2	26.5	0.2
8.5	67.3	75.2	60.4	66.1	62.7	48.2	1.6
9.5	61.6	56.0	53.5	59.7	31.4	66.6	3.6
10.5	54.9	36.8	46.5	52.9	325.4	69.6	3.9
11.5	47.0	23.1	39.6	45.7	572.6	54.4	1.8
12.5	38.9	14.2	32.9	38.2	609.6	36.2	0.4
SUM					**3004.2**	**371.0**	**41.0**

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EDUCATION

University of Oklahoma	Norman, OK
Master of Business Administration	2014
Areas of Concentration: Finance, Energy	
University of Oklahoma College of Law	Norman, OK
Juris Doctor	2007
Member, American Indian Law Review	
University of Oklahoma	Norman, OK
Bachelor of Business Administration	2003
Major: Finance	

PROFESSIONAL DESIGNATIONS

Society of Depreciation Professionals
Certified Depreciation Professional (CDP)

Society of Utility and Regulatory Financial Analysts
Certified Rate of Return Analyst (CRRA)

The Mediation Institute
Certified Civil / Commercial & Employment Mediator

WORK EXPERIENCE

Resolve Utility Consulting PLLC	Oklahoma City, OK
Managing Member	2016 – Present

Provide expert analysis and testimony specializing in depreciation and cost of capital issues for clients in utility regulatory proceedings.

Oklahoma Corporation Commission	Oklahoma City, OK
Public Utility Regulatory Analyst	2012 – 2016
Assistant General Counsel	2011 – 2012

Represented commission staff in utility regulatory proceedings and provided legal opinions to commissioners. Provided expert analysis and testimony in depreciation, cost of capital, incentive compensation, payroll and other issues.

Perebus Counsel, PLLC — Oklahoma City, OK
Managing Member — 2009 – 2011
Represented clients in the areas of family law, estate planning, debt negotiations, business organization, and utility regulation.

Moricoli & Schovanec, P.C. — Oklahoma City, OK
Associate Attorney — 2007 – 2009
Represented clients in the areas of contracts, oil and gas, business structures and estate administration.

TEACHING EXPERIENCE

University of Oklahoma — Norman, OK
Adjunct Instructor – "Conflict Resolution" — 2014 – Present
Adjunct Instructor – "Ethics in Leadership"

Rose State College — Midwest City, OK
Adjunct Instructor – "Legal Research" — 2013 – 2015
Adjunct Instructor – "Oil & Gas Law"

PUBLICATIONS

American Indian Law Review — Norman, OK
"Vine of the Dead: Reviving Equal Protection Rites for Religious Drug Use" — 2006
(31 Am. Indian L. Rev. 143)

VOLUNTEER EXPERIENCE

Calm Waters — Oklahoma City, OK
Board Member — 2015 – Present
Participate in management of operations, attend meetings, review performance, compensation, and financial records. Assist in fundraising events.

Group Facilitator & Fundraiser — 2014 – Present
Facilitate group meetings designed to help children and families cope with divorce and tragic events. Assist in fundraising events.

St. Jude Children's Research Hospital — Oklahoma City, OK
Oklahoma Fundraising Committee — 2008 – 2010
Raised money for charity by organizing local fundraising events.

PROFESSIONAL ASSOCIATIONS

Oklahoma Bar Association 2007 – Present

Society of Depreciation Professionals 2014 – Present
Board Member – President 2017
Participate in management of operations, attend meetings, review performance, organize presentation agenda.

Society of Utility Regulatory Financial Analysts 2014 – Present

SELECTED CONTINUING PROFESSIONAL EDUCATION

Society of Depreciation Professionals — Austin, TX
"Life and Net Salvage Analysis" — 2015
Extensive instruction on utility depreciation, including actuarial and simulation life analysis modes, gross salvage, cost of removal, life cycle analysis, and technology forecasting.

Society of Depreciation Professionals — New Orleans, LA
"Introduction to Depreciation" and "Extended Training" — 2014
Extensive instruction on utility depreciation, including average lives and net salvage.

Society of Utility and Regulatory Financial Analysts — Indianapolis, IN
46th Financial Forum. "The Regulatory Compact: Is it Still Relevant?" — 2014
Forum discussions on current issues.

New Mexico State University, Center for Public Utilities — Santa Fe, NM
Current Issues 2012, "The Santa Fe Conference" — 2012
Forum discussions on various current issues in utility regulation.

Michigan State University, Institute of Public Utilities — Clearwater, FL
"39th Eastern NARUC Utility Rate School" — 2011
One-week, hands-on training emphasizing the fundamentals of the utility ratemaking process.

New Mexico State University, Center for Public Utilities — Albuquerque, NM
"The Basics: Practical Regulatory Training for the Changing Electric Industries" — 2010
One-week, hands-on training designed to provide a solid foundation in core areas of utility ratemaking.

The Mediation Institute — Oklahoma City, OK
"Civil / Commercial & Employment Mediation Training" — 2009
Extensive instruction and mock mediations designed to build foundations in conducting mediations in civil matters.

Utility Regulatory Proceedings

State	Regulatory Agency / Company-Applicant	Docket Number	Testimony / Analysis Issues	Type	Date
TX	Railroad Commission of Texas CenterPoint Energy Texas Gas	GUD 10567	Depreciation rates, simulated and actuarial analysis	Prefiled	2/21/2017
AR	Arkansas Public Service Commission Oklahoma Gas & Electric Co.	160-159-GU	Cost of capital, depreciation rates, terminal salvage, lifespans	Prefiled	1/31/2017
FL	Florida Public Service Commission Peoples Gas	160-159-GU	Depreciation rates	Report	11/4/2016
AZ	Arizona Corporation Commission Arizona Public Service Co.	E-01345A-16-0036	Cost of capital, depreciation rates, terminal salvage, lifespans	Pre-filed	12/28/2016
NV	Nevada Public Utilities Commission Sierra Pacific Power Co.	16-06008	Depreciation rates, terminal salvage, lifespans, theoretical reserve	Pre-filed	9/23/2016
OK	Oklahoma Corporation Commission Oklahoma Gas & Electric Co.	PUD 201500273	Cost of capital, depreciation rates, terminal salvage, lifespans	Pre-filed Live	3/21/2016 5/3/2016
OK	Oklahoma Corporation Commission Public Service Co. of Oklahoma	PUD 201500208	Cost of capital, depreciation rates, terminal salvage, lifespans	Pre-filed Live	10/14/2015 12/8/2015
OK	Oklahoma Corporation Commission Oklahoma Natural Gas Co.	PUD 201500213	Cost of capital and depreciation rates	Pre-filed	10/19/2015
OK	Oklahoma Corporation Commission Oak Hills Water System	PUD 201500123	Cost of capital and depreciation rates	Pre-filed Live	7/8/2015 8/14/2015
OK	Oklahoma Corporation Commission CenterPoint Energy Oklahoma Gas	PUD 201400227	Fuel prudence review and fuel adjustment clause	Pre-filed Live	11/3/2014 2/10/2015
OK	Oklahoma Corporation Commission Public Service Co. of Oklahoma	PUD 201400233	Certificate of authority to issue new debt securities	Pre-filed Live	9/12/2014 9/25/2014

Utility Regulatory Proceedings

State	Regulatory Agency / Company-Applicant	Docket Number	Testimony / Analysis Issues	Type	Date
OK	Oklahoma Corporation Commission Empire District Electric Co.	PUD 201400226	Fuel prudence review and fuel adjustment clause	Pre-filed Live	12/9/2014 1/22/2015
OK	Oklahoma Corporation Commission Fort Cobb Fuel Authority	PUD 201400219	Fuel prudence review and fuel adjustment clause	Pre-filed Live	 1/29/2015
OK	Oklahoma Corporation Commission Fort Cobb Fuel Authority	PUD 201400140	Outside services, legislative advocacy, payroll expense, and insurance expense	Pre-filed	12/16/2014
OK	Oklahoma Corporation Commission Public Service Co. of Oklahoma	PUD 201300201	Authorization of standby and supplemental tariff	Pre-filed Live	12/9/2013 12/19/2013
OK	Oklahoma Corporation Commission Fort Cobb Fuel Authority	PUD 201300134	Fuel prudence review and fuel adjustment clause	Pre-filed Live	10/23/2013 1/30/2014
OK	Oklahoma Corporation Commission Empire District Electric Co.	PUD 201300131	Fuel prudence review and fuel adjustment clause	Pre-filed Live	11/21/2013 12/19/2013
OK	Oklahoma Corporation Commission CenterPoint Energy Oklahoma Gas	PUD 201300127	Fuel prudence review and fuel adjustment clause	Pre-filed Live	10/21/2013 1/23/2014
OK	Oklahoma Corporation Commission Oklahoma Gas & Electric Co.	PUD 201200185	Gas transportation contract extension	Pre-filed Live	9/20/2012 10/9/2012
OK	Oklahoma Corporation Commission Empire District Electric Co.	PUD 201200170	Fuel prudence review and fuel adjustment clause	Pre-filed Live	10/31/2012 12/13/2012
OK	Oklahoma Corporation Commission Oklahoma Gas & Electric Co.	PUD 201200169	Fuel prudence review and fuel adjustment clause	Pre-filed Live	12/19/2012 4/4/2013

Summary Expense Adjustment

Exhibit DG 2-2

Plant Function	Plant 6/30/2016	Empire Proposed Expense	OIEC Proposed Expense	**OIEC Adjustment**
Production	$ 36,669,999	$ 1,103,107	$ 873,302	$ (229,806)
Transmission	9,213,329	214,851	183,668	(31,183)
Distribution	24,631,970	771,684	655,458	(116,226)
General	2,305,665	138,205	131,311	(6,894)
Total Depreciable Plant	72,820,964	2,227,847	1,843,738	(384,109)
Riverton Amortization				(55,748)
Total Adjustment (OK Juris.)				**$ (439,856)**

*Detailed calculations from Exhibit DG 2-3

Detailed Expense Adjustment

Exhibit DG 2-3
Page 1 of 6

		[1]	[2]		[3]		[4]	
			Empire Proposal		OIEC Proposal		OIEC Adjustment - OK	
Account No.	Description	TY End OK Plant 6/30/2016	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	Production Plant							
	Asbury							
310.00	Land and Land Rights	33,898	0.00%					
311.00	Structure & Improvements	574,657	4.48%	25,745	3.80%	21,819	-0.68%	(3,926)
312.00	Boiler Plant Equipment	6,034,469	5.61%	338,534	4.34%	261,913	-1.27%	(76,621)
314.00	Turbo Generator Equipment	1,000,790	5.22%	52,241	4.35%	43,564	-0.87%	(8,677)
315.00	Accessory Electric Equipment	189,661	3.80%	7,207	3.38%	6,412	-0.42%	(795)
316.00	Miscellaneous Power Plant Equipment	63,441	4.38%	2,779	2.83%	1,795	-1.55%	(984)
	Total Asbury	7,896,916	5.40%	426,505	4.25%	335,503	-1.15%	(91,002)
	Riverton							
310.00	Land and Land Rights	3,467	0.00%					
311.00	Structure & Improvements	76,061	11.52%	8,762	11.52%	8,759	0.00%	(3)
312.00	Boiler Plant Equipment	3,538	11.52%	408	11.52%	407	0.00%	(0)
314.00	Turbo Generator Equipment	-	11.52%	-	0.00%	-	-11.52%	-
315.00	Accessory Electric Equipment	11,325	11.52%	1,305	11.52%	1,304	0.00%	(0)
316.00	Miscellaneous Power Plant Equipment	-	11.52%	-	11.52%	-	0.00%	-
	Total Riverton	94,390	11.10%	10,474	11.09%	10,470	0.00%	(4)
	Iatan 1							
310.00	Land and Land Rights	3,367	0.00%					
311.00	Structure & Improvements	114,116	1.96%	2,237	1.50%	1,711	-0.46%	(526)
312.00	Boiler Plant Equipment	2,056,336	3.25%	66,831	2.34%	48,180	-0.91%	(18,651)
312.00	Train	9,106	6.67%	607	0.00%			
314.00	Turbo Generator Equipment	338,019	2.88%	9,735	2.03%	6,869	-0.85%	(2,866)
315.00	Accessory Electric Equipment	220,584	3.67%	8,095	2.23%	4,922	-1.44%	(3,174)
316.00	Miscellaneous Power Plant Equipment	39,711	2.41%	957	1.13%	448	-1.28%	(509)
	Total Iatan 1	2,781,239	3.18%	88,462	2.23%	62,130	-0.95%	(25,725)
	Iatan 2							
310.00	Land and Land Rights	-	0.00%					
311.00	Structure & Improvements	563,911	2.92%	16,466	1.52%	8,577	-1.40%	(7,889)
312.00	Boiler Plant Equipment	3,833,095	1.96%	75,129	1.32%	50,496	-0.64%	(24,632)
314.00	Turbo Generator Equipment	1,323,760	1.54%	20,386	1.38%	18,209	-0.16%	(2,177)

Detailed Expense Adjustment

		[1]	[2]		[3]		[4]	
			Empire Proposal		OIEC Proposal		OIEC Adjustment - OK	
Account No.	Description	TY End OK Plant 6/30/2016	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
315.00	Accessory Electric Equipment	340,123	1.60%	5,442	1.47%	5,013	-0.13%	(429)
316.00	Miscellaneous Power Plant Equipment	7,222	4.18%	302	1.62%	117	-2.56%	(185)
	Total Iatan 2	6,068,111	1.94%	117,725	1.36%	82,413	-0.58%	(35,311)
	Iatan Common							
310.00	Land and Land Rights	200	0.00%					
311.00	Structure & Improvements	406,137	2.92%	11,859	1.52%	6,177	-1.40%	(5,682)
312.00	Boiler Plant Equipment	1,086,680	1.96%	21,299	1.32%	14,316	-0.64%	(6,983)
314.00	Turbo Generator Equipment	35,214	1.54%	542	1.38%	484	-0.16%	(58)
315.00	Accessory Electric Equipment	131,893	1.60%	2,110	1.47%	1,944	-0.13%	(166)
316.00	Miscellaneous Power Plant Equipment	18,185	4.18%	760	1.62%	295	-2.56%	(465)
	Total Iatan Common	1,678,309	2.18%	36,571	1.38%	23,217	-0.80%	(13,354)
	Plum Point							
310.00	Land and Land Rights	26,474	0.00%					
311.00	Structure & Improvements	571,979	2.18%	12,469	2.05%	11,709	-0.13%	(761)
312.00	Boiler Plant Equipment	1,487,854	2.17%	32,286	2.03%	30,243	-0.14%	(2,044)
312.00	Train	146,124	6.67%	9,746	0.00%	-	-6.67%	(9,746)
314.00	Turbo Generator Equipment	470,390	2.18%	10,254	2.05%	9,631	-0.13%	(623)
315.00	Accessory Electric Equipment	145,420	2.12%	3,083	1.99%	2,894	-0.13%	(189)
316.00	Miscellaneous Power Plant Equipment	82,162	2.07%	1,701	1.94%	1,593	-0.13%	(107)
	Total Plum Point	2,930,402	2.37%	69,540	1.91%	56,070	-0.46%	(13,470)
	Ozark Beach Hydro							
330.00	Land and Land Rights	6,269	0.00%					
331.00	Structures & Improvements	22,767	2.39%	544	1.53%	349	-0.86%	(195)
332.00	Reservoirs, Dams, and Waterways	94,516	1.93%	1,824	1.56%	1,471	-0.37%	(353)
333.00	Water Wheels, Turbines & Generators	86,748	3.11%	2,698	2.09%	1,815	-1.02%	(882)
334.00	Accessory Electric Equipment	39,355	3.14%	1,236	2.01%	792	-1.13%	(444)
335.00	Misc. Power Plant Equipment	13,850	3.66%	507	1.40%	195	-2.26%	(312)
	Total Ozark Beach	263,504	2.58%	6,809	1.75%	4,622	-0.83%	(2,186)
	State Line CC							
340.00	Land and Land Rights	23,533	0.00%					

Detailed Expense Adjustment

		[1]	[2]		[3]		[4]	
			Empire Proposal		OIEC Proposal		OIEC Adjustment - OK	
Account No.	Description	TY End OK Plant 6/30/2016	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
341.00	Structures & Improvements	294,676	2.19%	6,453	1.96%	5,767	-0.23%	(687)
342.00	Fuel Holders	13,147	0.00%	-	0.00%	-	0.00%	-
343.00	Prime Movers	2,957,586	2.07%	61,222	2.02%	59,761	-0.05%	(1,461)
344.00	Generators	839,971	2.50%	20,999	2.34%	19,648	-0.16%	(1,352)
345.00	Accessory Electric Equipment	229,552	2.74%	6,290	1.88%	4,326	-0.86%	(1,964)
346.00	Misc. Power Equipment	104,720	2.46%	2,576	2.19%	2,291	-0.27%	(285)
	Various Production CWIP	106,374	3.01%	3,202	0.00%			
	Total State Line CC	4,569,558	2.20%	100,742	2.01%	91,793	-0.20%	(5,748)
	State Line CT							
340.00	Land and Land Rights	329	0.00%					
341.00	Structures & Improvements	30,533	0.00%	-	1.96%	598	1.96%	598
342.00	Fuel Holders	88,216	1.59%	1,403	0.00%	-	-1.59%	(1,403)
343.00	Prime Movers	728,157	2.42%	17,621	2.02%	14,713	-0.40%	(2,908)
344.00	Generators	195,104	1.41%	2,751	2.34%	4,564	0.93%	1,813
345.00	Accessory Electric Equipment	85,215	1.85%	1,576	1.88%	1,606	0.03%	29
346.00	Misc. Power Equipment	7,206	3.77%	272	2.19%	158	-1.58%	(114)
	Total State Line CT	1,134,760	2.08%	23,623	1.91%	21,638	-0.17%	(1,985)
	Energy Center Units 1&2							
340.00	Land and Land Rights	4,579	0.00%					
341.00	Structures & Improvements	60,314	1.61%	971	0.54%	325	-1.07%	(646)
342.00	Fuel Holders	35,706	0.00%	-	0.00%	-	0.00%	-
343.00	Prime Movers	748,571	2.93%	21,933	2.47%	18,492	-0.46%	(3,442)
344.00	Generators	131,127	0.00%	-	0.00%	-	0.00%	-
345.00	Accessory Electric Equipment	57,113	5.55%	3,170	3.02%	1,722	-2.53%	(1,448)
346.00	Misc. Power Equipment	49,818	0.00%	-	0.00%	-	0.00%	-
	Total Energy Center Units 1&2	1,087,229	2.40%	26,074	1.89%	20,538	-0.51%	(5,535)
	Energy Center Units 3&4							
341.00	Structures & Improvements	31,383	3.27%	1,026	2.24%	703	-1.03%	(323)
342.00	Fuel Holders	40,615	2.99%	1,214	2.00%	812	-0.99%	(402)
343.00	Prime Movers	1,350,496	3.26%	44,026	2.23%	30,164	-1.03%	(13,862)
344.00	Generators	17,303	3.20%	554	2.46%	425	-0.74%	(128)
345.00	Accessory Electric Equipment	92,360	3.15%	2,909	2.08%	1,920	-1.07%	(989)

Detailed Expense Adjustment

		[1]	[2]		[3]		[4]	
			Empire Proposal		**OIEC Proposal**		**OIEC Adjustment - OK**	
Account No.	**Description**	**TY End OK Plant 6/30/2016**	**Rate**	**Annual Accrual**	**Rate**	**Annual Accrual**	**Rate**	**Annual Accrual**
346.00	Misc. Power Equipment	29,441	3.12%	919	1.93%	569	-1.19%	(349)
	Total Energy Center Units 3&4	1,561,599	3.24%	50,648	2.22%	34,594	-1.03%	(16,054)
	Riverton CT							
341.00	Structures & Improvements	209,256	4.51%	9,437	3.11%	6,499	-1.40%	(2,939)
342.00	Fuel Holders	12,648	2.87%	363	2.03%	257	-0.84%	(106)
343.00	Prime Movers	191,961	1.85%	3,551	1.17%	2,255	-0.68%	(1,297)
344.00	Generators	49,252	2.36%	1,162	1.77%	870	-0.59%	(292)
345.00	Accessory Electric Equipment	42,539	3.13%	1,331	2.00%	850	-1.13%	(481)
346.00	Misc. Power Equipment	21,997	4.00%	880	2.76%	606	-1.24%	(274)
	Total Riverton CT	527,654	3.17%	16,725	2.15%	11,337	-1.02%	(5,388)
	Riverton Unit 12							
341.00	Structures & Improvements	475,706	2.42%	11,512	2.23%	10,588	-0.19%	(924)
342.00	Fuel Holders	26,172	3.22%	843	2.00%	525	-1.22%	(318)
343.00	Prime Movers	4,171,749	2.01%	83,852	1.95%	81,152	-0.06%	(2,700)
344.00	Generators	586,398	2.05%	12,021	2.01%	11,798	-0.04%	(223)
345.00	Accessory Electric Equipment	736,440	2.64%	19,442	1.84%	13,564	-0.80%	(5,878)
346.00	Misc. Power Equipment	72,856	2.11%	1,537	1.85%	1,348	-0.26%	(189)
	Total Riverton Unit 12	6,069,321	2.13%	129,207	1.96%	118,975	-0.17%	(10,233)
	Riverton Common							
340.00	Land and Land Rights	7,007						
	Total Production Plant	36,669,999	3.01%	1,103,107	2.38%	873,302	-0.63%	(225,997)
	Transmission Plant							
350.00	Land and Land Rights	332,189						
352.00	Structures and Improvements	82,789	1.82%	1,507	1.82%	1,507	0.00%	-
353.00	Station Equipment	3,838,295	2.23%	85,594	1.87%	71,813	-0.36%	(13,781)
354.00	Towers and Fixtures	58,916	1.54%	907	1.54%	907	0.00%	-
355.00	Poles and Fixtures	2,302,140	3.51%	80,805	2.86%	65,775	-0.65%	(15,030)
356.00	Overhead Conductors and Devices	2,341,817	1.71%	40,045	1.61%	37,673	-0.10%	(2,372)

Detailed Expense Adjustment

		[1]	[2]		[3]		[4]	
			Empire Proposal		OIEC Proposal		OIEC Adjustment - OK	
Account No.	Description	TY End OK Plant 6/30/2016	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	Various Transmission CWIP	257,183	2.33%	5,992	2.33%	5,992	0.00%	-
	Total Transmission Plant	9,213,329	2.33%	214,851	1.99%	183,668	-0.34%	(31,183)
	Distribution Plant							
360.00	Land and Land Rights	116,964						
361.00	Structures and Improvements	759,544	1.56%	11,849	1.25%	9,494	-0.31%	(2,355)
362.00	Station Equipment	2,937,758	2.19%	64,337	1.68%	49,388	-0.51%	(14,949)
364.00	Poles, Towers and Fixtures	5,225,525	4.00%	209,021	3.39%	177,136	-0.61%	(31,885)
365.00	Overhead Conductors and Devices	5,487,038	3.39%	186,011	2.74%	150,330	-0.65%	(35,681)
366.00	Underground Conduit	1,097,697	2.62%	28,760	1.98%	21,777	-0.64%	(6,983)
367.00	Underground Conductors & Devices	1,672,643	2.58%	43,154	2.11%	35,278	-0.47%	(7,877)
368.00	Line Transformers	3,073,233	2.08%	63,923	1.96%	60,259	-0.12%	(3,664)
369.00	Services	2,161,201	4.44%	95,957	3.85%	83,123	-0.59%	(12,834)
370.00	Meters	655,345	2.37%	15,532	2.37%	15,532	0.00%	-
371.00	Installations on Customer Premises	463,618	4.43%	20,538	4.43%	20,538	0.00%	-
373.00	Street Lighting and Signal Systems	523,303	3.49%	18,263	3.49%	18,263	0.00%	-
	Various Distribution CWIP	458,100	3.13%	14,339	3.13%	14,339	0.00%	-
	Total Distribution Plant	24,631,970	3.13%	771,684	2.66%	655,458	-0.47%	(116,226)
	General Plant							
389.00	Land and Land Rights	17,105						
390.00	Structures and Improvements	289,604	3.57%	10,339	1.82%	5,266	-1.75%	(5,073)
391.10	Office Furniture and Equipment	162,525	4.76%	7,736	4.76%	7,736	0.00%	-
391.20	Computer Equipment	373,473	10.00%	37,347	10.00%	37,347	0.00%	-
392.00	Transportation Equipment	372,518	7.15%	26,635	7.15%	26,635	0.00%	-
393.00	Stores Equipment	23,609	2.50%	590	2.50%	590	0.00%	-
394.00	Tools, Shop and Garage Equipment	182,492	5.00%	9,125	5.00%	9,125	0.00%	-
395.00	Laboratory Equipment	39,830	2.17%	864	2.17%	864	0.00%	-
396.00	Power Operated Equipment	509,573	5.65%	28,791	5.65%	28,791	0.00%	-
397.00	Communication Equipment	309,396	4.76%	14,727	4.76%	14,727	0.00%	-
398.00	Miscellaneous Equipment	7,330	3.13%	229	3.13%	229	-0.01%	-
	Various General CWIP	18,211	10.00%	1,821				

Detailed Expense Adjustment

		[1]	[2]		[3]		[4]	
			Empire Proposal		OIEC Proposal		OIEC Adjustment - OK	
Account No.	**Description**	**TY End OK Plant 6/30/2016**	**Rate**	**Annual Accrual**	**Rate**	**Annual Accrual**	**Rate**	**Annual Accrual**
	Total General Plant	2,305,665	5.99%	138,205	5.70%	131,311	-0.30%	(5,073)
	TOTAL ELECTRIC PLANT	**$ 72,820,964**	**3.06%**	**$ 2,227,847**	**2.53%**	**$ 1,843,738**	**-0.53%**	**$ (378,478)**

[1] Company WP I-1

[2] Rate from depreciation study; annual accrual = rate x [1]

[3] Rates from Exhibit DG 2-5; Accrual = rate x [1]

[4] = [3] - [2]

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			Empire PROPOSAL				OIEC PROPOSAL				Difference	
			Iowa Curve			Annual	Iowa Curve			Annual		Annual
Account No.	Description	Plant 6/30/2015	Type	AL	Rate	Accrual	Type	AL	Rate	Accrual	Rate	Accrual
	Production Plant											
	Asbury											
311.00	Structure & Improvements	$ 20,684,563			4.48%	$ 927,565	0 -	0	3.80%	$ 694,546	-0.69%	$ (233,019)
312.00	Boiler Plant Equipment	219,488,184			5.61%	12,317,957	0 -	0	4.34%	9,418,710	-1.27%	(2,899,248)
314.00	Turbo Generator Equipment	36,200,752			5.22%	1,890,128	0 -	0	4.35%	1,568,802	-0.87%	(321,326)
315.00	Accessory Electric Equipment	6,837,913			3.80%	259,599	0 -	0	3.38%	241,871	-0.42%	(17,728)
316.00	Miscellaneous Power Plant Equipment	2,290,838			4.38%	100,359	0 -	0	2.83%	64,825	-1.55%	(35,534)
	Total Asbury	285,502,250			5.43%	15,495,609			4.27%	11,988,754	-1.16%	(3,506,855)
	Riverton											
311.00	Structure & Improvements	2,654,253			11.52%	305,655	0 -	0	11.52%	305,655	0.00%	0
312.00	Boiler Plant Equipment	129,030			11.52%	14,859	0 -	0	11.52%	14,859	0.00%	0
314.00	Turbo Generator Equipment	-			11.52%	-	0 -	0	0.00%	-	-11.52%	-
315.00	Accessory Electric Equipment	409,165			11.52%	47,118	0 -	0	11.52%	47,118	0.00%	0
316.00	Miscellaneous Power Plant Equipment	4,515			11.52%	520	0 -	0	11.52%	520	0.00%	0
	Total Riverton	3,196,964			11.52%	368,152			11.52%	368,152	0.00%	0
	Iatan 1											
311.00	Structure & Improvements	4,134,403			1.96%	81,009	0 -	0	1.50%	65,362	-0.46%	(15,646)
312.00	Boiler Plant Equipment	74,776,018			3.25%	2,433,289	0 -	0	2.34%	1,730,991	-0.91%	(702,298)
312.00	Train	329,005			6.67%	21,945	0 -	0	0.00%	-	-6.67%	(21,945)
314.00	Turbo Generator Equipment	12,115,969			2.88%	348,556	0 -	0	2.03%	225,888	-0.84%	(122,669)
315.00	Accessory Electric Equipment	7,524,873			3.67%	276,066	0 -	0	2.23%	154,332	-1.44%	(121,734)
316.00	Miscellaneous Power Plant Equipment	1,448,765			2.41%	34,979	0 -	0	1.13%	15,969	-1.29%	(19,010)
	Total Iatan 1	100,329,034			3.19%	3,195,844			2.24%	2,192,542	-0.94%	(987,656)
	Iatan 2											
311.00	Structure & Improvements	20,379,010			2.92%	594,404	0 -	0	1.52%	525,931	-1.40%	(68,473)
312.00	Boiler Plant Equipment	137,576,191			1.96%	2,698,408	0 -	0	1.32%	1,809,921	-0.64%	(888,487)
314.00	Turbo Generator Equipment	47,746,420			1.54%	733,825	0 -	0	1.38%	673,454	-0.16%	(60,371)
315.00	Accessory Electric Equipment	12,275,927			1.60%	195,922	0 -	0	1.47%	246,924	-0.12%	51,003
316.00	Miscellaneous Power Plant Equipment	231,170			4.18%	9,655	0 -	0	1.62%	11,656	-2.55%	2,001
	Total Iatan 2	218,208,718			1.94%	4,232,214			1.37%	3,267,887	-0.57%	(964,327)
	Iatan Common											
311.00	Structure & Improvements	14,255,204			2.92%	415,788	0 -	0	1.52%	216,826	-1.40%	(198,962)
312.00	Boiler Plant Equipment	39,149,809			1.96%	767,881	0 -	0	1.32%	515,751	-0.64%	(252,130)
314.00	Turbo Generator Equipment	1,239,082			1.54%	19,044	0 -	0	1.38%	17,044	-0.16%	(1,999)
315.00	Accessory Electric Equipment	4,760,916			1.60%	75,983	0 -	0	1.47%	70,169	-0.12%	(5,815)
316.00	Miscellaneous Power Plant Equipment	631,040			4.18%	26,357	0 -	0	1.62%	10,250	-2.55%	(16,106)

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			Empire PROPOSAL				OIEC PROPOSAL				Difference	
			Iowa Curve				Iowa Curve					
Account No.	Description	Plant 6/30/2015	Type	AL	Rate	Annual Accrual	Type	AL	Rate	Annual Accrual	Rate	Annual Accrual
	Total Iatan Common	60,036,052			2.17%	1,305,053			1.38%	830,041	-0.79%	(475,012)
	Plum Point											
311.00	Structure & Improvements	20,665,934			2.18%	450,702	0 -	0	2.05%	423,039	-0.13%	(27,663)
312.00	Boiler Plant Equipment	53,609,588			2.17%	1,161,371	0 -	0	2.03%	1,077,936	-0.13%	(83,434)
312.00	Train	5,267,226			6.67%	351,324	0 -	0	0.00%	-	-6.67%	(351,324)
314.00	Turbo Generator Equipment	16,961,881			2.18%	369,996	0 -	0	2.05%	347,185	-0.13%	(22,811)
315.00	Accessory Electric Equipment	5,254,093			2.12%	111,574	0 -	0	1.99%	104,472	-0.13%	(7,103)
316.00	Miscellaneous Power Plant Equipment	2,968,554			2.07%	61,511	0 -	0	1.94%	57,573	-0.13%	(3,938)
	Total Plum Point	104,727,276			2.39%	2,506,478			2.03%	2,010,205	-0.36%	(496,273)
	Ozark Beach Hydro											
331.00	Structures & Improvements	799,582			2.39%	19,115	0 -	0	1.53%	12,225	-0.86%	(6,890)
332.00	Reservoirs, Dams, and Waterways	3,414,912			1.93%	65,970	0 -	0	1.56%	53,143	-0.38%	(12,827)
333.00	Water Wheels, Turbines & Generators	3,181,201			3.11%	99,048	0 -	0	2.09%	66,465	-1.02%	(32,583)
334.00	Accessory Electric Equipment	1,404,531			3.14%	44,038	0 -	0	2.01%	27,692	-1.12%	(16,346)
335.00	Misc. Power Plant Equipment	492,647			3.66%	18,035	0 -	0	1.40%	6,357	-2.26%	(11,677)
	Total Ozark Beach	9,292,873			2.65%	246,207			1.80%	165,883	-0.85%	(80,324)
	State Line CC											
341.00	Structures & Improvements	10,635,737			2.19%	232,419	0 -	0	1.96%	208,126	-0.23%	(24,293)
342.00	Fuel Holders	409,439			0.00%	-	0 -	0	0.00%	(34,695)	0.00%	(34,695)
343.00	Prime Movers	106,742,478			2.07%	2,212,555	0 -	0	2.02%	2,107,335	-0.05%	(105,220)
344.00	Generators	31,262,316			2.50%	782,869	0 -	0	2.34%	730,981	-0.17%	(51,888)
345.00	Accessory Electric Equipment	8,292,989			2.74%	227,082	0 -	0	1.88%	154,672	-0.85%	(72,410)
346.00	Misc. Power Equipment	3,679,458			2.46%	90,418	0 -	0	2.19%	63,676	-0.27%	(26,742)
	Total State Line CC	161,022,417			2.20%	3,545,343			2.05%	3,230,095	-0.15%	(315,248)
	State Line CT											
341.00	Structures & Improvements	1,103,160			0.00%	-	0 -	0	0.00%	(2,843)	0.00%	(2,843)
342.00	Fuel Holders	3,187,313			1.59%	50,587	0 -	0	1.16%	37,369	-0.43%	(13,218)
343.00	Prime Movers	26,308,743			2.42%	636,903	0 -	0	1.81%	495,902	-0.61%	(141,001)
344.00	Generators	7,049,204			1.41%	99,645	0 -	0	1.32%	94,943	-0.09%	(4,702)
345.00	Accessory Electric Equipment	2,875,110			1.85%	53,229	0 -	0	1.40%	40,468	-0.45%	(12,762)
346.00	Misc. Power Equipment	292,744			3.77%	11,038	0 -	0	2.32%	24,182	-1.45%	13,143
	Total State Line CT	40,816,274			2.09%	851,403			1.61%	690,021	-0.47%	(161,382)
	Energy Center Units 1&2											
341.00	Structures & Improvements	2,134,907			1.61%	34,304	0 -	0	0.54%	11,498	-1.07%	(22,806)
342.00	Fuel Holders	1,290,095			0.00%	-	0 -	0	0.00%	(16,700)	0.00%	(16,700)

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			Empire PROPOSAL				OIEC PROPOSAL				Difference	
			Iowa Curve			Annual	Iowa Curve			Annual		Annual
Account No.	Description	Plant 6/30/2015	Type	AL	Rate	Accrual	Type	AL	Rate	Accrual	Rate	Accrual
343.00	Prime Movers	27,825,476			2.93%	814,387	0	- 0	2.47%	686,697	-0.46%	(127,690)
344.00	Generators	4,737,700			0.00%	-	0	- 0	0.00%	(121,199)	0.00%	(121,199)
345.00	Accessory Electric Equipment	2,263,612			5.55%	125,677	0	- 0	3.02%	67,804	-2.54%	(57,873)
346.00	Misc. Power Equipment	1,816,646			0.00%	-	0	- 0	0.00%	(81,828)	0.00%	(81,828)
	Total Energy Center Units 1&2	40,068,437			2.43%	974,369			1.36%	546,273	-1.07%	(428,096)
	Energy Center Units 3&4											
341.00	Structures & Improvements	1,133,884			3.27%	37,058	0	- 0	2.24%	25,716	-1.03%	(11,342)
342.00	Fuel Holders	1,467,460			2.99%	43,932	0	- 0	2.00%	29,347	-0.99%	(14,585)
343.00	Prime Movers	48,234,546			3.26%	1,574,440	0	- 0	2.23%	1,077,346	-1.03%	(497,094)
344.00	Generators	519,289			3.20%	16,625	0	- 0	2.46%	12,765	-0.74%	(3,860)
345.00	Accessory Electric Equipment	3,338,042			3.15%	105,277	0	- 0	2.08%	68,583	-1.07%	(36,694)
346.00	Misc. Power Equipment	1,105,379			3.12%	34,462	0	- 0	1.93%	21,376	-1.18%	(13,085)
	Total Energy Center Units 3&4	55,798,599			3.25%	1,811,793			2.21%	1,235,134	-1.03%	(576,660)
	Riverton CT											
341.00	Structures & Improvements	7,339,079			4.51%	331,187	0	- 0	3.11%	39,025	-1.41%	(292,162)
342.00	Fuel Holders	456,988			2.87%	13,116	0	- 0	2.03%	9,648	-0.84%	(3,467)
343.00	Prime Movers	6,671,999			1.85%	123,204	0	- 0	1.17%	90,697	-0.67%	(32,507)
344.00	Generators	1,764,497			2.36%	41,719	0	- 0	1.77%	35,710	-0.60%	(6,010)
345.00	Accessory Electric Equipment	1,430,904			3.13%	44,828	0	- 0	2.00%	32,994	-1.13%	(11,834)
346.00	Misc. Power Equipment	740,456			4.00%	29,581	0	- 0	2.76%	5,934	-1.24%	(23,647)
	Total Riverton CT	18,403,922			3.17%	583,636			1.60%	214,008	-1.57%	(369,627)
	Riverton Unit 12											
341.00	Structures & Improvements	494,249			2.42%	11,959	0	- 0	2.23%	12,326	-0.19%	367
342.00	Fuel Holders	945,601			3.22%	30,410	0	- 0	2.00%	18,958	-1.21%	(11,452)
343.00	Prime Movers	16,505,226			2.01%	331,221	0	- 0	1.95%	320,862	-0.06%	(10,359)
344.00	Generators	11,537,062			2.05%	236,636	0	- 0	2.01%	232,337	-0.04%	(4,299)
345.00	Accessory Electric Equipment	8,620,428			2.64%	227,456	0	- 0	1.84%	175,245	-0.80%	(52,211)
346.00	Misc. Power Equipment	1,484,187			2.11%	31,262	0	- 0	1.85%	27,458	-0.26%	(3,804)
	Total Riverton Unit 12	39,586,753			2.20%	868,944			1.94%	787,186	-0.25%	(81,758)
	Total Production Plant	1,136,989,568			3.16%	35,985,045			2.42%	27,526,181	-0.75%	(8,443,218)
	Transmission Plant											
352.00	Structures and Improvements	2,901,325		- 55	1.82%	52,804	R2	- 55	1.82%	52,804	0.00%	-
353.00	Station Equipment	119,157,090	S2	- 52	2.23%	2,657,203	R2	- 62	1.87%	2,194,781	-0.36%	(462,422)
354.00	Towers and Fixtures	2,136,752		- 65	1.54%	32,906	R2	- 65	1.54%	32,906	0.00%	-

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			Empire PROPOSAL				OIEC PROPOSAL				Difference	
Account		Plant	Iowa Curve			Annual	Iowa Curve			Annual		Annual
No.	Description	6/30/2015	Type	AL	Rate	Accrual	Type	AL	Rate	Accrual	Rate	Accrual
355.00	Poles and Fixtures	79,706,458	S2.5	57	3.51%	2,797,697	R3	70	2.86%	2,117,624	-0.65%	(680,073)
356.00	Overhead Conductors and Devices	80,991,018		65	1.71%	1,384,946	R3	69	1.61%	1,295,311	-0.10%	(89,636)
359.00	Roads and Trails	-			0.00%	-			0.00%	-	0.00%	-
	Total Transmission Plant	284,892,643			2.43%	6,925,556			2.06%	5,692,595	-0.38%	(1,232,131)
	Distribution Plant											
361.00	Structures and Improvements	27,401,649	S1	64	1.56%	427,466	R2	80	1.25%	362,706	-0.31%	(64,760)
362.00	Station Equipment	100,170,779	R1.5	53	2.19%	2,193,740	R1	69	1.68%	1,680,510	-0.51%	(513,230)
364.00	Poles, Towers and Fixtures	183,365,567	R3	50	4.00%	7,334,623	R4	59	3.39%	6,103,694	-0.61%	(1,230,929)
365.00	Overhead Conductors and Devices	193,449,947	R2.5	59	3.39%	6,557,953	R2.5	73	2.74%	5,210,366	-0.65%	(1,347,587)
366.00	Underground Conduit	38,030,668	R4	47	2.62%	996,404	R2.5	62	1.98%	739,618	-0.64%	(256,786)
367.00	Underground Conductors & Devices	59,875,907	R2	45	2.58%	1,544,798	R1.5	55	2.11%	1,247,259	-0.47%	(297,540)
368.00	Line Transformers	108,466,691	R2	48	2.08%	2,256,107	R2	51	1.96%	2,076,083	-0.12%	(180,024)
369.00	Services	77,775,708	R4	45	4.44%	3,453,241	R5	52	3.85%	2,954,250	-0.59%	(498,992)
370.00	Meters	22,526,507	S0	43	2.37%	533,878	S0	43	2.37%	533,878	0.00%	-
371.00	Installations on Customer Premises	16,947,926	R1	30	4.43%	750,793	R1	30	4.43%	750,793	0.00%	-
373.00	Street Lighting and Signal Systems	18,968,907	R1	45	3.49%	662,015	R1	45	3.49%	662,015	0.00%	-
	Total Distribution Plant	846,980,255			3.15%	26,711,018			2.67%	22,300,779	-0.49%	(4,389,847)
	General Plant											
390.00	Structures and Improvements	10,883,118	L3	28	3.57%	388,527	L0	55	1.82%	181,692	-1.75%	(206,835)
391.10	Office Furniture and Equipment	6,160,960	R1	21	4.76%	293,262	R1	21	4.76%	293,262	0.00%	-
391.20	Computer Equipment	13,895,203		10	10.00%	1,389,520	SQ	10	10.00%	1,389,520	0.00%	-
392.00	Transportation Equipment	12,152,005	L2	13	7.15%	868,868	L2	13	7.15%	868,868	0.00%	-
393.00	Stores Equipment	801,823	R2	40	2.50%	20,046	R2	40	2.50%	20,046	0.00%	-
394.00	Tools, Shop and Garage Equipment	5,918,332		20	5.00%	295,917	SQ	20	5.00%	295,917	0.00%	-
395.00	Laboratory Equipment	1,292,173	R3	46	2.17%	28,040	R3	46	2.17%	28,040	0.00%	-
396.00	Power Operated Equipment	17,618,256	R3	17	5.65%	995,431	R3	17	5.65%	995,431	0.00%	-
397.00	Communication Equipment	12,014,046	L1	21	4.76%	571,869	L1	21	4.76%	571,869	0.00%	-
398.00	Miscellaneous Equipment	273,321	S0	32	3.13%	8,555	S0	32	3.13%	8,555	-0.01%	-
	Total General Plant	81,009,237			6.00%	4,860,035			5.84%	4,537,386	-0.16%	(206,835)
	TOTAL PLANT STUDIED	**$ 2,349,871,702**			**3.17%**	**$ 74,481,654**			**2.58%**	**$ 60,056,941**	**-0.59%**	**$ (14,272,031)**

Detailed Rate Comparison

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		[1]	[2]				[3]				[4]	
			Empire PROPOSAL				OIEC PROPOSAL				Difference	
			Iowa Curve				Iowa Curve					
Account No.	Description	Plant 6/30/2015	Type	AL	Rate	Annual Accrual	Type	AL	Rate	Annual Accrual	Rate	Annual Accrual

[1] From Company Depreciation Study
[2] From Company Depreciation Study
[3] From Rate Development exhibit (some unadjusted annual accruals hard coded to match Company proposal due to rounding)
[4] = [3] - [2]

Depreciation Rate Development

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		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Account		Plant	Iowa Curve		Net	Depreciable	Book	Future	Rem. Life,	Service Life		Net Salvage		Total	
No.	Description	12/31/2014	Type	AL	Salvage	Base	Reserve	Accruals	Avg. Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	Production Plant														
	Asbury														
311.00	Structure & Improvements	$ 18,292,563			0.0%	$ 18,292,563	$ 4,054,373	$ 14,238,191	20.50	$ 694,546	3.80%	$ -	0.00%	$ 694,546	**3.80%**
312.00	Boiler Plant Equipment	217,007,193			0.0%	217,007,193	23,923,643	193,083,550	20.50	9,418,710	4.34%	-	0.00%	9,418,710	**4.34%**
314.00	Turbo Generator Equipment	36,039,914			0.0%	36,039,914	3,879,472	32,160,443	20.50	1,568,802	4.35%	-	0.00%	1,568,802	**4.35%**
315.00	Accessory Electric Equipment	7,154,041			0.0%	7,154,041	2,195,678	4,958,363	20.50	241,871	3.38%	-	0.00%	241,871	**3.38%**
316.00	Miscellaneous Power Plant Equipment	2,290,843			0.0%	2,290,843	961,930	1,328,913	20.50	64,825	2.83%	-	0.00%	64,825	**2.83%**
	Total Asbury	280,784,554				280,784,554	35,015,095	245,769,459	20.50	11,988,754	4.27%	-	0.00%	11,988,754	**4.27%**
	Riverton														
311.00	Structure & Improvements	2,654,253			0.0%	2,654,253	1,737,288	916,965	3.00	305,655	11.52%	-	0.00%	305,655	**11.52%**
312.00	Boiler Plant Equipment	129,030			0.0%	129,030	84,454	44,576	3.00	14,859	11.52%	-	0.00%	14,859	**11.52%**
314.00	Turbo Generator Equipment	-			0.0%	-	-	-	3.00	-	0.00%	-	0.00%	-	**0.00%**
315.00	Accessory Electric Equipment	409,165			0.0%	409,165	267,811	141,354	3.00	47,118	11.52%	-	0.00%	47,118	**11.52%**
316.00	Miscellaneous Power Plant Equipment	4,515			0.0%	4,515	2,955	1,560	3.00	520	11.52%	-	0.00%	520	**11.52%**
	Total Riverton	3,196,964				3,196,964	2,092,509	1,104,455	3.00	368,152	11.52%	-	0.00%	368,152	**11.52%**
	Iatan 1														
311.00	Structure & Improvements	4,359,286			0.0%	4,359,286	2,692,543	1,666,742	25.50	65,362	1.50%	-	0.00%	65,362	**1.50%**
312.00	Boiler Plant Equipment	73,879,236			0.0%	73,879,236	29,738,977	44,140,259	25.50	1,730,991	2.34%	-	0.00%	1,730,991	**2.34%**
312.00	Train	-			0.0%	-	-	-	25.50	-	0.00%	-	0.00%	-	**0.00%**
314.00	Turbo Generator Equipment	11,115,815			0.0%	11,115,815	5,355,678	5,760,138	25.50	225,888	2.03%	-	0.00%	225,888	**2.03%**
315.00	Accessory Electric Equipment	6,916,869			0.0%	6,916,869	2,981,400	3,935,469	25.50	154,332	2.23%	-	0.00%	154,332	**2.23%**
316.00	Miscellaneous Power Plant Equipment	1,414,804			0.0%	1,414,804	1,007,595	407,208	25.50	15,969	1.13%	-	0.00%	15,969	**1.13%**
	Total Iatan 1	97,686,010				97,686,010	41,776,193	55,909,817	25.50	2,192,542	2.24%	-	0.00%	2,192,542	**2.24%**
	Iatan 2														
311.00	Structure & Improvements	34,577,245			0.0%	34,577,245	5,388,070	29,189,175	55.50	525,931	1.52%	-	0.00%	525,931	**1.52%**
312.00	Boiler Plant Equipment	137,388,055			0.0%	137,388,055	36,937,440	100,450,615	55.50	1,809,921	1.32%	-	0.00%	1,809,921	**1.32%**
314.00	Turbo Generator Equipment	48,958,112			0.0%	48,958,112	11,581,403	37,376,709	55.50	673,454	1.38%	-	0.00%	673,454	**1.38%**
315.00	Accessory Electric Equipment	16,753,742			0.0%	16,753,742	3,049,438	13,704,305	55.50	246,924	1.47%	-	0.00%	246,924	**1.47%**
316.00	Miscellaneous Power Plant Equipment	717,586			0.0%	717,586	70,673	646,913	55.50	11,656	1.62%	-	0.00%	11,656	**1.62%**
	Total Iatan 2	238,394,740				238,394,740	57,027,024	181,367,716	55.50	3,267,887	1.37%	-	0.00%	3,267,887	**1.37%**
	Iatan Common														
311.00	Structure & Improvements	14,255,204			0.0%	14,255,204	535,129	13,720,075	55.50					216,826	**1.52%**
312.00	Boiler Plant Equipment	39,149,809			0.0%	39,149,809	4,031,332	35,118,477	55.50					515,751	**1.32%**
314.00	Turbo Generator Equipment	1,239,082			0.0%	1,239,082	47,622	1,191,461	55.50					17,044	**1.38%**
315.00	Accessory Electric Equipment	4,760,916			0.0%	4,760,916	187,623	4,573,292	55.50					70,169	**1.47%**
316.00	Miscellaneous Power Plant Equipment	631,040			0.0%	631,040	33,402	597,638	55.50					10,250	**1.62%**
	Total Iatan Common	60,036,052				60,036,052	4,835,108	55,200,944	66.50	-	0.00%	-	1.38%	830,041	**1.38%**
	Plum Point														
311.00	Structure & Improvements	20,665,934			0.0%	20,665,934	1,417,641	19,248,293	45.50	423,039	2.05%	-	0.00%	423,039	**2.05%**
312.00	Boiler Plant Equipment	53,031,016			0.0%	53,031,016	3,984,918	49,046,098	45.50	1,077,936	2.03%	-	0.00%	1,077,936	**2.03%**
312.00	Train	-			0.0%	-		-	45.50	-	0.00%	-	0.00%	-	**0.00%**
314.00	Turbo Generator Equipment	16,956,702			0.0%	16,956,702	1,159,784	15,796,918	45.50	347,185	2.05%	-	0.00%	347,185	**2.05%**
315.00	Accessory Electric Equipment	5,248,915			0.0%	5,248,915	495,457	4,753,458	45.50	104,472	1.99%	-	0.00%	104,472	**1.99%**
316.00	Miscellaneous Power Plant Equipment	2,968,554			0.0%	2,968,554	349,001	2,619,553	45.50	57,573	1.94%	-	0.00%	57,573	**1.94%**
	Total Plum Point	98,871,121				98,871,121	7,406,801	91,464,320	45.50	2,010,205	2.03%	-	0.00%	2,010,205	**2.03%**
	Ozark Beach Hydro														
331.00	Structures & Improvements	796,556			0.0%	796,556	325,891	470,665	38.50	12,225	1.53%	-	0.00%	12,225	**1.53%**
332.00	Reservoirs, Dams, and Waterways	3,414,911			0.0%	3,414,911	1,368,904	2,046,007	38.50	53,143	1.56%	-	0.00%	53,143	**1.56%**
333.00	Water Wheels, Turbines & Generators	3,175,990			0.0%	3,175,990	617,071	2,558,918	38.50	66,465	2.09%	-	0.00%	66,465	**2.09%**
334.00	Accessory Electric Equipment	1,375,734			0.0%	1,375,734	309,583	1,066,151	38.50	27,692	2.01%	-	0.00%	27,692	**2.01%**
335.00	Misc. Power Plant Equipment	452,661			0.0%	452,661	207,899	244,761	38.50	6,357	1.40%	-	0.00%	6,357	**1.40%**
	Total Ozark Beach	9,215,852				9,215,852	2,829,348	6,386,503	38.50	165,883	1.80%	-	0.00%	165,883	**1.80%**
	State Line CC														
341.00	Structures & Improvements	10,635,060			0.0%	10,635,060	3,038,448	7,596,612	36.50	208,126	1.96%	-	0.00%	208,126	**1.96%**

Depreciation Rate Development

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		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
			Iowa Curve							Service Life		Net Salvage		Total	
Account No.	Description	Plant 12/31/2014	Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Rem. Life, Avg. Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
342.00	Fuel Holders	366,555			0.0%	366,555	1,632,929	(1,266,373)	36.50	(34,695)	-9.47%	-	9.47%	(34,695)	**0.00%**
343.00	Prime Movers	104,291,940			0.0%	104,291,940	27,374,209	76,917,731	36.50	2,107,335	2.02%	-	0.00%	2,107,335	**2.02%**
344.00	Generators	31,250,753			0.0%	31,250,753	4,569,953	26,680,801	36.50	730,981	2.34%	-	0.00%	730,981	**2.34%**
345.00	Accessory Electric Equipment	8,207,163			0.0%	8,207,163	2,561,645	5,645,518	36.50	154,672	1.88%	-	0.00%	154,672	**1.88%**
346.00	Misc. Power Equipment	2,910,958			0.0%	2,910,958	586,771	2,324,188	36.50	63,676	2.19%	-	0.00%	63,676	**2.19%**
	Total State Line CC	157,662,430				157,662,430	39,763,954	117,898,476	36.50	3,230,095	2.05%	-	0.00%	3,230,095	**2.05%**
	State Line CT														
341.00	Structures & Improvements	1,103,839			0.0%	1,103,839	1,190,550	(86,711)	30.50	(2,843)	-0.26%	-	0.26%	(2,843)	**0.00%**
342.00	Fuel Holders	3,230,198			0.0%	3,230,198	2,090,436	1,139,762	30.50	37,369	1.16%	-	0.00%	37,369	**1.16%**
343.00	Prime Movers	27,377,664			0.0%	27,377,664	12,252,645	15,125,018	30.50	495,902	1.81%	-	0.00%	495,902	**1.81%**
344.00	Generators	7,178,571			0.0%	7,178,571	4,282,803	2,895,768	30.50	94,943	1.32%	-	0.00%	94,943	**1.32%**
345.00	Accessory Electric Equipment	2,896,245			0.0%	2,896,245	1,661,982	1,234,263	30.50	40,468	1.40%	-	0.00%	40,468	**1.40%**
346.00	Misc. Power Equipment	1,041,157			0.0%	1,041,157	303,610	737,548	30.50	24,182	2.32%	-	0.00%	24,182	**2.32%**
	Total State Line CT	42,827,674				42,827,674	21,782,026	21,045,648	30.50	690,021	1.61%	-	0.00%	690,021	**1.61%**
	Energy Center Units 1&2														
341.00	Structures & Improvements	2,134,901			0.0%	2,134,901	1,945,178	189,723	16.50	11,498	0.54%	-	0.00%	11,498	**0.54%**
342.00	Fuel Holders	1,290,086			0.0%	1,290,086	1,565,630	(275,544)	16.50	(16,700)	-1.29%	-	1.29%	(16,700)	**0.00%**
343.00	Prime Movers	27,798,738			0.0%	27,798,738	16,468,237	11,330,501	16.50	686,697	2.47%	-	0.00%	686,697	**2.47%**
344.00	Generators	4,737,701			0.0%	4,737,701	6,737,484	(1,999,783)	16.50	(121,199)	-2.56%	-	2.56%	(121,199)	**0.00%**
345.00	Accessory Electric Equipment	2,248,690			0.0%	2,248,690	1,129,918	1,118,772	16.50	67,804	3.02%	-	0.00%	67,804	**3.02%**
346.00	Misc. Power Equipment	1,813,312			0.0%	1,813,312	3,163,476	(1,350,164)	16.50	(81,828)	-4.51%	-	4.51%	(81,828)	**0.00%**
	Total Energy Center Units 1&2	40,023,428				40,023,428	31,009,924	9,013,505	16.50	546,273	1.36%	-	0.00%	546,273	**1.36%**
	Energy Center Units 3&4														
341.00	Structures & Improvements	1,147,718			0.0%	1,147,718	157,634	990,084	38.50	25,716	2.24%	-	0.00%	25,716	**2.24%**
342.00	Fuel Holders	1,467,461			0.0%	1,467,461	337,597	1,129,865	38.50	29,347	2.00%	-	0.00%	29,347	**2.00%**
343.00	Prime Movers	48,234,546			0.0%	48,234,546	6,756,732	41,477,814	38.50	1,077,346	2.23%	-	0.00%	1,077,346	**2.23%**
344.00	Generators	519,289			0.0%	519,289	27,820	491,468	38.50	12,765	2.46%	-	0.00%	12,765	**2.46%**
345.00	Accessory Electric Equipment	3,298,748			0.0%	3,298,748	658,318	2,640,430	38.50	68,583	2.08%	-	0.00%	68,583	**2.08%**
346.00	Misc. Power Equipment	1,105,378			0.0%	1,105,378	282,393	822,985	38.50	21,376	1.93%	-	0.00%	21,376	**1.93%**
	Total Energy Center Units 3&4	55,773,139				55,773,139	8,220,493	47,552,646	38.50	1,235,134	2.21%	-	0.00%	1,235,134	**2.21%**
	Riverton CT														
341.00	Structures & Improvements	1,256,593			0.0%	1,256,593	339,512	917,080	23.50	39,025	3.11%	-	0.00%	39,025	**3.11%**
342.00	Fuel Holders	474,674			0.0%	474,674	247,937	226,737	23.50	9,648	2.03%	-	0.00%	9,648	**2.03%**
343.00	Prime Movers	7,721,713			0.0%	7,721,713	5,590,330	2,131,383	23.50	90,697	1.17%	-	0.00%	90,697	**1.17%**
344.00	Generators	2,020,924			0.0%	2,020,924	1,181,750	839,174	23.50	35,710	1.77%	-	0.00%	35,710	**1.77%**
345.00	Accessory Electric Equipment	1,651,026			0.0%	1,651,026	875,658	775,368	23.50	32,994	2.00%	-	0.00%	32,994	**2.00%**
346.00	Misc. Power Equipment	215,291			0.0%	215,291	75,836	139,455	23.50	5,934	2.76%	-	0.00%	5,934	**2.76%**
	Total Riverton CT	13,340,220				13,340,220	8,311,024	5,029,197	23.50	214,008	1.60%	-	0.00%	214,008	**1.60%**
	Riverton Unit 12														
341.00	Structures & Improvements	553,801			0.0%	553,801	29,934	523,867	42.50	12,326	2.23%	-	0.00%	12,326	**2.23%**
342.00	Fuel Holders	945,602			0.0%	945,602	139,901	805,701	42.50	18,958	2.00%	-	0.00%	18,958	**2.00%**
343.00	Prime Movers	16,494,326			0.0%	16,494,326	2,857,695	13,636,630	42.50	320,862	1.95%	-	0.00%	320,862	**1.95%**
344.00	Generators	11,548,070			0.0%	11,548,070	1,673,752	9,874,318	42.50	232,337	2.01%	-	0.00%	232,337	**2.01%**
345.00	Accessory Electric Equipment	9,514,852			0.0%	9,514,852	2,066,927	7,447,925	42.50	175,245	1.84%	-	0.00%	175,245	**1.84%**
346.00	Misc. Power Equipment	1,484,186			0.0%	1,484,186	317,227	1,166,959	42.50	27,458	1.85%	-	0.00%	27,458	**1.85%**
	Total Riverton Unit 12	40,540,836				40,540,836	7,085,435	33,455,401	42.50	787,186	1.94%	-	0.00%	787,186	**1.94%**
	Total Production Plant	1,138,353,021				1,138,353,021	267,154,934	871,198,087	31.65	26,696,140	2.35%	-	0.07%	27,526,181	2.42%
	Transmission Plant														
352.00	Structures and Improvements	2,900,606	R2	55	0.0%	2,900,606	1,335,234	1,565,372	55.00	52,738	1.82%	-	0.00%	52,738	**1.82%**
353.00	Station Equipment	117,307,244	R2	62	-16.0%	136,076,403	42,589,034	93,487,368	62.00	1,892,052	1.61%	302,728	0.26%	2,194,781	**1.87%**
354.00	Towers and Fixtures	2,089,249	R2	65	0.0%	2,089,249	865,985	1,223,264	65.00	32,142	1.54%	-	0.00%	32,142	**1.54%**
355.00	Poles and Fixtures	74,116,825	R3	70	-100.0%	148,233,649	23,164,238	125,069,412	70.00	1,058,812	1.43%	1,058,812	1.43%	2,117,624	**2.86%**
356.00	Overhead Conductors and Devices	80,519,307	R3	69	-11.0%	89,376,431	24,547,155	64,829,277	69.00	1,166,946	1.45%	128,364	0.16%	1,295,311	**1.61%**
359.00	Roads and Trails														

Depreciation Rate Development

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		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
			Iowa Curve							Service Life		Net Salvage		Total	
Account No.	Description	Plant 12/31/2014	Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Rem. Life, Avg. Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	Total Transmission Plant	276,933,230				378,676,338	92,501,645	286,174,693	50.27	4,202,691	1.52%	1,489,904	0.54%	5,692,595	2.06%
	Distribution Plant														
361.00	Structures and Improvements	29,016,469	R2	80	0.0%	29,016,469	4,898,782	24,117,687	80.00	362,706	1.25%	-	0.00%	362,706	**1.25%**
362.00	Station Equipment	99,961,353	R1	69	-16.0%	115,955,170	35,385,582	80,569,587	69.00	1,448,715	1.45%	231,794	0.23%	1,680,510	**1.68%**
364.00	Poles, Towers and Fixtures	180,058,978	R4	59	-100.0%	360,117,957	88,518,198	271,599,759	59.00	3,051,847	1.69%	3,051,847	1.69%	6,103,694	**3.39%**
365.00	Overhead Conductors and Devices	190,178,364	R2.5	73	-100.0%	380,356,728	79,928,945	300,427,783	73.00	2,605,183	1.37%	2,605,183	1.37%	5,210,366	**2.74%**
366.00	Underground Conduit	37,281,548	R2.5	62	-23.0%	45,856,304	15,490,903	30,365,401	62.00	601,315	1.61%	138,303	0.37%	739,618	**1.98%**
367.00	Underground Conductors & Devices	59,137,274	R1.5	55	-16.0%	68,599,237	29,833,330	38,765,907	55.00	1,075,223	1.82%	172,036	0.29%	1,247,259	**2.11%**
368.00	Line Transformers	105,880,249	R2	51	0.0%	105,880,249	38,051,314	67,828,936	51.00	2,076,083	1.96%	-	0.00%	2,076,083	**1.96%**
369.00	Services	76,810,492	R5	52	-100.0%	153,620,985	49,419,445	104,201,540	52.00	1,477,125	1.92%	1,477,125	1.92%	2,954,250	**3.85%**
370.00	Meters	22,007,394	S0	43	-2.0%	22,447,542	7,640,970	14,806,573	43.00	511,800	2.33%	10,236	0.05%	522,036	**2.37%**
371.00	Installations on Customer Premises	16,825,198	R1	30	-33.0%	22,377,514	11,749,433	10,628,081	30.00	560,840	3.33%	185,077	1.10%	745,917	**4.43%**
373.00	Street Lighting and Signal Systems	18,869,639	R1	45	-57.0%	29,625,333	4,850,431	24,774,902	45.00	419,325	2.22%	239,015	1.27%	658,341	**3.49%**
	Total Distribution Plant	836,026,959				1,333,853,487	365,767,333	968,086,155	43.41	14,190,163	1.70%	8,110,616	0.97%	22,300,779	2.67%
	General Plant														
390.00	Structures and Improvements	9,993,085	L0	55	0.0%	9,993,085	6,379,076	3,614,009	55.00	181,692	1.82%	-	0.00%	181,692	**1.82%**
391.10	Office Furniture and Equipment	4,983,038	R1	21	0.0%	4,983,038	1,869,399	3,113,638	21.00	237,288	4.76%	-	0.00%	237,288	**4.76%**
391.20	Computer Equipment	13,894,381	SQ	10	0.0%	13,894,381	9,408,280	4,486,101	10.00	1,389,438	10.00%	-	0.00%	1,389,438	**10.00%**
392.00	Transportation Equipment	12,111,140	L2	13	7.0%	11,263,361	6,736,867	4,526,494	13.00	931,626	7.69%	(65,214)	-0.54%	866,412	**7.15%**
393.00	Stores Equipment	595,145	R2	40	0.0%	595,145	366,012	229,133	40.00	14,879	2.50%	-	0.00%	14,879	**2.50%**
394.00	Tools, Shop and Garage Equipment	5,670,457	SQ	20	0.0%	5,670,457	3,268,453	2,402,003	20.00	283,523	5.00%	-	0.00%	283,523	**5.00%**
395.00	Laboratory Equipment	1,292,173	R3	46	0.0%	1,292,173	828,182	463,991	46.00	28,091	2.17%	-	0.00%	28,091	**2.17%**
396.00	Power Operated Equipment	17,176,807	R3	17	4.0%	16,489,735	7,723,565	8,766,170	17.00	1,010,400	5.88%	(40,416)	-0.24%	969,984	**5.65%**
397.00	Communication Equipment	11,731,494	L1	21	0.0%	11,731,494	5,923,613	5,807,882	21.00	558,643	4.76%	-	0.00%	558,643	**4.76%**
398.00	Miscellaneous Equipment	237,967	S0	32	0.0%	237,967	169,623	68,344	32.00	7,436	3.13%	-	0.00%	7,436	**3.13%**
	Total General Plant	77,685,687				76,150,835	42,673,070	33,477,765	7.38	4,643,016	5.98%	(105,630)	-0.14%	4,537,386	5.84%
	TOTAL PLANT STUDIED	**$ 2,328,998,897**				**$ 2,927,033,681**	**$ 768,096,982**	**$ 2,158,936,699**	**35.95**	**$ 49,732,010**	**2.14%**	**$ 9,494,891**	**0.44%**	**$ 60,056,941**	**2.58%**

[1] 12-31-14 plant balances for production accounts provided in response to DR OIEC 1.15; for Iatan Common, plant and reserve balances at 6-30-15 and rates hard coded to match Iatan 2 rates.

[2] Average life and Iowa curve shape developed through actuarial analysis and professional judgment for mass accounts. Company did not provide interim survivor curve analysis for production accounts.

[3] Company did not support net salvage proposals for production accounts; net salvage for mass accounts estimated through statistical analysis and professional judgment

[4] = [1]*(1-[3])

[5] 12-31-14 reserve balances for production accounts provided in response to DR OIEC 1.15

[6] = [4] - [5]

[7] For production accounts, remaining life determined by estimated retirement date (half-year convention) and unaffected by interim retirements due to lack of support by Company; for mass accounts, whole life rates used to match Company's technique.

[8] = ([1] - [5]) / [7]

[9] = [8] / [1]

[10] = [12] - [8]

[11] = [13] - [9]

[12] = [6] / [7]

[13] = [12] / [1]. Any negative rates adjusted up to zero.

* N/D = Nondepreciable

Account 353 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire S2-52	[5] OIEC R2-62	[6] Empire SSD	[7] OIEC SSD
0.0	115,172,644	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	114,300,598	99.60%	100.00%	99.92%	0.0000	0.0000
1.5	112,634,654	99.47%	100.00%	99.76%	0.0000	0.0000
2.5	108,634,207	98.78%	100.00%	99.60%	0.0001	0.0001
3.5	105,334,492	98.66%	100.00%	99.42%	0.0002	0.0001
4.5	97,136,278	98.47%	100.00%	99.23%	0.0002	0.0001
5.5	94,060,716	98.38%	99.99%	99.04%	0.0003	0.0000
6.5	90,347,670	98.22%	99.98%	98.83%	0.0003	0.0000
7.5	87,803,769	98.13%	99.97%	98.61%	0.0003	0.0000
8.5	80,698,322	97.99%	99.95%	98.38%	0.0004	0.0000
9.5	80,273,040	97.85%	99.92%	98.14%	0.0004	0.0000
10.5	77,950,169	97.49%	99.87%	97.89%	0.0006	0.0000
11.5	74,378,110	97.38%	99.81%	97.62%	0.0006	0.0000
12.5	67,978,627	97.23%	99.72%	97.34%	0.0006	0.0000
13.5	61,734,957	96.82%	99.62%	97.05%	0.0008	0.0000
14.5	56,813,574	96.74%	99.48%	96.75%	0.0008	0.0000
15.5	54,776,919	96.53%	99.31%	96.42%	0.0008	0.0000
16.5	53,769,065	96.10%	99.11%	96.09%	0.0009	0.0000
17.5	47,490,806	95.84%	98.86%	95.74%	0.0009	0.0000
18.5	45,203,190	95.53%	98.57%	95.37%	0.0009	0.0000
19.5	41,589,032	94.56%	98.23%	94.98%	0.0013	0.0000
20.5	39,221,479	94.40%	97.83%	94.58%	0.0012	0.0000
21.5	36,235,121	93.89%	97.38%	94.16%	0.0012	0.0000
22.5	34,077,775	93.62%	96.87%	93.72%	0.0011	0.0000
23.5	32,942,658	93.52%	96.29%	93.26%	0.0008	0.0000
24.5	28,218,523	91.71%	95.65%	92.78%	0.0016	0.0001
25.5	25,932,372	91.39%	94.93%	92.28%	0.0013	0.0001
26.5	21,964,586	90.72%	94.14%	91.76%	0.0012	0.0001
27.5	19,875,332	90.28%	93.28%	91.21%	0.0009	0.0001
28.5	18,718,635	89.86%	92.33%	90.65%	0.0006	0.0001
29.5	16,409,244	89.64%	91.31%	90.06%	0.0003	0.0000
30.5	13,794,142	89.30%	90.20%	89.44%	0.0001	0.0000
31.5	12,651,846	88.88%	89.02%	88.80%	0.0000	0.0000
32.5	11,233,578	88.63%	87.75%	88.14%	0.0001	0.0000
33.5	9,293,799	88.31%	86.40%	87.45%	0.0004	0.0001
34.5	8,368,592	88.05%	84.97%	86.73%	0.0009	0.0002
35.5	7,309,273	86.83%	83.47%	85.98%	0.0011	0.0001
36.5	6,688,165	85.82%	81.88%	85.21%	0.0016	0.0000
37.5	5,573,417	84.45%	80.22%	84.40%	0.0018	0.0000
38.5	5,037,761	84.33%	78.49%	83.57%	0.0034	0.0001
39.5	4,192,382	83.98%	76.68%	82.70%	0.0053	0.0002
40.5	3,736,130	83.12%	74.81%	81.80%	0.0069	0.0002
41.5	2,832,720	81.81%	72.88%	80.87%	0.0080	0.0001
42.5	2,689,394	79.47%	70.89%	79.91%	0.0074	0.0000
43.5	2,629,070	77.66%	68.84%	78.91%	0.0078	0.0002
44.5	1,437,865	76.63%	66.74%	77.88%	0.0098	0.0002
45.5	1,396,130	75.31%	64.60%	76.81%	0.0115	0.0002
46.5	1,186,663	75.31%	62.43%	75.71%	0.0166	0.0000
47.5	712,555	74.75%	60.21%	74.57%	0.0211	0.0000

Account 353 Curve Fitting

Exhibit DG 2-6
Page 2 of 2

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire S2-52	[5] OIEC R2-62	[6] Empire SSD	[7] OIEC SSD
48.5	608,569	74.75%	57.97%	73.39%	0.0281	0.0002
49.5	593,789	73.43%	55.71%	72.18%	0.0314	0.0002
50.5	451,262	73.03%	53.43%	70.93%	0.0384	0.0004
51.5	251,862	73.03%	51.15%	69.65%	0.0479	0.0011
52.5	76,619	72.57%	48.85%	68.32%	0.0562	0.0018
53.5	12,347	72.57%	46.57%	66.96%	0.0676	0.0031
54.5		72.57%	44.29%	65.57%	0.0800	0.0049
55.5			42.03%	64.13%		
56.5			39.79%	62.67%		
57.5			37.57%	61.17%		
58.5			35.40%	59.63%		
59.5			33.26%	58.07%		
60.5			31.16%	56.47%		
61.5			29.11%	54.85%		
62.5			27.12%	53.20%		
63.5			25.19%	51.52%		
64.5			23.32%	49.82%		
Sum of Squared Differences				[8]	0.4738	0.0141
Up to 1% of Beginning Exposures				[9]	0.1030	0.0023

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 355 Curve Fitting

Exhibit DG 2-7

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire S2.5-57	[5] OIEC R3-70	[6] Empire SSD	[7] OIEC SSD
0.0	62,637,090	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	59,757,218	98.94%	100.00%	99.99%	0.0001	0.0001
1.5	55,502,537	98.94%	100.00%	99.97%	0.0001	0.0001
2.5	48,602,628	98.86%	100.00%	99.94%	0.0001	0.0001
3.5	44,061,155	98.74%	100.00%	99.91%	0.0002	0.0001
4.5	40,000,172	98.63%	100.00%	99.87%	0.0002	0.0002
5.5	36,404,122	98.58%	100.00%	99.84%	0.0002	0.0002
6.5	32,533,623	98.56%	99.99%	99.79%	0.0002	0.0002
7.5	28,169,716	98.53%	99.99%	99.75%	0.0002	0.0001
8.5	26,646,238	98.53%	99.98%	99.70%	0.0002	0.0001
9.5	25,671,448	98.52%	99.97%	99.64%	0.0002	0.0001
10.5	24,336,197	98.49%	99.96%	99.57%	0.0002	0.0001
11.5	22,604,256	98.44%	99.93%	99.50%	0.0002	0.0001
12.5	21,814,066	98.44%	99.90%	99.43%	0.0002	0.0001
13.5	21,395,545	98.44%	99.86%	99.34%	0.0002	0.0001
14.5	19,855,867	98.43%	99.81%	99.25%	0.0002	0.0001
15.5	18,623,902	98.35%	99.75%	99.15%	0.0002	0.0001
16.5	17,332,093	98.27%	99.67%	99.04%	0.0002	0.0001
17.5	15,387,835	98.16%	99.57%	98.92%	0.0002	0.0001
18.5	14,749,903	98.09%	99.45%	98.79%	0.0002	0.0000
19.5	13,601,370	97.97%	99.31%	98.65%	0.0002	0.0000
20.5	13,007,859	97.86%	99.14%	98.50%	0.0002	0.0000
21.5	11,990,020	97.26%	98.94%	98.33%	0.0003	0.0001
22.5	11,619,306	97.12%	98.71%	98.15%	0.0003	0.0001
23.5	11,351,905	96.99%	98.44%	97.96%	0.0002	0.0001
24.5	10,768,275	96.96%	98.12%	97.75%	0.0001	0.0001
25.5	10,201,202	96.92%	97.76%	97.53%	0.0001	0.0000
26.5	8,499,054	96.86%	97.36%	97.29%	0.0000	0.0000
27.5	7,975,701	96.79%	96.90%	97.03%	0.0000	0.0000
28.5	7,152,199	96.61%	96.38%	96.75%	0.0000	0.0000
29.5	6,602,359	96.59%	95.80%	96.46%	0.0001	0.0000
30.5	5,396,544	96.48%	95.15%	96.15%	0.0002	0.0000
31.5	5,162,560	96.06%	94.44%	95.81%	0.0003	0.0000
32.5	4,918,539	96.04%	93.65%	95.46%	0.0006	0.0000
33.5	3,639,750	96.00%	92.79%	95.08%	0.0010	0.0001
34.5	3,232,607	95.94%	91.84%	94.68%	0.0017	0.0002
35.5	3,174,662	95.55%	90.82%	94.25%	0.0022	0.0002
36.5	2,963,306	95.44%	89.71%	93.80%	0.0033	0.0003
37.5	2,612,977	95.03%	88.51%	93.32%	0.0042	0.0003
38.5	2,386,394	94.60%	87.23%	92.81%	0.0054	0.0003
39.5	2,155,708	94.40%	85.86%	92.27%	0.0073	0.0005
40.5	2,013,597	94.28%	84.40%	91.71%	0.0098	0.0007
41.5	1,575,585	93.99%	82.85%	91.11%	0.0124	0.0008
42.5	1,452,677	92.74%	81.21%	90.48%	0.0133	0.0005
43.5	1,277,538	92.36%	79.49%	89.82%	0.0166	0.0006
44.5	1,061,096	89.92%	77.69%	89.11%	0.0150	0.0001
45.5	981,994	89.38%	75.80%	88.38%	0.0184	0.0001
46.5	856,142	86.33%	73.84%	87.60%	0.0156	0.0002
47.5	716,981	84.74%	71.81%	86.79%	0.0167	0.0004

Account 355 Curve Fitting

Exhibit DG 2-7
Page 2 of 2

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire S2.5-57	[5] OIEC R3-70	[6] Empire SSD	[7] OIEC SSD
48.5	594,198	81.25%	69.71%	85.93%	0.0133	0.0022
49.5	411,331	73.96%	67.54%	85.04%	0.0041	0.0123
50.5	311,254	68.11%	65.32%	84.09%	0.0008	0.0255
51.5	203,322	63.79%	63.05%	83.10%	0.0001	0.0373
52.5	82,089	62.78%	60.74%	82.07%	0.0004	0.0372
53.5	30,632	57.37%	58.39%	80.98%	0.0001	0.0557
54.5		52.03%	56.01%	79.84%	0.0016	0.0773
55.5			53.62%	78.64%		
56.5			51.21%	77.39%		
57.5			48.79%	76.09%		
58.5			46.38%	74.72%		
59.5			43.99%	73.30%		
60.5			41.61%	71.82%		
61.5			39.26%	70.27%		
62.5			36.95%	68.67%		
63.5			34.68%	67.00%		
64.5			32.46%	65.27%		
Sum of Squared Differences				[8]	0.1693	0.2553
Up to 1% of Beginning Exposures				[9]	0.1322	0.0074

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 356 Curve Fitting

Exhibit DG 2-8
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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire N/A	[5] OIEC R3-69	[6] Empire SSD	[7] OIEC SSD
0.0	79,107,001	100.00%	N/A	100.00%	N/A	0.0000
0.5	77,392,652	99.87%		99.99%		0.0000
1.5	77,581,118	99.87%		99.96%		0.0000
2.5	71,143,104	99.84%		99.94%		0.0000
3.5	65,984,154	99.70%		99.91%		0.0000
4.5	61,600,179	99.36%		99.87%		0.0000
5.5	59,520,369	99.34%		99.83%		0.0000
6.5	57,140,217	99.24%		99.79%		0.0000
7.5	54,249,632	98.99%		99.74%		0.0001
8.5	52,103,324	98.84%		99.69%		0.0001
9.5	50,779,363	98.07%		99.63%		0.0002
10.5	49,311,855	98.05%		99.56%		0.0002
11.5	45,523,701	98.01%		99.49%		0.0002
12.5	44,109,207	97.45%		99.41%		0.0004
13.5	43,356,193	97.39%		99.33%		0.0004
14.5	36,046,187	97.15%		99.23%		0.0004
15.5	35,114,153	97.14%		99.13%		0.0004
16.5	32,187,137	97.04%		99.01%		0.0004
17.5	28,513,423	96.89%		98.89%		0.0004
18.5	28,067,314	96.72%		98.75%		0.0004
19.5	27,318,088	96.65%		98.61%		0.0004
20.5	26,742,499	96.59%		98.45%		0.0003
21.5	25,530,038	96.58%		98.28%		0.0003
22.5	24,651,704	96.57%		98.09%		0.0002
23.5	23,880,335	96.53%		97.89%		0.0002
24.5	22,459,782	96.52%		97.67%		0.0001
25.5	21,240,904	96.45%		97.44%		0.0001
26.5	16,888,328	96.45%		97.19%		0.0001
27.5	15,853,922	96.37%		96.92%		0.0000
28.5	13,356,992	96.36%		96.64%		0.0000
29.5	13,168,467	96.20%		96.33%		0.0000
30.5	9,893,263	96.17%		96.00%		0.0000
31.5	9,338,889	96.14%		95.65%		0.0000
32.5	8,965,754	96.14%		95.28%		0.0001
33.5	6,834,485	95.09%		94.88%		0.0000
34.5	6,093,149	94.87%		94.47%		0.0000
35.5	6,053,515	94.73%		94.02%		0.0001
36.5	5,901,464	94.63%		93.55%		0.0001
37.5	5,214,378	94.57%		93.04%		0.0002
38.5	4,765,874	93.86%		92.51%		0.0002
39.5	4,392,852	93.22%		91.95%		0.0002
40.5	4,182,697	90.83%		91.36%		0.0000
41.5	3,189,344	90.38%		90.73%		0.0000
42.5	2,918,420	89.99%		90.07%		0.0000
43.5	2,639,721	87.76%		89.38%		0.0003
44.5	2,114,268	86.52%		88.64%		0.0005
45.5	2,019,411	85.82%		87.87%		0.0004
46.5	1,843,924	85.48%		87.06%		0.0002
47.5	1,579,374	84.80%		86.21%		0.0002

Account 356 Curve Fitting

Exhibit DG 2-8
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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire N/A	[5] OIEC R3-69	[6] Empire SSD	[7] OIEC SSD
48.5	1,230,537	84.45%		85.31%		0.0001
49.5	670,353	82.32%		84.36%		0.0004
50.5	586,376	81.50%		83.37%		0.0004
51.5	404,174	81.32%		82.33%		0.0001
52.5	160,510	80.31%		81.24%		0.0001
53.5	42,426	80.31%		80.10%		0.0000
54.5		80.31%		78.90%		0.0002
55.5				77.64%		
56.5				76.33%		
57.5				74.96%		
58.5				73.52%		
59.5				72.03%		
60.5				70.47%		
61.5				68.85%		
62.5				67.16%		
63.5				65.41%		
64.5				63.60%		
Sum of Squared Differences				[8]	N/A	0.0092
Up to 1% of Beginning Exposures				[9]	N/A	0.0077

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 361 Curve Fitting

Exhibit DG 2-9

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire S1-64	[5] OIEC R2-80	[6] Empire SSD	[7] OIEC SSD
0.0	10,959,094	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	10,625,803	99.97%	100.00%	99.94%	0.0000	0.0000
1.5	10,348,912	99.90%	100.00%	99.82%	0.0000	0.0000
2.5	9,856,428	99.90%	99.99%	99.69%	0.0000	0.0000
3.5	9,814,116	99.85%	99.97%	99.56%	0.0000	0.0000
4.5	9,900,512	99.82%	99.94%	99.42%	0.0000	0.0000
5.5	9,864,838	99.74%	99.90%	99.28%	0.0000	0.0000
6.5	9,679,909	99.71%	99.83%	99.13%	0.0000	0.0000
7.5	9,373,667	99.59%	99.75%	98.97%	0.0000	0.0000
8.5	9,250,413	99.58%	99.65%	98.81%	0.0000	0.0001
9.5	9,132,365	99.52%	99.53%	98.64%	0.0000	0.0001
10.5	8,967,968	98.94%	99.39%	98.47%	0.0000	0.0000
11.5	8,737,513	98.93%	99.22%	98.29%	0.0000	0.0000
12.5	8,717,596	98.83%	99.02%	98.10%	0.0000	0.0001
13.5	8,552,653	98.67%	98.79%	97.90%	0.0000	0.0001
14.5	8,372,377	98.59%	98.54%	97.69%	0.0000	0.0001
15.5	7,381,126	98.36%	98.26%	97.48%	0.0000	0.0001
16.5	7,149,578	98.34%	97.94%	97.26%	0.0000	0.0001
17.5	6,811,478	96.14%	97.60%	97.03%	0.0002	0.0001
18.5	6,398,211	95.80%	97.23%	96.80%	0.0002	0.0001
19.5	6,249,357	95.01%	96.82%	96.55%	0.0003	0.0002
20.5	5,872,524	94.76%	96.38%	96.30%	0.0003	0.0002
21.5	5,478,522	94.67%	95.90%	96.03%	0.0002	0.0002
22.5	4,838,128	93.98%	95.40%	95.76%	0.0002	0.0003
23.5	4,707,615	93.84%	94.86%	95.47%	0.0001	0.0003
24.5	4,455,639	93.51%	94.28%	95.18%	0.0001	0.0003
25.5	4,300,911	93.40%	93.68%	94.88%	0.0000	0.0002
26.5	3,953,594	93.15%	93.03%	94.56%	0.0000	0.0002
27.5	2,579,809	92.46%	92.36%	94.24%	0.0000	0.0003
28.5	2,357,478	92.27%	91.65%	93.90%	0.0000	0.0003
29.5	2,228,980	92.18%	90.91%	93.55%	0.0002	0.0002
30.5	2,174,354	92.04%	90.14%	93.19%	0.0004	0.0001
31.5	1,738,868	92.04%	89.33%	92.82%	0.0007	0.0001
32.5	1,667,584	92.03%	88.49%	92.44%	0.0013	0.0000
33.5	1,037,876	92.03%	87.62%	92.04%	0.0019	0.0000
34.5	959,221	92.03%	86.72%	91.63%	0.0028	0.0000
35.5	760,042	91.91%	85.79%	91.21%	0.0037	0.0000
36.5	701,272	91.91%	84.83%	90.77%	0.0050	0.0001
37.5	690,711	91.38%	83.84%	90.32%	0.0057	0.0001
38.5	662,522	91.38%	82.82%	89.85%	0.0073	0.0002
39.5	620,786	91.38%	81.77%	89.37%	0.0092	0.0004
40.5	614,348	91.38%	80.69%	88.88%	0.0114	0.0006
41.5	604,589	91.21%	79.59%	88.37%	0.0135	0.0008
42.5	582,303	90.91%	78.46%	87.84%	0.0155	0.0009
43.5	561,612	90.86%	77.31%	87.30%	0.0184	0.0013
44.5	543,435	90.78%	76.14%	86.74%	0.0214	0.0016
45.5	499,287	90.72%	74.94%	86.16%	0.0249	0.0021
46.5	490,572	90.72%	73.72%	85.57%	0.0289	0.0027
47.5	426,169	90.72%	72.48%	84.96%	0.0333	0.0033

Account 361 Curve Fitting

[1] **Age (Years)**	[2] **Exposures (Dollars)**	[3] **Observed Life Table (OLT)**	[4] **Empire S1-64**	[5] **OIEC R2-80**	[6] **Empire SSD**	[7] **OIEC SSD**
48.5	406,959	90.72%	71.22%	84.33%	0.0380	0.0041
49.5	398,868	90.72%	69.94%	83.68%	0.0432	0.0050
50.5	377,707	90.72%	68.64%	83.02%	0.0488	0.0059
51.5	337,087	90.72%	67.33%	82.33%	0.0547	0.0070
52.5	208,636	90.72%	66.00%	81.63%	0.0611	0.0083
53.5	122,606	90.72%	64.65%	80.91%	0.0679	0.0096
54.5		90.72%	63.30%	80.16%	0.0752	0.0111
55.5			61.93%	79.40%		
56.5			60.55%	78.62%		
57.5			59.16%	77.81%		
58.5			57.77%	76.99%		
59.5			56.37%	76.14%		
60.5			54.96%	75.27%		
61.5			53.54%	74.38%		
62.5			52.13%	73.47%		
63.5			50.71%	72.53%		
64.5			49.29%	71.57%		
Sum of Squared Differences				[8]	0.5962	0.0691

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 362 Curve Fitting

Exhibit DG 2-10
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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R1.5-53	[5] OIEC R1-69	[6] Empire SSD	[7] OIEC SSD
0.0	79,028,670	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	77,290,260	98.88%	99.83%	99.81%	0.0001	0.0001
1.5	76,387,923	98.58%	99.49%	99.43%	0.0001	0.0001
2.5	75,846,203	98.29%	99.14%	99.05%	0.0001	0.0001
3.5	75,310,567	98.11%	98.77%	98.65%	0.0000	0.0000
4.5	74,963,684	97.64%	98.39%	98.25%	0.0001	0.0000
5.5	73,282,701	97.47%	97.99%	97.84%	0.0000	0.0000
6.5	66,449,739	97.21%	97.59%	97.42%	0.0000	0.0000
7.5	62,935,830	96.95%	97.16%	97.00%	0.0000	0.0000
8.5	61,603,277	96.28%	96.73%	96.57%	0.0000	0.0000
9.5	58,838,097	96.03%	96.28%	96.13%	0.0000	0.0000
10.5	57,073,305	95.92%	95.81%	95.68%	0.0000	0.0000
11.5	54,685,686	95.74%	95.33%	95.22%	0.0000	0.0000
12.5	49,597,474	95.39%	94.83%	94.76%	0.0000	0.0000
13.5	46,649,102	95.25%	94.31%	94.29%	0.0001	0.0001
14.5	45,776,586	94.79%	93.78%	93.82%	0.0001	0.0001
15.5	44,187,306	94.45%	93.23%	93.33%	0.0001	0.0001
16.5	42,486,673	94.05%	92.67%	92.84%	0.0002	0.0001
17.5	39,991,734	93.83%	92.09%	92.34%	0.0003	0.0002
18.5	36,083,203	93.45%	91.48%	91.83%	0.0004	0.0003
19.5	34,232,433	93.14%	90.86%	91.32%	0.0005	0.0003
20.5	31,007,652	92.74%	90.22%	90.80%	0.0006	0.0004
21.5	26,986,536	92.44%	89.56%	90.27%	0.0008	0.0005
22.5	22,940,476	92.00%	88.87%	89.73%	0.0010	0.0005
23.5	20,718,969	91.46%	88.16%	89.19%	0.0011	0.0005
24.5	16,907,464	91.21%	87.43%	88.64%	0.0014	0.0007
25.5	13,699,210	90.74%	86.68%	88.08%	0.0017	0.0007
26.5	11,849,820	90.22%	85.90%	87.52%	0.0019	0.0007
27.5	10,835,861	90.10%	85.09%	86.94%	0.0025	0.0010
28.5	9,565,421	89.81%	84.25%	86.36%	0.0031	0.0012
29.5	9,075,362	89.31%	83.39%	85.77%	0.0035	0.0013
30.5	8,129,097	88.72%	82.50%	85.17%	0.0039	0.0013
31.5	6,967,871	87.97%	81.57%	84.56%	0.0041	0.0012
32.5	6,700,365	86.56%	80.62%	83.94%	0.0035	0.0007
33.5	6,588,372	86.43%	79.63%	83.31%	0.0046	0.0010
34.5	5,920,851	85.68%	78.62%	82.67%	0.0050	0.0009
35.5	5,611,792	84.41%	77.57%	82.01%	0.0047	0.0006
36.5	5,353,884	83.74%	76.48%	81.35%	0.0053	0.0006
37.5	4,564,810	82.32%	75.36%	80.68%	0.0048	0.0003
38.5	3,928,043	82.09%	74.20%	79.99%	0.0062	0.0004
39.5	3,611,331	82.07%	73.01%	79.30%	0.0082	0.0008
40.5	2,998,402	80.31%	71.79%	78.59%	0.0073	0.0003
41.5	2,371,530	79.99%	70.52%	77.87%	0.0090	0.0005
42.5	1,994,512	79.56%	69.22%	77.13%	0.0107	0.0006
43.5	1,813,007	79.43%	67.89%	76.38%	0.0133	0.0009
44.5	1,411,995	77.38%	66.51%	75.62%	0.0118	0.0003
45.5	1,274,801	77.08%	65.10%	74.85%	0.0143	0.0005
46.5	998,044	76.90%	63.66%	74.06%	0.0175	0.0008
47.5	635,226	76.89%	62.18%	73.27%	0.0216	0.0013

Account 362 Curve Fitting

Exhibit DG 2-10
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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R1.5-53	[5] OIEC R1-69	[6] Empire SSD	[7] OIEC SSD
48.5	534,488	76.89%	60.66%	72.45%	0.0263	0.0020
49.5	332,346	76.84%	59.11%	71.63%	0.0314	0.0027
50.5	277,715	76.84%	57.54%	70.79%	0.0373	0.0037
51.5	252,258	76.84%	55.93%	69.93%	0.0437	0.0048
52.5	213,730	76.84%	54.29%	69.06%	0.0509	0.0060
53.5	130,197	76.84%	52.62%	68.18%	0.0586	0.0075
54.5		76.84%	50.94%	67.29%	0.0671	0.0091
55.5			49.23%	66.38%		
56.5			47.50%	65.46%		
57.5			45.75%	64.52%		
58.5			44.00%	63.57%		
59.5			42.24%	62.61%		
60.5			40.47%	61.64%		
61.5			38.70%	60.65%		
62.5			36.94%	59.66%		
63.5			35.18%	58.65%		
64.5			33.44%	57.62%		
Sum of Squared Differences				[8]	0.4911	0.0577
Up to 1% of Beginning Exposures				[9]	0.1541	0.0206

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 364 Curve Fitting

Exhibit DG 2-11

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R3-50	[5] OIEC R4-59	[6] Empire SSD	[7] OIEC SSD
0.0	137,614,123	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	134,402,247	99.98%	99.98%	100.00%	0.0000	0.0000
1.5	132,748,577	99.98%	99.95%	100.00%	0.0000	0.0000
2.5	131,095,493	99.38%	99.91%	100.00%	0.0000	0.0000
3.5	130,896,280	99.26%	99.86%	99.99%	0.0000	0.0001
4.5	130,858,332	99.24%	99.80%	99.99%	0.0000	0.0001
5.5	123,598,813	99.24%	99.74%	99.98%	0.0000	0.0001
6.5	115,250,066	99.22%	99.66%	99.98%	0.0000	0.0001
7.5	99,895,119	99.21%	99.57%	99.97%	0.0000	0.0001
8.5	94,258,109	99.21%	99.47%	99.96%	0.0000	0.0001
9.5	89,526,930	99.21%	99.36%	99.95%	0.0000	0.0001
10.5	85,243,253	99.21%	99.23%	99.94%	0.0000	0.0001
11.5	81,901,105	99.21%	99.09%	99.93%	0.0000	0.0001
12.5	78,853,107	99.20%	98.92%	99.91%	0.0000	0.0000
13.5	75,000,077	99.20%	98.73%	99.88%	0.0000	0.0000
14.5	71,374,176	99.19%	98.53%	99.86%	0.0000	0.0000
15.5	67,252,610	99.17%	98.29%	99.82%	0.0001	0.0000
16.5	63,799,292	99.17%	98.04%	99.79%	0.0001	0.0000
17.5	59,769,225	99.17%	97.75%	99.74%	0.0002	0.0000
18.5	54,898,255	99.17%	97.43%	99.68%	0.0003	0.0000
19.5	50,195,245	99.17%	97.08%	99.62%	0.0004	0.0000
20.5	45,172,642	99.16%	96.70%	99.55%	0.0006	0.0000
21.5	40,813,633	99.16%	96.28%	99.46%	0.0008	0.0000
22.5	37,143,937	99.15%	95.81%	99.35%	0.0011	0.0000
23.5	34,453,210	99.15%	95.31%	99.24%	0.0015	0.0000
24.5	31,525,215	99.14%	94.76%	99.10%	0.0019	0.0000
25.5	29,057,665	99.12%	94.16%	98.94%	0.0025	0.0000
26.5	26,565,199	99.11%	93.51%	98.76%	0.0031	0.0000
27.5	24,368,481	99.10%	92.81%	98.55%	0.0040	0.0000
28.5	22,209,812	99.10%	92.05%	98.31%	0.0050	0.0001
29.5	20,198,408	99.09%	91.23%	98.04%	0.0062	0.0001
30.5	18,589,391	99.05%	90.35%	97.73%	0.0076	0.0002
31.5	17,003,632	99.02%	89.40%	97.39%	0.0093	0.0003
32.5	15,653,321	98.99%	88.38%	97.00%	0.0113	0.0004
33.5	14,277,335	98.96%	87.28%	96.57%	0.0136	0.0006
34.5	13,007,026	98.84%	86.11%	96.08%	0.0162	0.0008
35.5	11,800,217	98.44%	84.85%	95.54%	0.0185	0.0008
36.5	10,682,602	98.28%	83.51%	94.94%	0.0218	0.0011
37.5	9,700,841	97.46%	82.07%	94.27%	0.0237	0.0010
38.5	8,823,259	96.31%	80.53%	93.53%	0.0249	0.0008
39.5	7,986,802	95.15%	78.89%	92.73%	0.0264	0.0006
40.5	6,874,963	91.22%	77.14%	91.84%	0.0198	0.0000
41.5	5,751,779	87.88%	75.28%	90.87%	0.0159	0.0009
42.5	4,879,266	85.86%	73.30%	89.82%	0.0158	0.0016
43.5	4,089,794	82.97%	71.21%	88.67%	0.0138	0.0033
44.5	3,489,854	82.25%	68.99%	87.44%	0.0176	0.0027
45.5	2,964,502	81.61%	66.66%	86.10%	0.0224	0.0020
46.5	2,543,605	81.26%	64.20%	84.67%	0.0291	0.0012
47.5	2,111,712	79.50%	61.63%	83.13%	0.0319	0.0013

Account 364 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R3-50	[5] OIEC R4-59	[6] Empire SSD	[7] OIEC SSD
48.5	1,716,980	77.35%	58.95%	81.49%	0.0338	0.0017
49.5	1,329,359	75.57%	56.17%	79.75%	0.0376	0.0017
50.5	993,813	75.57%	53.29%	77.89%	0.0496	0.0005
51.5	744,519	75.09%	50.34%	75.90%	0.0613	0.0001
52.5	430,212	75.03%	47.32%	73.78%	0.0768	0.0002
53.5	181,679	75.03%	44.25%	71.47%	0.0947	0.0013
54.5		75.03%	41.16%	68.99%	0.1147	0.0037
55.5			38.07%	66.31%		
56.5			35.00%	63.42%		
57.5			31.98%	60.34%		
58.5			29.03%	57.07%		
59.5			26.17%	53.64%		
60.5			23.42%	50.09%		
61.5			20.81%	46.45%		
62.5			18.35%	42.76%		
63.5			16.05%	39.07%		
64.5			13.92%	35.42%		
Sum of Squared Differences				[8]	0.8361	0.0297
Up to 1% of Beginning Exposures				[9]	0.3356	0.0192

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 365 Curve Fitting

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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R2.5-59	[5] OIEC R2.5-73	[6] Empire SSD	[7] OIEC SSD
0.0	146,445,624	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	146,268,011	99.96%	99.95%	99.96%	0.0000	0.0000
1.5	146,366,247	99.95%	99.85%	99.88%	0.0000	0.0000
2.5	145,935,766	99.88%	99.75%	99.80%	0.0000	0.0000
3.5	145,863,095	99.86%	99.64%	99.71%	0.0000	0.0000
4.5	145,844,861	99.85%	99.52%	99.62%	0.0000	0.0000
5.5	143,270,229	99.85%	99.39%	99.52%	0.0000	0.0000
6.5	135,002,661	99.82%	99.25%	99.42%	0.0000	0.0000
7.5	120,154,931	99.77%	99.10%	99.31%	0.0000	0.0000
8.5	114,551,514	99.73%	98.94%	99.19%	0.0001	0.0000
9.5	108,222,289	99.67%	98.77%	99.07%	0.0001	0.0000
10.5	103,385,751	99.62%	98.59%	98.94%	0.0001	0.0000
11.5	96,652,791	99.58%	98.40%	98.81%	0.0001	0.0001
12.5	92,515,014	99.48%	98.19%	98.66%	0.0002	0.0001
13.5	87,003,208	99.38%	97.97%	98.51%	0.0002	0.0001
14.5	81,675,350	99.29%	97.73%	98.35%	0.0002	0.0001
15.5	77,558,185	99.09%	97.48%	98.18%	0.0003	0.0001
16.5	73,363,609	98.86%	97.22%	98.01%	0.0003	0.0001
17.5	66,745,126	98.70%	96.93%	97.82%	0.0003	0.0001
18.5	62,015,622	98.58%	96.63%	97.62%	0.0004	0.0001
19.5	56,183,420	98.17%	96.31%	97.41%	0.0003	0.0001
20.5	49,755,326	97.99%	95.96%	97.20%	0.0004	0.0001
21.5	44,107,252	97.88%	95.60%	96.97%	0.0005	0.0001
22.5	39,640,664	97.74%	95.21%	96.73%	0.0006	0.0001
23.5	36,758,732	97.57%	94.80%	96.47%	0.0008	0.0001
24.5	33,556,188	97.35%	94.37%	96.20%	0.0009	0.0001
25.5	30,264,069	97.07%	93.91%	95.92%	0.0010	0.0001
26.5	27,044,403	96.79%	93.43%	95.63%	0.0011	0.0001
27.5	25,037,521	96.49%	92.91%	95.32%	0.0013	0.0001
28.5	22,411,989	96.16%	92.37%	95.00%	0.0014	0.0001
29.5	20,390,802	95.73%	91.80%	94.66%	0.0015	0.0001
30.5	18,618,036	95.39%	91.19%	94.30%	0.0018	0.0001
31.5	17,050,249	94.77%	90.55%	93.93%	0.0018	0.0001
32.5	15,625,998	93.89%	89.88%	93.54%	0.0016	0.0000
33.5	14,147,879	93.24%	89.17%	93.13%	0.0017	0.0000
34.5	12,590,796	92.68%	88.42%	92.71%	0.0018	0.0000
35.5			87.64%	92.26%		
36.5			86.82%	91.80%		
37.5			85.95%	91.31%		
38.5			85.04%	90.80%		
39.5			84.09%	90.27%		
40.5			83.09%	89.72%		
41.5			82.04%	89.14%		
42.5			80.94%	88.54%		
43.5			79.78%	87.91%		
44.5			78.58%	87.26%		
Sum of Squared Differences				[8]	0.0209	0.0022

Account 365 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R2.5-59	[5] OIEC R2.5-73	[6] Empire SSD	[7] OIEC SSD

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 366 Curve Fitting

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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R4-47	[5] OIEC R2.5-62	[6] Empire SSD	[7] OIEC SSD
0.0	30,280,795	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	29,607,670	100.00%	100.00%	99.96%	0.0000	0.0000
1.5	29,400,901	99.87%	100.00%	99.86%	0.0000	0.0000
2.5	29,068,838	99.26%	99.99%	99.76%	0.0001	0.0000
3.5	28,835,401	98.65%	99.99%	99.66%	0.0002	0.0001
4.5	28,833,722	98.64%	99.98%	99.54%	0.0002	0.0001
5.5	28,304,928	98.64%	99.98%	99.42%	0.0002	0.0001
6.5	26,145,648	98.58%	99.97%	99.29%	0.0002	0.0001
7.5	22,835,909	98.54%	99.96%	99.15%	0.0002	0.0000
8.5	20,144,165	98.53%	99.94%	99.01%	0.0002	0.0000
9.5	17,341,208	98.49%	99.92%	98.85%	0.0002	0.0000
10.5	16,090,822	98.48%	99.89%	98.68%	0.0002	0.0000
11.5	15,035,831	98.45%	99.86%	98.51%	0.0002	0.0000
12.5	14,284,888	98.44%	99.82%	98.32%	0.0002	0.0000
13.5	13,247,702	98.32%	99.77%	98.11%	0.0002	0.0000
14.5	12,024,502	98.24%	99.70%	97.90%	0.0002	0.0000
15.5	10,764,570	98.09%	99.62%	97.67%	0.0002	0.0000
16.5	9,657,546	97.93%	99.53%	97.43%	0.0003	0.0000
17.5	8,823,045	97.87%	99.41%	97.17%	0.0002	0.0000
18.5	7,900,133	97.76%	99.27%	96.90%	0.0002	0.0001
19.5	7,055,362	97.58%	99.10%	96.61%	0.0002	0.0001
20.5	5,931,079	97.02%	98.90%	96.30%	0.0004	0.0001
21.5	4,774,099	96.66%	98.66%	95.98%	0.0004	0.0000
22.5	3,975,912	96.38%	98.37%	95.63%	0.0004	0.0001
23.5	3,360,924	95.99%	98.04%	95.27%	0.0004	0.0001
24.5	2,978,139	95.69%	97.65%	94.88%	0.0004	0.0001
25.5	2,458,487	94.93%	97.20%	94.47%	0.0005	0.0000
26.5	2,274,177	94.24%	96.67%	94.04%	0.0006	0.0000
27.5	1,905,683	93.85%	96.07%	93.59%	0.0005	0.0000
28.5	1,493,511	93.34%	95.38%	93.11%	0.0004	0.0000
29.5	1,318,714	92.61%	94.59%	92.60%	0.0004	0.0000
30.5	1,207,122	91.68%	93.70%	92.07%	0.0004	0.0000
31.5	1,084,472	91.36%	92.69%	91.51%	0.0002	0.0000
32.5	998,265	91.19%	91.56%	90.92%	0.0000	0.0000
33.5	895,787	90.25%	90.30%	90.30%	0.0000	0.0000
34.5	780,019	89.71%	88.90%	89.65%	0.0001	0.0000
35.5			87.35%	88.96%		
36.5			85.65%	88.25%		
37.5			83.80%	87.49%		
38.5			81.78%	86.70%		
39.5			79.59%	85.87%		
40.5			77.22%	85.00%		
41.5			74.65%	84.10%		
42.5			71.82%	83.14%		
43.5			68.71%	82.15%		
44.5			65.28%	81.11%		
Sum of Squared Differences				[8]	0.0086	0.0010

Account 366 Curve Fitting

Exhibit DG 2-13
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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R4-47	[5] OIEC R2.5-62	[6] Empire SSD	[7] OIEC SSD

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 367 Curve Fitting

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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R2-45	[5] OIEC R1.5-55	[6] Empire SSD	[7] OIEC SSD
0.0	55,287,256	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	54,422,961	100.00%	99.89%	99.84%	0.0000	0.0000
1.5	54,233,017	99.89%	99.67%	99.51%	0.0000	0.0000
2.5	53,705,181	99.12%	99.43%	99.17%	0.0000	0.0000
3.5	53,569,921	98.90%	99.17%	98.82%	0.0000	0.0000
4.5	53,557,775	98.88%	98.89%	98.45%	0.0000	0.0000
5.5	53,044,654	98.83%	98.59%	98.07%	0.0000	0.0001
6.5	50,079,773	98.74%	98.27%	97.68%	0.0000	0.0001
7.5	43,850,732	98.48%	97.93%	97.28%	0.0000	0.0001
8.5	40,308,495	98.24%	97.57%	96.86%	0.0000	0.0002
9.5	37,118,459	98.14%	97.17%	96.43%	0.0001	0.0003
10.5	34,966,495	97.82%	96.76%	95.99%	0.0001	0.0003
11.5	32,964,028	97.30%	96.31%	95.53%	0.0001	0.0003
12.5	31,277,816	96.85%	95.83%	95.06%	0.0001	0.0003
13.5	29,077,133	95.75%	95.33%	94.57%	0.0000	0.0001
14.5	26,488,676	94.81%	94.79%	94.07%	0.0000	0.0001
15.5	23,474,400	93.81%	94.22%	93.55%	0.0000	0.0000
16.5	21,413,284	92.89%	93.61%	93.01%	0.0001	0.0000
17.5	19,365,014	91.11%	92.97%	92.46%	0.0003	0.0002
18.5	17,006,198	90.32%	92.28%	91.89%	0.0004	0.0002
19.5	14,529,210	89.79%	91.56%	91.30%	0.0003	0.0002
20.5	12,025,681	89.12%	90.79%	90.70%	0.0003	0.0002
21.5	9,683,970	87.99%	89.98%	90.08%	0.0004	0.0004
22.5	8,134,582	86.86%	89.13%	89.43%	0.0005	0.0007
23.5	7,136,619	86.14%	88.22%	88.77%	0.0004	0.0007
24.5	5,975,446	85.07%	87.27%	88.09%	0.0005	0.0009
25.5	5,096,837	84.79%	86.26%	87.38%	0.0002	0.0007
26.5	4,888,929	84.19%	85.20%	86.65%	0.0001	0.0006
27.5	4,621,513	83.98%	84.08%	85.90%	0.0000	0.0004
28.5	4,265,298	83.64%	82.90%	85.12%	0.0001	0.0002
29.5	4,010,520	83.52%	81.67%	84.31%	0.0003	0.0001
30.5	3,607,737	83.14%	80.37%	83.48%	0.0008	0.0000
31.5	3,318,716	82.94%	79.01%	82.63%	0.0015	0.0000
32.5	2,929,163	82.85%	77.58%	81.75%	0.0028	0.0001
33.5	2,672,488	82.72%	76.09%	80.83%	0.0044	0.0004
34.5	2,269,389	82.57%	74.53%	79.89%	0.0065	0.0007
35.5	1,770,633	82.24%	72.90%	78.92%	0.0087	0.0011
36.5	1,371,987	80.42%	71.20%	77.91%	0.0085	0.0006
37.5	1,097,031	80.29%	69.43%	76.88%	0.0118	0.0012
38.5	856,611	80.07%	67.59%	75.81%	0.0156	0.0018
39.5	660,398	79.76%	65.68%	74.71%	0.0198	0.0025
40.5	448,721	79.73%	63.70%	73.58%	0.0257	0.0038
41.5	288,014	79.73%	61.65%	72.42%	0.0327	0.0053
42.5	166,387	79.73%	59.55%	71.22%	0.0407	0.0072
43.5	99,443	79.68%	57.38%	69.98%	0.0497	0.0094
44.5	57,167	79.68%	55.16%	68.72%	0.0601	0.0120
45.5	7,507	79.68%	52.88%	67.42%	0.0718	0.0150
46.5	6,351	79.68%	50.56%	66.08%	0.0848	0.0185
47.5			48.20%	64.71%		

Account 367 Curve Fitting

Exhibit DG 2-14
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[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R2-45	[5] OIEC R1.5-55	[6] Empire SSD	[7] OIEC SSD
48.5			45.81%	63.31%		
49.5			43.40%	61.88%		
50.5			40.97%	60.41%		
51.5			38.54%	58.92%		
52.5			36.11%	57.39%		
53.5			33.71%	55.84%		
54.5			31.33%	54.26%		
55.5			28.99%	52.66%		
56.5			26.70%	51.03%		
57.5			24.47%	49.38%		
Sum of Squared Differences				[8]	0.4505	0.0873
Up to 1% of Beginning Exposures				[9]	0.0849	0.0160

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 368 Curve Fitting

Exhibit DG 2-15
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[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**Empire R2-48**	**OIEC R2-51**	**Empire SSD**	**OIEC SSD**
0.0	97,898,689	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	95,251,608	99.89%	99.90%	99.91%	0.0000	0.0000
1.5	95,068,511	99.75%	99.69%	99.71%	0.0000	0.0000
2.5	94,774,181	99.56%	99.47%	99.50%	0.0000	0.0000
3.5	94,510,475	99.37%	99.23%	99.28%	0.0000	0.0000
4.5	94,351,443	99.19%	98.97%	99.04%	0.0000	0.0000
5.5	91,117,258	99.02%	98.70%	98.79%	0.0000	0.0000
6.5	85,868,693	98.83%	98.41%	98.52%	0.0000	0.0000
7.5	79,990,433	98.61%	98.10%	98.24%	0.0000	0.0000
8.5	75,336,078	98.36%	97.76%	97.93%	0.0000	0.0000
9.5	71,091,231	98.07%	97.41%	97.61%	0.0000	0.0000
10.5	67,981,039	97.84%	97.03%	97.27%	0.0001	0.0000
11.5	64,176,660	97.30%	96.63%	96.91%	0.0000	0.0000
12.5	60,971,623	96.91%	96.21%	96.52%	0.0000	0.0000
13.5	58,413,538	96.52%	95.76%	96.12%	0.0001	0.0000
14.5	55,235,990	96.10%	95.28%	95.69%	0.0001	0.0000
15.5	51,720,588	95.68%	94.77%	95.24%	0.0001	0.0000
16.5	47,944,228	95.23%	94.24%	94.76%	0.0001	0.0000
17.5	45,291,186	94.79%	93.67%	94.25%	0.0001	0.0000
18.5	41,720,167	94.27%	93.07%	93.72%	0.0001	0.0000
19.5	38,247,358	93.65%	92.44%	93.16%	0.0001	0.0000
20.5	33,895,041	92.97%	91.77%	92.57%	0.0001	0.0000
21.5	31,476,268	92.23%	91.06%	91.95%	0.0001	0.0000
22.5	28,988,181	91.54%	90.32%	91.29%	0.0001	0.0000
23.5	26,865,407	90.81%	89.53%	90.61%	0.0002	0.0000
24.5	24,810,574	89.77%	88.71%	89.88%	0.0001	0.0000
25.5	22,656,618	88.86%	87.84%	89.13%	0.0001	0.0000
26.5	20,723,772	88.06%	86.93%	88.33%	0.0001	0.0000
27.5	18,975,839	87.27%	85.97%	87.50%	0.0002	0.0000
28.5	16,756,962	86.04%	84.96%	86.62%	0.0001	0.0000
29.5	15,145,083	85.01%	83.90%	85.70%	0.0001	0.0000
30.5	13,675,546	83.83%	82.79%	84.74%	0.0001	0.0001
31.5	12,481,020	82.84%	81.63%	83.74%	0.0001	0.0001
32.5	11,560,695	81.77%	80.41%	82.69%	0.0002	0.0001
33.5	10,457,151	80.97%	79.14%	81.59%	0.0003	0.0000
34.5	9,533,705	80.01%	77.81%	80.45%	0.0005	0.0000
35.5	8,557,307	78.95%	76.42%	79.25%	0.0006	0.0000
36.5	7,501,688	77.82%	74.98%	78.01%	0.0008	0.0000
37.5	6,754,932	76.97%	73.47%	76.71%	0.0012	0.0000
38.5	5,942,329	75.91%	71.90%	75.36%	0.0016	0.0000
39.5	5,478,622	74.81%	70.26%	73.96%	0.0021	0.0001
40.5	4,934,131	74.03%	68.57%	72.50%	0.0030	0.0002
41.5	4,179,474	73.06%	66.82%	70.99%	0.0039	0.0004
42.5	3,715,991	72.34%	65.00%	69.43%	0.0054	0.0008
43.5	3,054,751	71.31%	63.13%	67.81%	0.0067	0.0012
44.5	2,644,654	70.39%	61.20%	66.13%	0.0084	0.0018
45.5	2,174,880	69.16%	59.21%	64.40%	0.0099	0.0023
46.5	1,843,614	68.45%	57.17%	62.63%	0.0127	0.0034
47.5	1,393,198	67.23%	55.09%	60.80%	0.0147	0.0041

Exhibit DG 2-15
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Account 368 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R2-48	[5] OIEC R2-51	[6] Empire SSD	[7] OIEC SSD
48.5	1,055,734	65.86%	52.95%	58.92%	0.0167	0.0048
49.5	791,497	65.25%	50.78%	56.99%	0.0209	0.0068
50.5	619,373	65.25%	48.57%	55.02%	0.0278	0.0105
51.5	453,982	65.25%	46.33%	53.02%	0.0358	0.0150
52.5	303,988	65.25%	44.08%	50.97%	0.0448	0.0204
53.5	159,699	65.25%	41.80%	48.90%	0.0550	0.0267
54.5		65.25%	39.52%	46.80%	0.0662	0.0341
55.5			37.25%	44.68%		
56.5			34.98%	42.54%		
57.5			32.74%	40.40%		
58.5			30.52%	38.25%		
59.5			28.34%	36.11%		
60.5			26.21%	33.99%		
61.5			24.13%	31.88%		
62.5			22.12%	29.81%		
63.5			20.18%	27.77%		
64.5			18.33%	25.78%		
Sum of Squared Differences				[8]	0.3419	0.1334
Up to 1% of Beginning Exposures				[9]	0.0914	0.0200

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 369 Curve Fitting

Exhibit DG 2-16
Page 1 of 2

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire R4-45	[5] OIEC R5-52	[6] Empire SSD	[7] OIEC SSD
0.0	68,946,796	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	65,633,713	100.00%	100.00%	100.00%	0.0000	0.0000
1.5	65,641,655	100.00%	100.00%	100.00%	0.0000	0.0000
2.5	65,576,327	99.90%	99.99%	100.00%	0.0000	0.0000
3.5	65,576,289	99.90%	99.99%	100.00%	0.0000	0.0000
4.5	65,575,735	99.90%	99.98%	100.00%	0.0000	0.0000
5.5	63,939,512	99.90%	99.97%	100.00%	0.0000	0.0000
6.5	61,459,477	99.90%	99.96%	100.00%	0.0000	0.0000
7.5	55,020,358	99.87%	99.95%	100.00%	0.0000	0.0000
8.5	51,676,090	99.86%	99.93%	100.00%	0.0000	0.0000
9.5	48,486,438	99.84%	99.91%	100.00%	0.0000	0.0000
10.5	45,521,912	99.80%	99.88%	100.00%	0.0000	0.0000
11.5	42,648,124	99.79%	99.84%	100.00%	0.0000	0.0000
12.5	40,452,798	99.78%	99.79%	100.00%	0.0000	0.0000
13.5	37,652,419	99.77%	99.73%	100.00%	0.0000	0.0000
14.5	35,633,423	99.75%	99.65%	100.00%	0.0000	0.0000
15.5	33,734,008	99.74%	99.56%	100.00%	0.0000	0.0000
16.5	31,800,766	99.73%	99.44%	100.00%	0.0000	0.0000
17.5	29,751,765	99.72%	99.30%	100.00%	0.0000	0.0000
18.5	27,484,354	99.70%	99.13%	100.00%	0.0000	0.0000
19.5	24,760,905	99.65%	98.93%	100.00%	0.0001	0.0000
20.5	22,074,036	99.60%	98.68%	100.00%	0.0001	0.0000
21.5	19,706,556	99.58%	98.39%	100.00%	0.0001	0.0000
22.5	17,869,741	99.50%	98.04%	100.00%	0.0002	0.0000
23.5	16,500,316	99.46%	97.63%	99.99%	0.0003	0.0000
24.5	14,954,580	99.42%	97.15%	99.98%	0.0005	0.0000
25.5	13,637,189	99.38%	96.60%	99.96%	0.0008	0.0000
26.5	12,541,399	99.36%	95.95%	99.94%	0.0012	0.0000
27.5	11,398,618	99.34%	95.21%	99.89%	0.0017	0.0000
28.5	10,477,622	99.29%	94.36%	99.83%	0.0024	0.0000
29.5	9,545,828	99.21%	93.40%	99.74%	0.0034	0.0000
30.5	8,790,672	99.08%	92.30%	99.61%	0.0046	0.0000
31.5	7,998,631	99.03%	91.08%	99.43%	0.0063	0.0000
32.5	7,396,835	98.96%	89.70%	99.20%	0.0086	0.0000
33.5	6,762,303	98.86%	88.16%	98.90%	0.0114	0.0000
34.5	6,074,237	98.50%	86.47%	98.53%	0.0145	0.0000
35.5	5,299,815	97.34%	84.60%	98.05%	0.0162	0.0001
36.5	4,570,121	97.21%	82.56%	97.47%	0.0215	0.0000
37.5	3,904,748	95.92%	80.34%	96.76%	0.0243	0.0001
38.5	3,319,365	95.70%	77.93%	95.89%	0.0316	0.0000
39.5	2,863,751	94.81%	75.30%	94.85%	0.0381	0.0000
40.5	2,440,858	94.47%	72.42%	93.60%	0.0486	0.0001
41.5	1,918,921	93.29%	69.22%	92.10%	0.0579	0.0001
42.5	1,494,235	92.45%	65.68%	90.33%	0.0717	0.0005
43.5	1,193,950	91.25%	61.80%	88.23%	0.0867	0.0009
44.5	965,666	90.05%	57.59%	85.77%	0.1053	0.0018
45.5	767,118	83.65%	53.10%	82.90%	0.0933	0.0001
46.5	576,413	80.31%	48.40%	79.60%	0.1018	0.0000
47.5	420,672	78.49%	43.58%	75.85%	0.1219	0.0007

Account 369 Curve Fitting

[1] **Age (Years)**	[2] **Exposures (Dollars)**	[3] **Observed Life Table (OLT)**	[4] **Empire R4-45**	[5] **OIEC R5-52**	[6] **Empire SSD**	[7] **OIEC SSD**
48.5	287,239	78.08%	38.74%	71.64%	0.1548	0.0042
49.5	167,266	76.49%	33.97%	66.97%	0.1808	0.0091
50.5	79,158	76.49%	29.39%	61.89%	0.2219	0.0213
51.5	13,371	61.78%	25.05%	56.45%	0.1349	0.0028
52.5	1,719	48.43%	21.02%	50.73%	0.0751	0.0005
53.5		48.43%	17.35%	44.82%	0.0966	0.0013
54.5			14.07%	38.87%		
55.5			11.19%	33.01%		
56.5			8.69%	27.38%		
57.5			6.57%	22.12%		
58.5			4.80%	17.37%		
59.5			3.38%	13.22%		
60.5			2.27%	9.73%		
61.5			1.42%	6.93%		
62.5			0.82%	4.78%		
63.5			0.42%	3.19%		
Sum of Squared Differences				[8]	1.7392	0.0439
Up to 1% of Beginning Exposures				[9]	0.6515	0.0040

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 390 Curve Fitting

Exhibit DG 2-17

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire L3-28	[5] OIEC L0-55	[6] Empire SSD	[7] OIEC SSD
0.0	12,611,883	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	12,531,371	99.98%	100.00%	99.88%	0.0000	0.0000
1.5	12,416,047	99.94%	100.00%	99.51%	0.0000	0.0000
2.5	11,510,460	99.84%	100.00%	99.02%	0.0000	0.0001
3.5	11,117,428	99.79%	100.00%	98.45%	0.0000	0.0002
4.5	11,033,183	99.16%	99.98%	97.80%	0.0001	0.0002
5.5	10,949,978	98.93%	99.93%	97.10%	0.0001	0.0003
6.5	10,677,085	96.67%	99.83%	96.34%	0.0010	0.0000
7.5	10,483,745	96.26%	99.66%	95.54%	0.0012	0.0001
8.5	10,373,949	95.34%	99.42%	94.70%	0.0017	0.0000
9.5	10,081,522	94.05%	99.08%	93.83%	0.0025	0.0000
10.5	9,859,991	92.43%	98.62%	92.92%	0.0038	0.0000
11.5	9,728,045	91.21%	98.04%	91.98%	0.0047	0.0001
12.5	9,414,888	90.77%	97.31%	91.02%	0.0043	0.0000
13.5	9,316,375	90.68%	96.38%	90.03%	0.0032	0.0000
14.5	9,201,335	89.61%	95.21%	89.02%	0.0031	0.0000
15.5	9,086,687	88.46%	93.72%	87.99%	0.0028	0.0000
16.5	8,760,410	86.61%	91.86%	86.94%	0.0028	0.0000
17.5	8,727,285	86.34%	89.53%	85.88%	0.0010	0.0000
18.5	8,702,233	86.21%	86.69%	84.80%	0.0000	0.0002
19.5	8,247,402	84.59%	83.33%	83.71%	0.0002	0.0001
20.5	8,178,029	83.83%	79.45%	82.62%	0.0019	0.0001
21.5	8,080,542	82.84%	75.13%	81.51%	0.0059	0.0002
22.5	7,895,431	81.80%	70.45%	80.39%	0.0129	0.0002
23.5	7,814,543	80.89%	65.53%	79.27%	0.0236	0.0003
24.5	7,821,789	80.63%	60.51%	78.14%	0.0405	0.0006
25.5	7,782,896	80.23%	55.51%	77.01%	0.0611	0.0010
26.5	7,392,208	79.88%	50.65%	75.87%	0.0854	0.0016
27.5	128,338	71.83%	46.02%	74.74%	0.0666	0.0008
28.5	139,301	71.81%	41.68%	73.60%	0.0908	0.0003
29.5	146,096	71.81%	37.67%	72.47%	0.1165	0.0000
30.5	115,616	56.83%	34.00%	71.33%	0.0521	0.0210
31.5	114,606	56.33%	30.66%	70.20%	0.0659	0.0192
32.5	114,606	56.33%	27.62%	69.07%	0.0824	0.0162
33.5	109,313	53.73%	24.87%	67.94%	0.0833	0.0202
34.5	93,631	53.73%	22.37%	66.82%	0.0984	0.0171
35.5	93,631	53.73%	20.08%	65.69%	0.1132	0.0143
36.5	93,631	53.73%	17.98%	64.57%	0.1278	0.0118
37.5	93,631	53.73%	16.05%	63.46%	0.1420	0.0095
38.5	93,631	53.73%	14.26%	62.34%	0.1558	0.0074
39.5	93,631	53.73%	12.62%	61.23%	0.1690	0.0056
40.5	93,631	53.73%	11.10%	60.13%	0.1818	0.0041
41.5	82,631	47.42%	9.70%	59.03%	0.1423	0.0135
42.5	76,851	44.10%	8.41%	57.93%	0.1274	0.0191
43.5	76,851	44.10%	7.24%	56.84%	0.1358	0.0162
44.5	76,851	44.10%	6.18%	55.76%	0.1438	0.0136
45.5	76,851	44.10%	5.22%	54.68%	0.1511	0.0112
46.5	76,851	44.10%	4.37%	53.61%	0.1579	0.0090
47.5	76,851	44.10%	3.61%	52.55%	0.1639	0.0071

Account 390 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Empire L3-28	[5] OIEC L0-55	[6] Empire SSD	[7] OIEC SSD
48.5	76,851	44.10%	2.95%	51.49%	0.1693	0.0055
49.5	31,714	18.20%	2.37%	50.44%	0.0250	0.1040
50.5	28,581	16.40%	1.88%	49.40%	0.0211	0.1089
51.5		16.40%	1.47%	48.37%	0.0223	0.1022
52.5			1.12%	47.34%	0.0001	0.2241
53.5			0.84%	46.32%	0.0001	0.2146
54.5			0.61%	45.32%	0.0000	0.2053
55.5			0.43%	44.32%		
56.5			0.30%	43.33%		
57.5			0.19%	42.35%		
58.5			0.12%	41.38%		
59.5			0.07%	40.42%		
60.5			0.04%	39.47%		
61.5			0.02%	38.53%		
Sum of Squared Differences				[8]	3.0697	1.2075
Up to 1% of Beginning Exposures				[9]	0.3304	0.0063

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Riverton Amortization Adjustment

Exhibit DG 2-18

Description	Units 7 & 8	Unit 9
Accumulated depreciation reserve at 6/30/2015	$ (4,675,891)	
Depreciation reserve associated with remaining plant in service	2,092,509	
Undepreciated amount of retired plant	(6,768,400)	(758,397)
Estimated net cost of removal for decommissioning units	(3,910,566)	(56,093)
Total amount of depreciation reserve shortfall	(10,678,966)	(814,490)
Annual amortization (over 42 years) of Riverton reserve shortfall	254,261	19,393
Total Amortization	273,654	
(OK Jurisdiction - 2.75%)	7,525	
Company Riverton Amortization Adjustment	63,273	
OIEC Adjustment	**$ (55,748)**	