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APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS

OF

DAVID J. GARRETT

ON BEHALF OF

CITIES ADVOCATING REASONABLE DEREGULATION

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EXHIBITS

WORKPAPERS

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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]

[1] Exhibit DJG-1.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am testifying on behalf of Cities Advocating Reasonable Deregulation ("CARD").

Q. DESCRIBE THE PURPOSE AND SCOPE OF YOUR TESTIMONY IN THIS PROCEEDING.

A. In this case, I am testifying with regard to Southwestern Electric Power Company's ("SWEPCO" or the "Company") proposed depreciation rates and the Company's depreciation study. I also address the Company's decommissioning cost estimates.

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 develop reasonable depreciation rates in this case. The table below compares CARD's and SWEPCO's proposed depreciation accruals by plant function.

Figure 1:
CARD Summary Depreciation Adjustment

Plant Function	Plant Balance 12/31/2019	SWEPCO Proposed Accrual	CARD Proposed Accrual	**CARD Adjustment**
Production	$ 4,276,623,503	$ 115,877,699	$ 110,908,141	$ (4,969,558)
Transmission	2,056,196,799	47,890,727	43,360,540	(4,530,187)
Distribution	2,271,709,069	63,573,769	55,268,012	(8,305,757)
General	209,693,771	6,441,093	6,441,091	(2)
Total	$ 8,814,223,142	$ 233,783,288	$ 215,977,784	**$ (17,805,504)**

CARD's total adjustment reduces the Company's proposed annual depreciation accrual by $17.8 million.[2]

[2] *See* Exhibit DJG-2; applies to plant balances at 12-31-19.

Q. SUMMARIZE THE PRIMARY FACTORS DRIVING CARD'S DEPRECIATION ACCRUAL ADJUSTMENT.

A. There are three primary factors driving CARD's depreciation adjustment in this case: (1) removing the contingency factors from the Company's proposed decommissioning costs; (2) removing the escalation factors from the Company's proposed decommissioning costs; and (3) proposing different service lives for the Company's mass property accounts (transmission and distribution). These issues and their estimated impacts are summarized in the table below.

Figure 2:
Broad Issue Impacts

Issue	Impact
1. Removing contingency factor from demolition cost estimates	$1.3 million
2. Remove escalation factor from demolition cost estimates	$3.7 million
2. Proposing longer service lives for nine mass property accounts	$12.8 million
Total	**$17.8 million**

Each of these issues will be discussed in more detail below.

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 used and useful 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 in order to increase earnings; this 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 and recovers the full cost of its plant investment. 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. 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 from a public policy perspective 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."[3] 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.[4] Moreover, the *Lindheimer* Court found:

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

[4] *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."

> [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.[5]

Thus, SWEPCO bears the burden of making a convincing showing that its proposed depreciation rates are not excessive; this standard necessarily encompasses the net salvage and service life parameters that impact depreciation rates.

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.[6] 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.[7] 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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[5] *Id.* at 169.

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

[7] 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.[8]

Thus, the concept of depreciation as "the allocation of cost has proven to be the most useful and most widely used concept."[9]

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.[10] In this case, I used the straight-line method, the average life procedure, the remaining life technique, and the broad group model. This system would be denoted as an "SL-AL-RL-BG" system. 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.

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

[9] Wolf *supra* n. 6, at 73.

[10] *See* Wolf *supra* n. 6, at 70, 140.

Q. DID MR. CASH USE A SIMILAR DEPRECIATION SYSTEM IN HIS ANALYSIS?

A. Yes. Essentially, Company witness Jason A. Cash and I used the same depreciation system to develop our proposed depreciation rates. Thus, the discrepancy in our recommendations is not driven by the use of different depreciation systems, but rather by our differing opinions regarding service lives.

V. TERMINAL NET SALVAGE AND DEMOLITION COSTS

Q. DESCRIBE HOW TERMINAL NET SALVAGE IMPACTS DEPRECIATION RATES.

A. The Company's terminal net salvage rates are based on decommissioning cost estimates provided by Paul M. Eiden. Mr. Eiden's estimates for each of the Company's production units include estimates for scrap value (or "gross salvage") and for the labor and materials required to decommission or dismantle the units (i.e., "removal cost"). Since the removal costs exceed gross salvage, it results in an overall negative net salvage that increases costs for current customers.

Q. PLEASE SUMMARIZE THE COMPANY'S REQUEST REGARDING THE RECOVERY OF DECOMMISSIONING COSTS.

A. Essentially, the Company is asking the Commission to approve about $200 million of future costs, some of which may not even be incurred, up to nearly 50 years in advance for some plants.[11] This request is problematic because these costs are far from known and measurable.

Q. DESCRIBE THE PROBLEMS WITH THE COMPANY'S PROPOSED DECOMMISSIONING COSTS.

A. There are two main problems with the Company's terminal net salvage estimates proposals: (1) the decommissioning studies include arbitrary and unsupported contingency factors that increase decommissioning costs by 10% and reduce scrap value estimates by 10%; and (2) the Company escalates the current decommissioning costs into the future by

[11] *See* Company workpaper "Net Salvage Ratio Calc for Prod 2019 Updated Demo at 10 percent."

an annual inflation rate of 2.22% without applying a discount rate, thus charging current ratepayers with inflated future costs. Each of these problems results in the Company's terminal net salvage rates and depreciation rates for the affected production plants to be unreasonable.

Q. DO YOU AGREE WITH THE COMPANY'S APPLICATION OF A CONTINGENCY FACTOR TO ITS ESTIMATED DECOMMISSIONING COSTS?

A. No. Charging current ratepayers an additional 10% on top of already-uncertain future cost estimates is arbitrary and unfair. The Company's inclusion of contingency costs translates to an increase of about $22 million to the base decommissioning cost estimates.[12] Mr. Eiden's testimony offers little support for the inclusion of contingency costs. Typically, utilities argue that the inclusion of contingency costs is necessary to account for the uncertainties inherent in future demolition cost estimates. Similar to the Commission's reasoning for disallowing interim retirements – that they are not "known and measurable" – decommissioning costs are also not known and measurable. Moreover, future decommissioning cost estimates are arguably even *less* known and measurable than interim retirements. Applying an arbitrary 10% contingency factor on the basis that future costs are "uncertain," on top of a cost that is already uncertain further exacerbates the underlying problem with such costs. That is, if a cost is already not known and measurable, we should not arbitrarily increase such costs by 10%, especially in a ratemaking context. This arrangement is particularly unfair to current ratepayers. That is, it is not fair to increase a future cost estimate by 10% (or any amount) because it is uncertain, when the same argument could be made in support of decreasing the cost by the same percentage. The more fair and reasonable approach is not increase or decrease uncertain future demolition costs by any arbitrary amount.

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[12] *See* Exhibit DJG-5.

Q. DO YOUR PROPOSED NET SALVAGE RATES EXCLUDE THE COMPANY'S PROPOSED CONTINGENCY FACTORS?

A. Yes, for the reasons discussed above, my proposed terminal net salvage rates exclude the 10% contingency factors proposed by SWEPCO.[13]

Q. DESCRIBE THE SPECIFIC PROBLEMS WITH THE ESCALATION FACTOR THE COMPANY APPLIED TO ITS DECOMMISSIONING COST ESTIMATES.

A. The Company has added an annual escalation factor of 2.22% to the decommissioning cost estimates. It is not reasonable to charge current ratepayers for a future cost that has not been discounted to present value. The concept of the time value of money is a cornerstone of finance and valuation. For example, the Gordon Growth Model (or DCF Model) is one of the most widely-used valuation models. This model applies a growth rate to a company's dividends many years into the future. However, that dividend stream is then discounted back to the current year by a discount rate in order to arrive at the present value of an asset. In contrast to this approach, the Company has escalated the present value of its decommissioning costs decades into the future and is essentially asking current ratepayers to pay the future value of a cost with present-day dollars. This arrangement ignores the time value of money principle and is unfair to customers.

Q. DO YOUR PROPOSED NET SALVAGE RATES EXCLUDE THE COMPANY'S PROPOSED ESCALATION FACTOR?

A. Yes, for the reasons discussed above, my proposed terminal net salvage rates exclude the 2.22% annual escalation factor proposed by SWEPCO.[14]

VI. SERVICE LIFE ESTIMATES

Q. GENERALLY DESCRIBE YOUR APPROACH IN ESTIMATING THE SERVICE LIVES OF MASS PROPERTY.

A. I used the Company's historical 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

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[13] *See* Exhibit DJG-5 for specific calculations.

[14] *See* Exhibit DJG-5 for specific calculations.

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). To calculate an average life (the area under a curve), a complete survivor curve is required. 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 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. For example, if a particular account has insufficient retirement history, mathematical curve-fitting techniques may not be as useful in analyzing the account. In fact, for some of the accounts in this case I selected Iowa curves that were not the mathematical best fit, and this generally resulted in shorter curves (i.e., higher depreciation rate) being chosen, as further illustrated below. In other words, when I chose to deviate from the mathematically best-fitting Iowa curve, I generally selected Iowa curves and service lives that were closer to the Company's position rather than further from it, in the interest of reasonableness.

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."[15] 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. In the graphs shown below, the truncated OLT curves are shown based on this benchmark.

Q. SUMMARIZE THE DIFFERENCES BETWEEN YOUR SERVICE LIFE ESTIMATES AND THE COMPANY'S SERVICE LIFE ESTIMATES FOR THE ACCOUNTS YOU ADJUSTED.

A. The Iowa curves I selected to describe the service lives for the accounts I identify below generally provide better mathematical fits to SWEPCO's observed data, when compared to the Company's selected Iowa curves. The following charts and discussion illustrate how my recommendations are based on objective and unbiased factors. For most of the depreciable accounts discussed below, the curves I selected provide a better mathematical fit to the observed data than the curves the Company selected, especially when applied to the most statistically-relevant portions of the OLT curve. More importantly, the service lives I propose result in depreciation rates that are not only fair and reasonable, but also serve as a mitigating factor to the otherwise substantial rate increase that would be imposed on customers in the Company's position were adopted without adjustment. I think this is especially true given the unique financial hardships facing customers in the wake of an unprecedented global pandemic. In other words, my proposed service lives are not only technically sound and accurate based on the Iowa curve analyses I performed, but also

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15 Wolf *supra* n. 6, at 46.

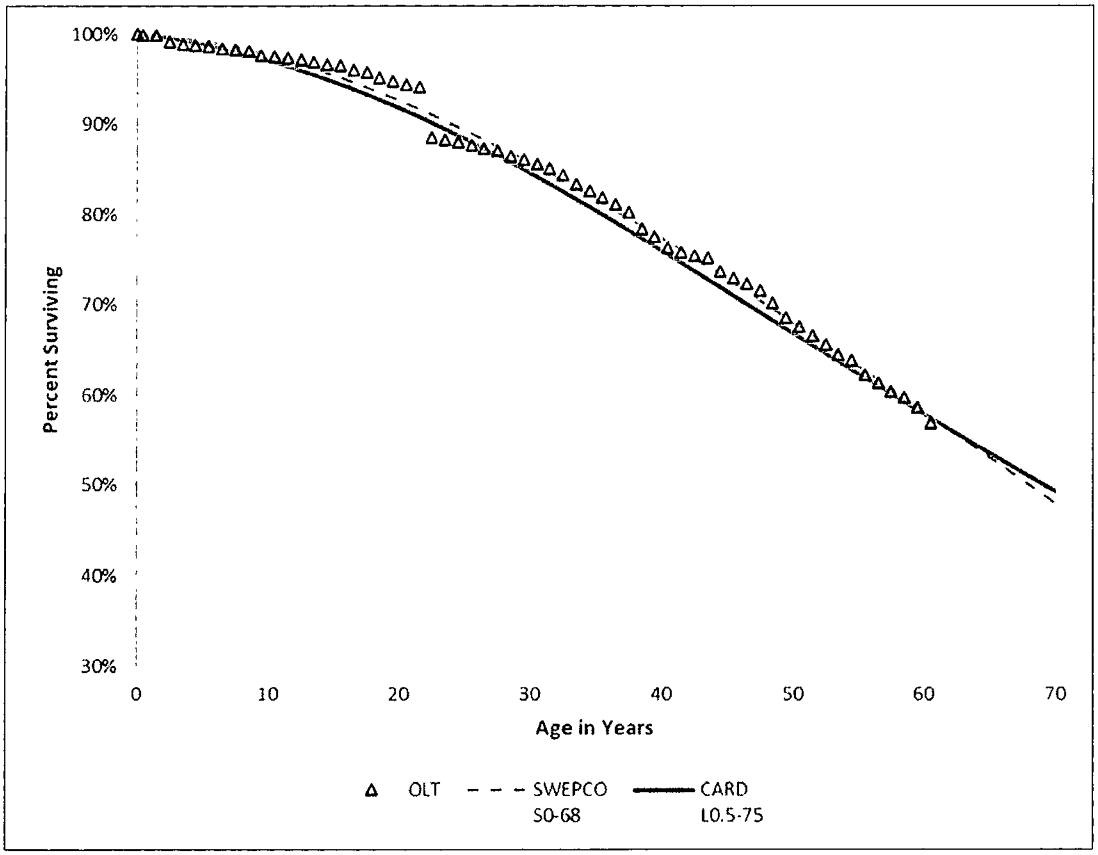
result in overall fair and reasonable depreciation rates given the totality of the economic circumstances.

1. Account 353 – Transmission Station Equipment

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. The observed survivor curve for Account 353 is ideal for Iowa-curve fitting techniques because the OLT curve for this account follows a relatively smooth pattern, and is in the shape of a typical Iowa type curve. 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; rather, it represents actual data and retirement experience. The OLT curve is represented by the black triangles in each of the following graphs. The Company selected the S0-68 Iowa curve to represent the mortality characteristics of this account, and I selected the L0.5-75 Iowa curve. Both Iowa curves are displayed in the following graph, along with the OLT curve.

Figure 3:
Account 353 – Transmission Station Equipment



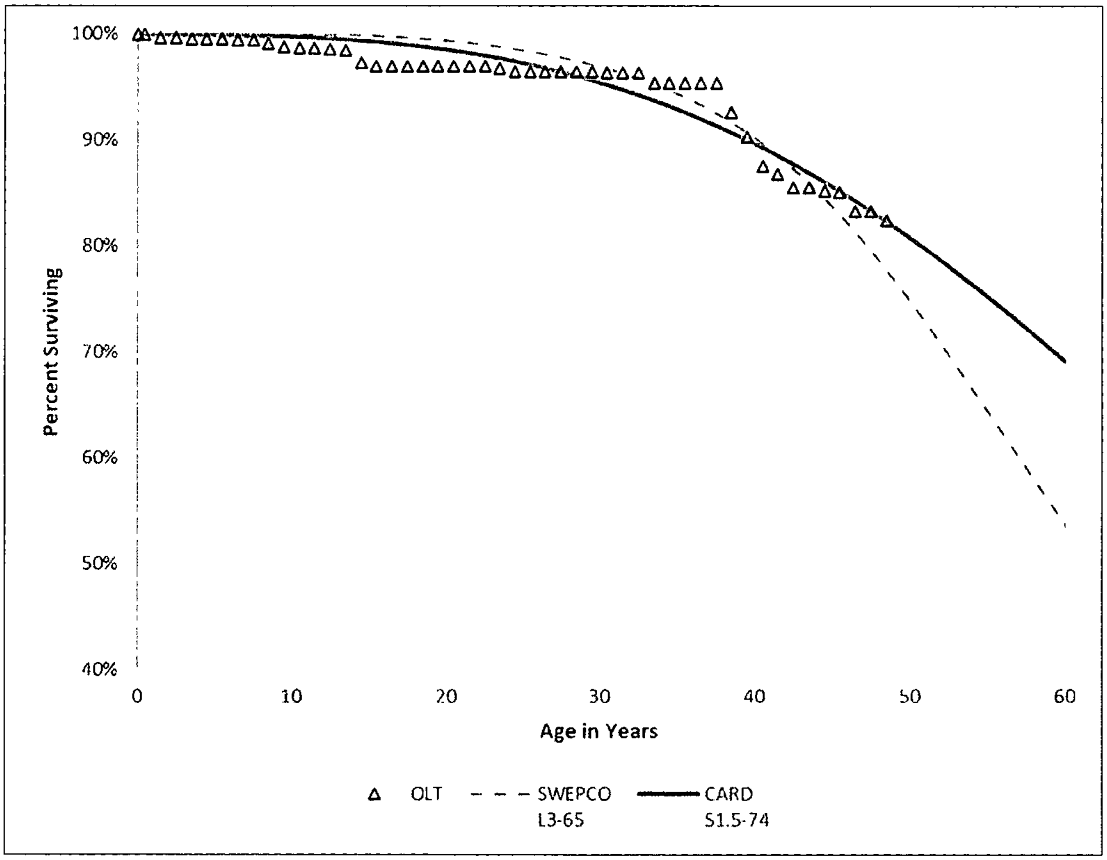
As shown in the graph, both Iowa curves provide relatively close fits to the relevant observed data. The Iowa curve I selected results in a longer average life and lower depreciation rate. While the Iowa curve selected by the Company for this account is not unreasonable, I recommend the Commission consider the rate mitigating effect that would result from adopting the L0.5-75 curve for this account as a reasonable alternative to the Company's proposal.

2. Account 354 – Transmission Towers and Fixtures

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. The curve I selected for this account is the S1.5-74 curve, and the curve the Company selected is the L3-65 curve. The graph below shows these two curves juxtaposed with the relevant OLT curve.

Figure 4:
Account 354 – Transmission Towers and Fixtures



As with the account discussed above, both of the selected Iowa curves provide relatively close and reasonable fits to the observed data. All else held constant, the S1.5-74 curve would result in a lower depreciation rate and expense.

Q. DOES THE S1.5-74 CURVE YOU SELECTED PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA THAN THE COMPANY'S CURVE?

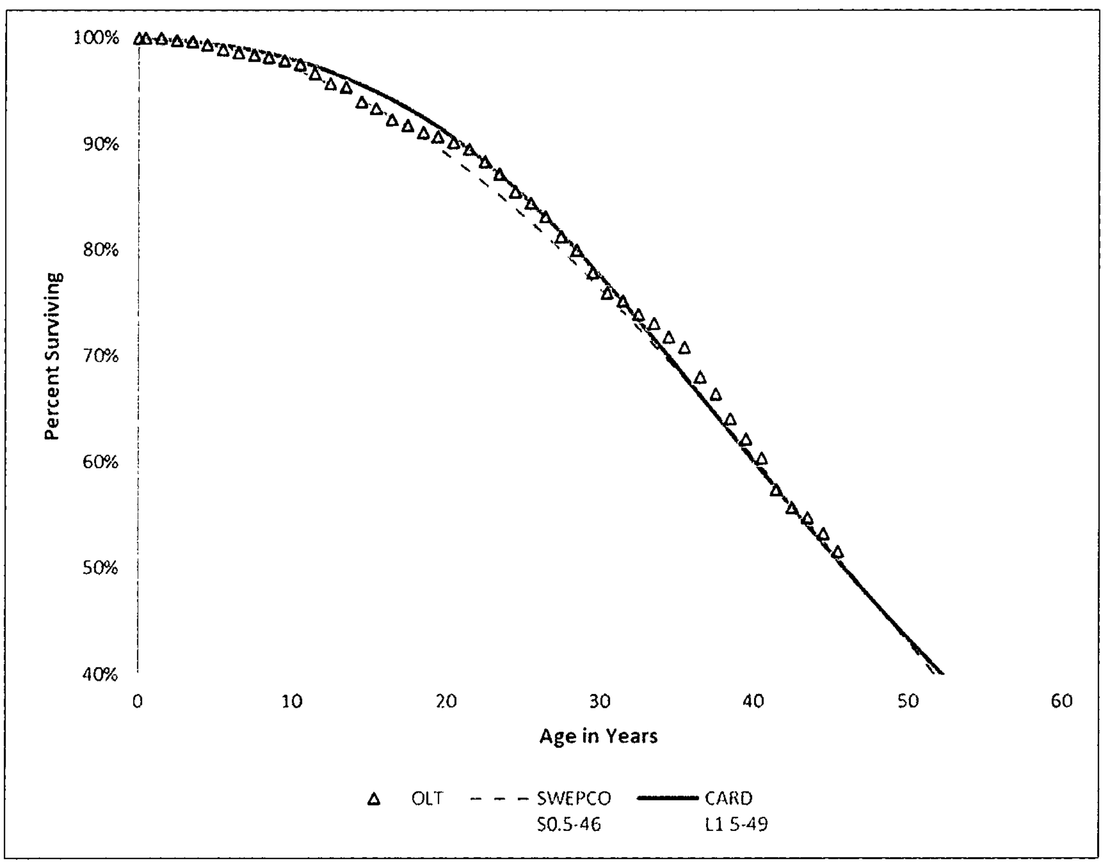
A. Yes. Mathematical curve fitting essentially involves measuring the distance between the OLT curve and the selected Iowa curve. The best mathematically-fitted curve is the one that minimizes the distance between the OLT curve and the Iowa curve, thus providing the closest fit. The "distance" between the curves is calculated using the "sum-of-squared differences" ("SSD") technique. Specifically, the SSD for the Company's curve is 0.0157, while the SSD for the S1.5-74 curve I selected is 0.0112.[16] Thus, the Iowa curve I selected results in the better mathematical fit; more pertinently, it results in a lower and more reasonable depreciation rate given the totality of the economic circumstances.

3. Account 355 – Transmission Poles and Fixtures

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Cash selected the S0.5-46 curve for this account, and I selected the L1.5-49 curve. The graph below shows these two curves along with the truncated OLT curve.

Figure 5:
Account 355 – Transmission Poles and Fixtures



[16] *See* Exhibit DJG-7.

As with the accounts discussed above, both Iowa curves provide relatively close fits to the observed data.

Q. DOES YOUR SELECTED CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA?

A. Yes. Specifically, the SSD for the Company's curve is 0.0064, while the SSD for the L1.5-49 curve I selected is 0.0047.[17] Thus, the Iowa curve I selected results in the better mathematical fit; more pertinently, it results in a lower and more reasonable depreciation rate given the totality of the economic circumstances.

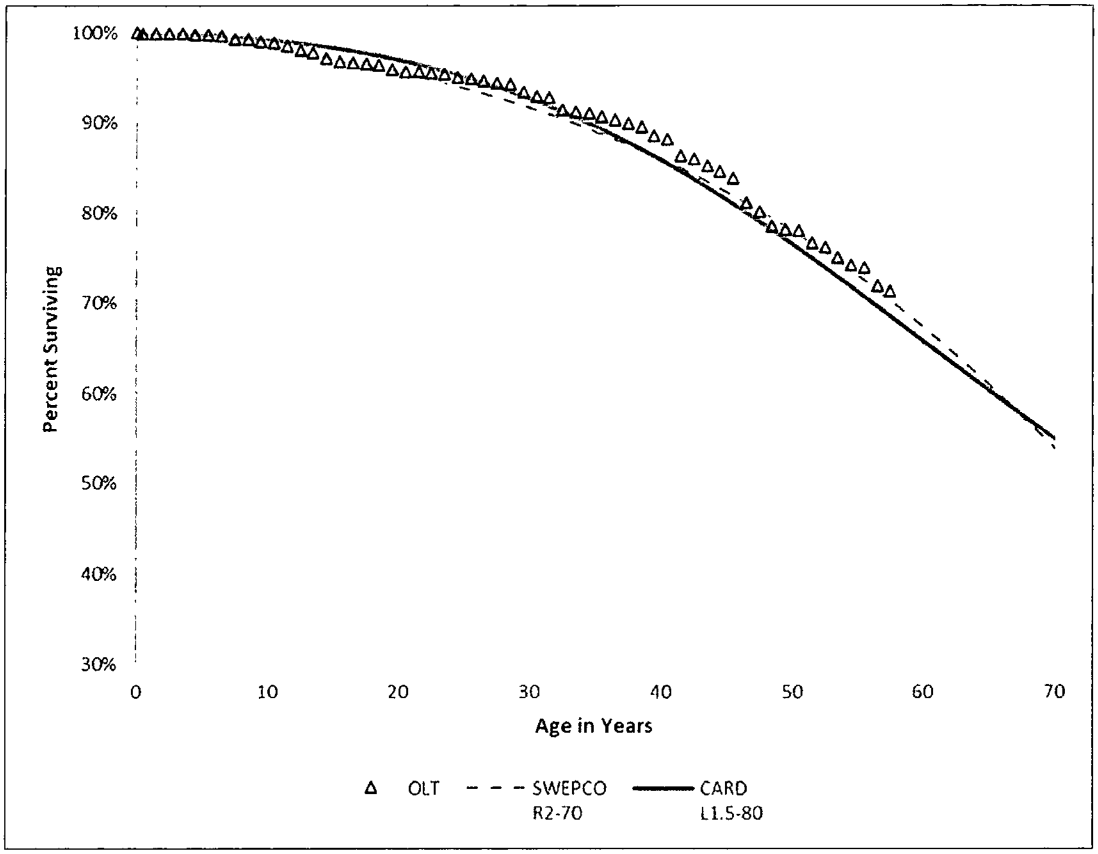
4. Account 356 – Overhead Conductors and Devices

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. For this account, Mr. Cash selected the R2-70 curve, and I selected the L1.5-80 curve. The graph below shows these two Iowa curves along with the OLT curve.

[17] Exhibit DJG-8.

Figure 6:
Account 356 – Overhead Conductors and Devices



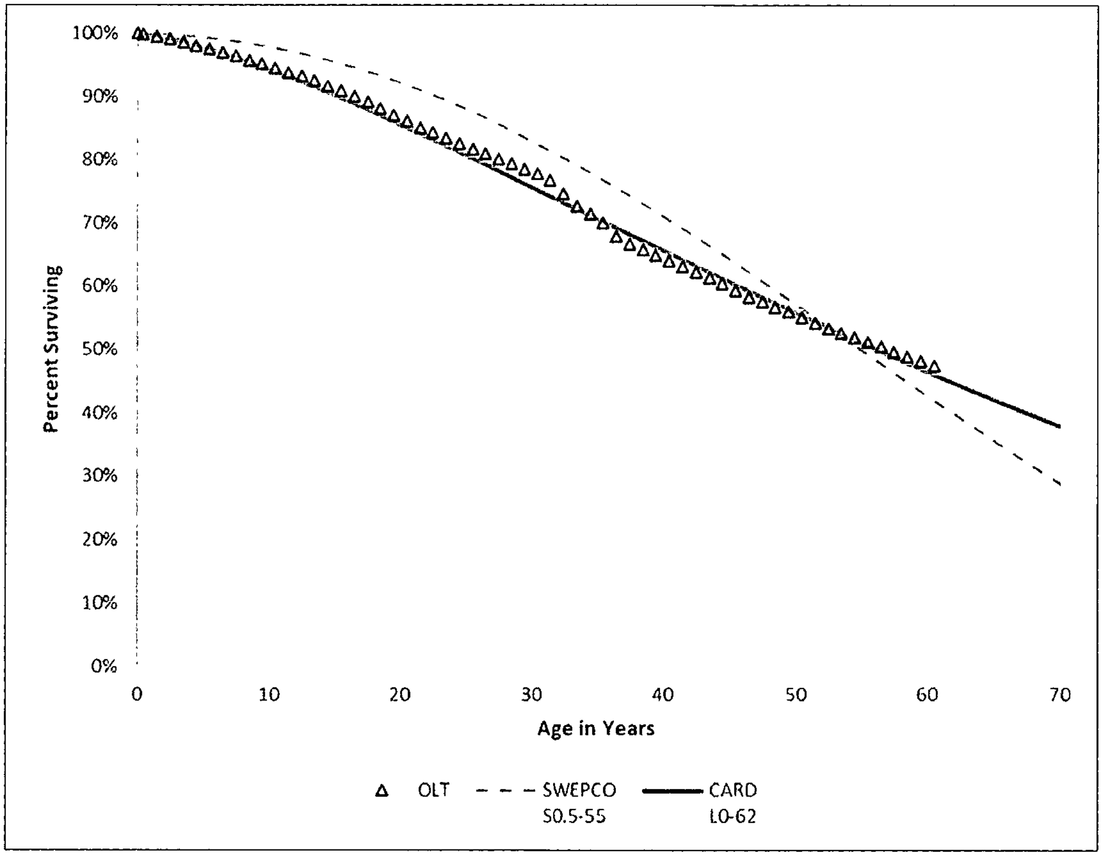
For this account, both of the selected Iowa curves provide close fits to the truncated OLT curve. As with the accounts discussed above, the Iowa curve I selected results in a longer average service life and lower depreciation rate. Under the current economic circumstances, the rate mitigating effect of the Iowa curve I selected makes it the preferable in my opinion.

5. Account 364 – Distribution Poles, Towers and Fixtures

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Cash selected the S0.5-55 curve for this account, and I selected the L0-62 curve. Both Iowa curves are shown in the graph below along with the OLT curve.

Figure 7:
Account 364 – Distribution Poles, Towers and Fixtures



Unlike the accounts discussed above, there is a notable visual difference in the goodness of fit between the two selected Iowa curves. From a visual inspection, it is clear that the L0-62 curve I selected provides a closer fit to the relevant observed data than the Company's selected curve.

Q. DOES YOUR SELECTED CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA?

A. Yes. Specifically, the SSD for the Company's curve is 0.1285, while the SSD for the L0-62 curve I selected is only 0.0072, making it the better mathematically fitting curve.[18] The

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[18] Exhibit DJG-10.

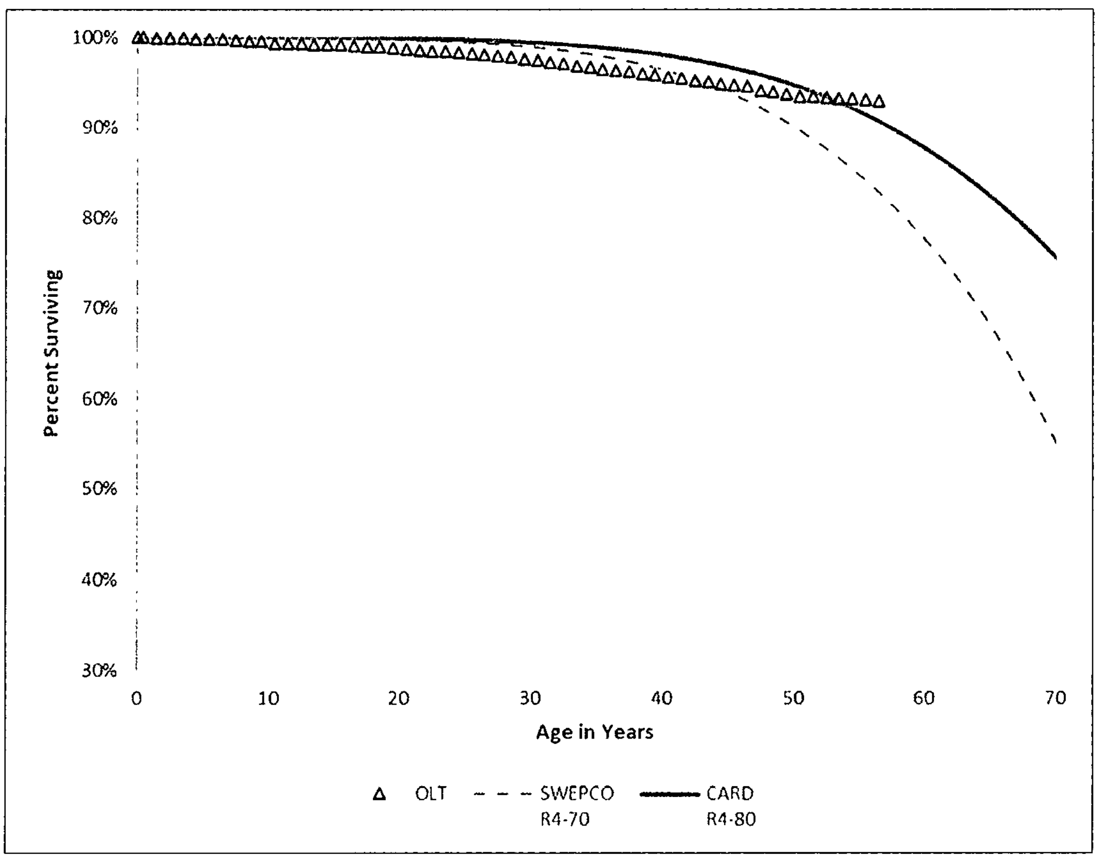
L0-62 Iowa curve results in a more reasonable and accurate depreciation rate for this account.

6. Account 366 – Underground Conduit

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Cash selected the R4-70 curve for this account, and I selected the R4-80 curve. Thus, both Iowa curves have the same curve shape, with a 10-year difference in average life. Both Iowa curves are shown in the graph below along with the OLT curve.

Figure 8:
Account 366 – Underground Conduit



Although the graph above shows only truncated OLT curve, the full observed life table for this account shows a 70% survival rate at the 90-year age interval for the assets in this account. Although both of the selected Iowa curves essentially assume that the retirement rate will increase going forward, the R4-70 curve selected by the Company is too short at this time given the historical data.

Q. DOES YOUR SELECTED CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA?

A. Yes. Specifically, the SSD for the Company's curve is 0.0411, while the SSD for the R4-80 curve is 0.0129, which means it results in the better mathematical fit.[19]

7. Account 367 – Underground Conductor

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Cash selected the R3-46 curve for this account, and I selected the R1-62 curve. Both Iowa curves are shown in the graph below along with the OLT curve.

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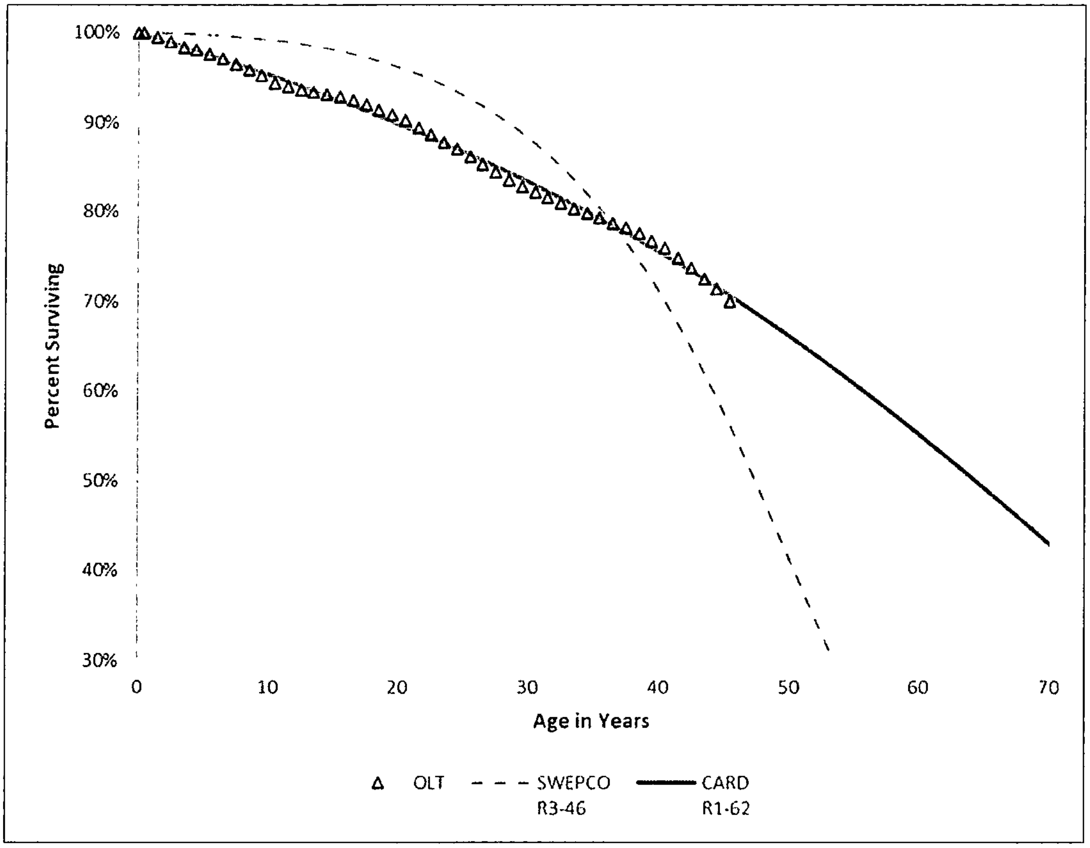
[19] Exhibit DJG-11.

Figure 9:
Account 367 – Underground Conductor



As shown in the graph above, the R3-46 curve selected by Mr. Cash does not appear to provide an accurate fit or description of the historical retirement rate observed thus far in this account. The higher-modal R3 curve has a higher arch relative to the flatter OLT curve. In contrast, the lower-modal R1-62 curve I selected provides a better fit through the more-relevant upper and middle portions of this truncated OLT curve.

Q. DOES YOUR SELECTED CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA?

A. Yes. Specifically, the SSD for the Company's curve is 0.1426, while the SSD for the R1-62 curve I selected is 0.0011, which means it results in the better mathematical fit.[20]

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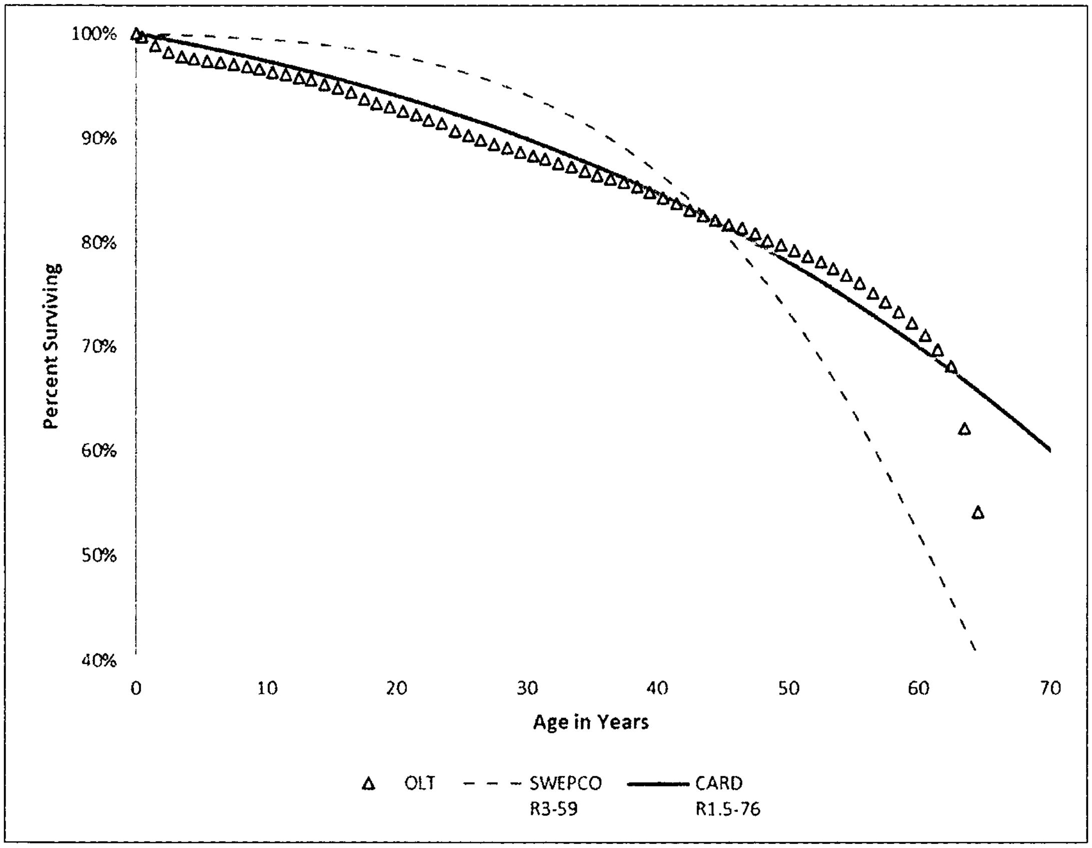
[20] Exhibit DJG-12.

8. Account 369 – Distribution Services

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Cash selected the R3-59 curve for this account, and I selected the R1.5-76 curve. Both Iowa curves are shown in the graph below along with the OLT curve.

Figure 10:
Account 369 – Distribution Services



As with Account 367 discussed above, the Company's selected Iowa curve for Account 369 has a higher mode (i.e., more rounded and less flat) than the observed retirement pattern otherwise indicated by the OLT curve. As a result, the proposed depreciation rate derived from the Company's curve is unreasonably high.

Q. DOES YOUR SELECTED CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA?

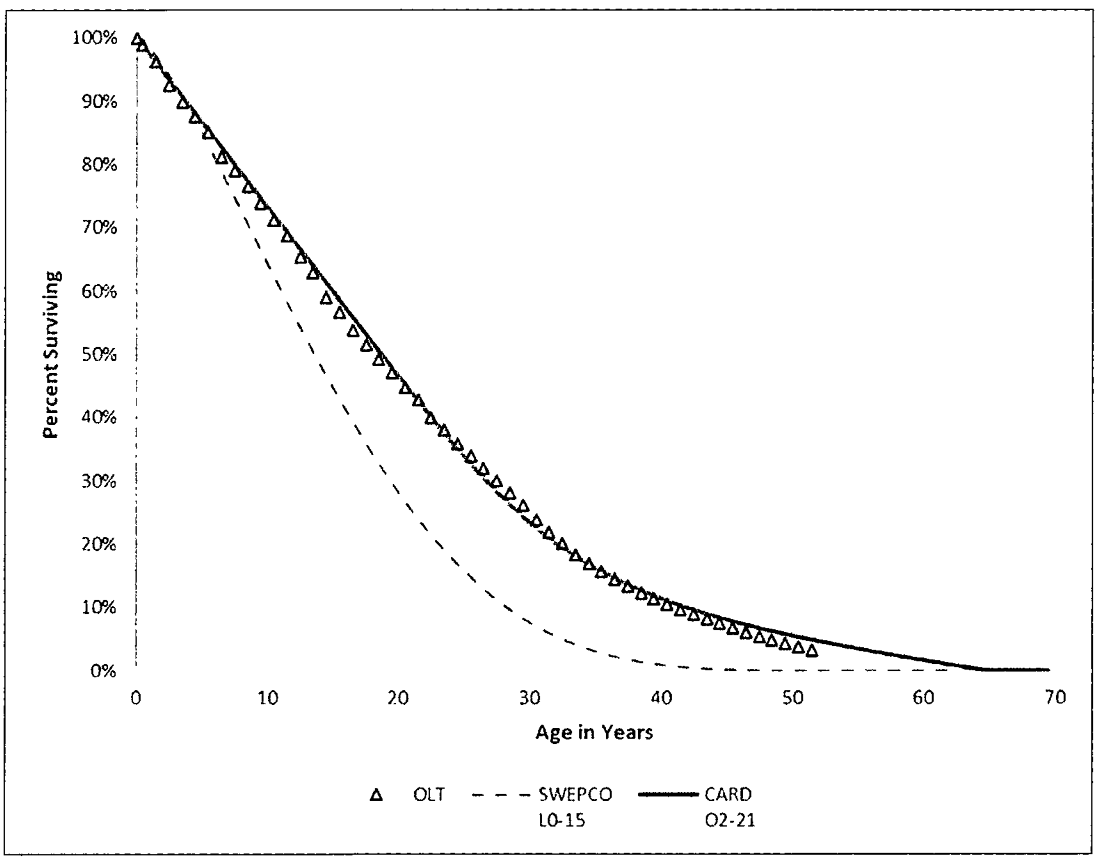
A. Yes. Specifically, the SSD for the Company's curve is 0.4459, while the SSD for the R1.5-76 curve I selected is 0.0254, which means it results in the better mathematical fit.[21]

9. Account 370 – Meters

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Cash selected the L0-15 curve for this account, and I selected the O2-21 curve. Both Iowa curves are shown in the graph below along with the OLT curve.

Figure 11:
Account 370 – Meters



[21] Exhibit DJG-13.

The primary purpose of Iowa curve fitting is to develop a smooth and complete survivor curve to conduct an average life calculation. Here, the OLT is already relatively smooth and complete, which makes the Iowa curve fitting process relatively straight forward. For this account, the O2-21 curve clearly provides a more accurate fit than the Company's Iowa curve.

Q. DOES YOUR SELECTED CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OBSERVED DATA?

A. Yes. Although it is clear from a visual perspective that the O2-21 curve results in the better fit, we can confirm the results mathematically. The SSD for the Company's curve is 0.7716, while the SSD for the O2-21 curve I selected is only 0.0062, which means it results in the better mathematical fit and more reasonable depreciation rate for this account.[22]

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

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[22] Exhibit DJG-14.

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APPENDIX A:

THE DEPRECIATION SYSTEM

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.[23] 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.[24] The figure below illustrates the basic concept of a depreciation system and includes some of the available parameters.[25]

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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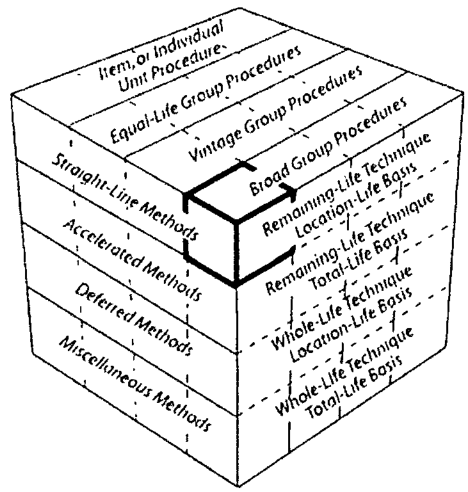
23 Wolf *supra* n. 6, at 69-70.

24 *Id.* at 70, 139-40.

25 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 12:
The Depreciation System Cube



1. <u>Allocation Methods</u>

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.[26] 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.[27] The basic formula for the straight-line method is as follows:[28]

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26 NARUC *supra* n. 7, at 56.

27 *Id.*

28 *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.[29] 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:[30]

Equation 2:
Straight-Line Rate

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

2. <u>Grouping Procedures</u>

The "procedure" refers to the way the allocation method is applied through subdividing the total property into groups.[31] 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 excessively conducting calculations for each unit. Whereas an individual unit of property has a

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[29] *Id.* at 57.

[30] *Id.* at 56.

[31] Wolf *supra* n. 6, at 74-75.

single life, a group of property displays a dispersion of lives and the life characteristics of the group must be described statistically.[32] 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.[33]

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.[34] 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.[35] Under the equal life procedure the property is divided into subgroups that each has a common life.[36]

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 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.[37]

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32 *Id.* at 74.

33 NARUC *supra* n. 7, at 61-62.

34 *See* Wolf *supra* n. 6, at 74-75.

35 *Id.* at 75.

36 *Id.*

37 NARUC *supra* n. 7, at 63-64.

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.[38] 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.[39] 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 in the annual accrual.[40] 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:[41]

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[38] Wolf *supra* n. 6, at 83.

[39] NARUC *supra* n. 7, at 325.

[40] NARUC *supra* n. 7, 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.").

[41] *Id.* at 64.

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.[42]

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.[43] 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 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

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42 Wolf *supra* n. 6, at 178.

43 *See* Wolf *supra* n. 6, at 139 (I added the term "model" to distinguish this fourth depreciation system parameter from the other three parameters).

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.

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APPENDIX B:

IOWA CURVES

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.[44] 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.[45] 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.[46] They generalized the 65 curves into 13 survivor curve types and published their results in *Bulletin 103: Life Characteristics of*

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[44] Wolf *supra* n. 6, at 276.

[45] *Id.* at 23.

[46] *Id.* at 34.

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.[47] 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."[48] 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.[49] 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 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

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47 *Id.*

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

49 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. 6, at 305-38 (publishing the percent surviving for each Iowa curve, including "O" type curve, at one percent intervals).

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:[50]

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.[51]

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 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.

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[50] *See* Wolf *supra* n. 6, at 37.

[51] *Id.*

2. <u>Classification</u>

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).[52] 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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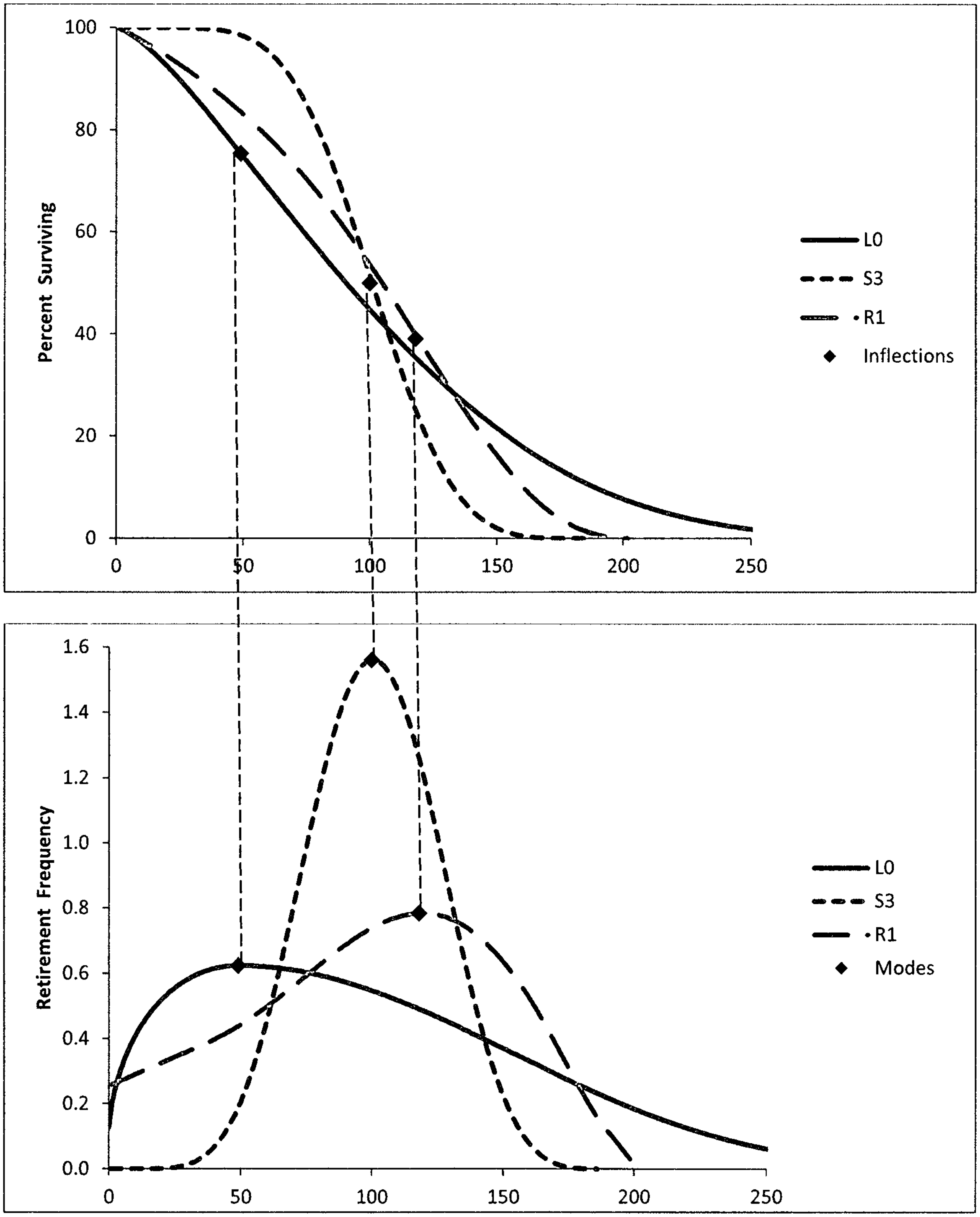
[52] In 1967, Harold A. Cowles added four origin-modal curves known as "O type" curves. There are also several "half" curves and a square curve, so the total amount of survivor curves commonly called "Iowa" curves is about 31 (see NARUC supra n. 7, at 68).

Figure 13:
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."[53]

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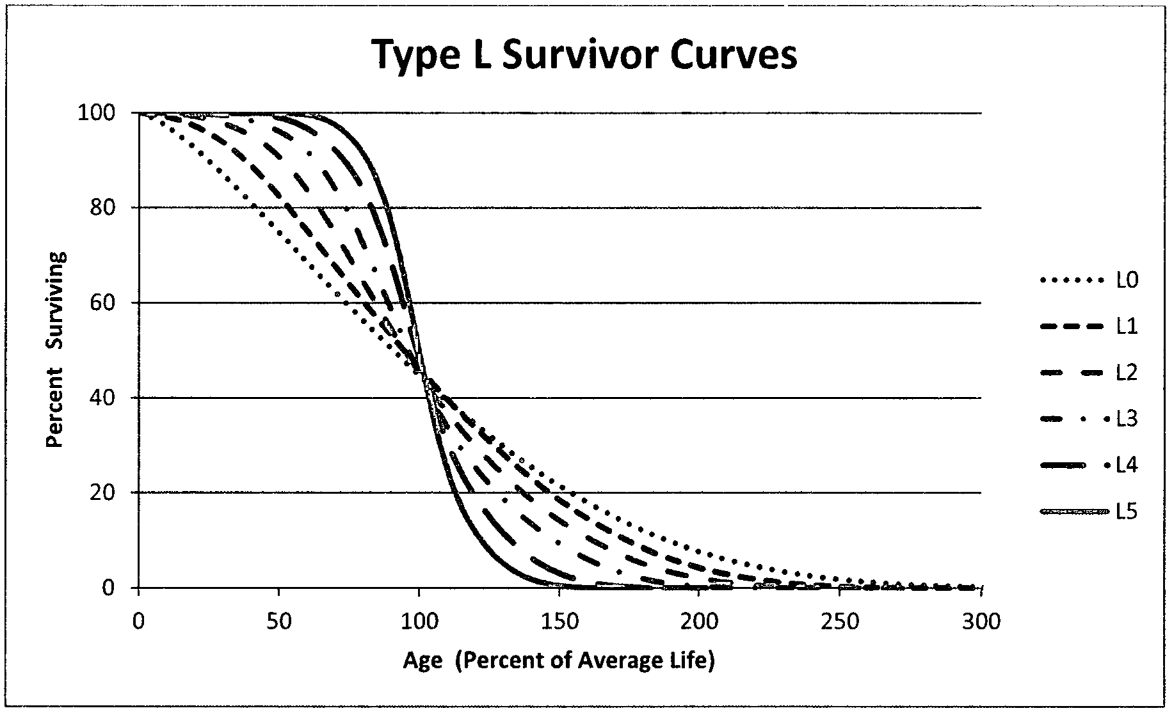
[53] Winfrey, *Bulletin 125: Statistical Analyses of Industrial Property Retirements* 60, Vol. XXXIV, No. 23 (Iowa State College of Agriculture and Mechanic Arts 1935).

Figure 14:
Type L Survivor and Frequency Curves



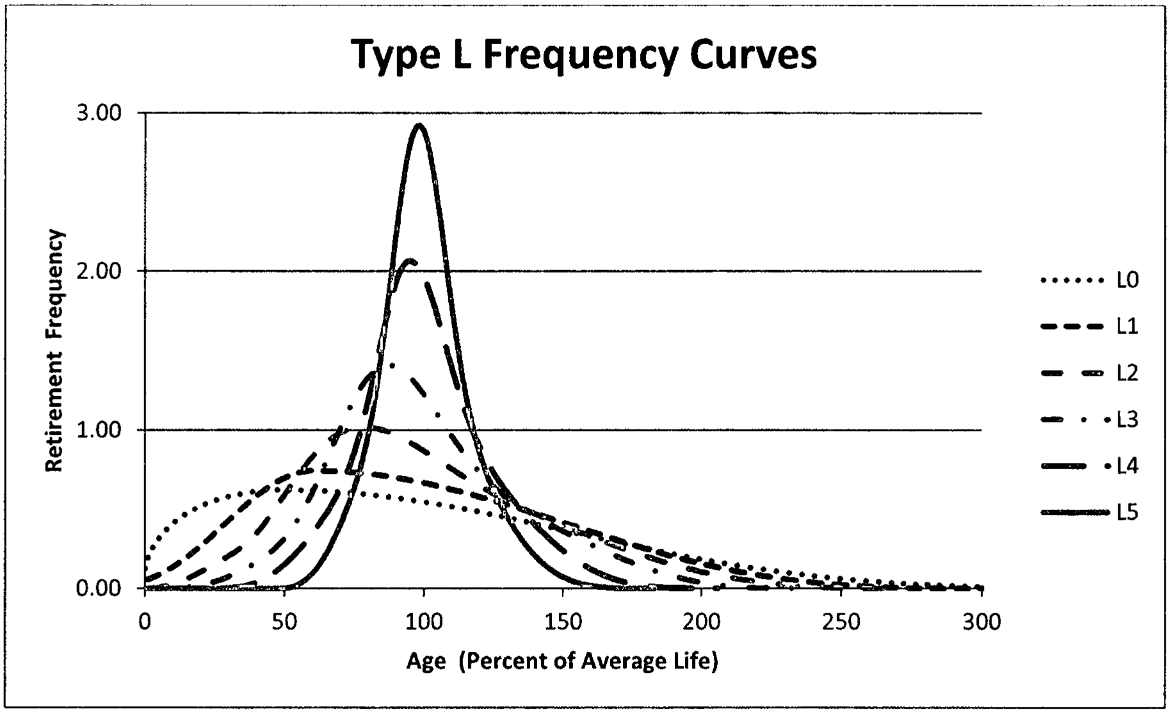
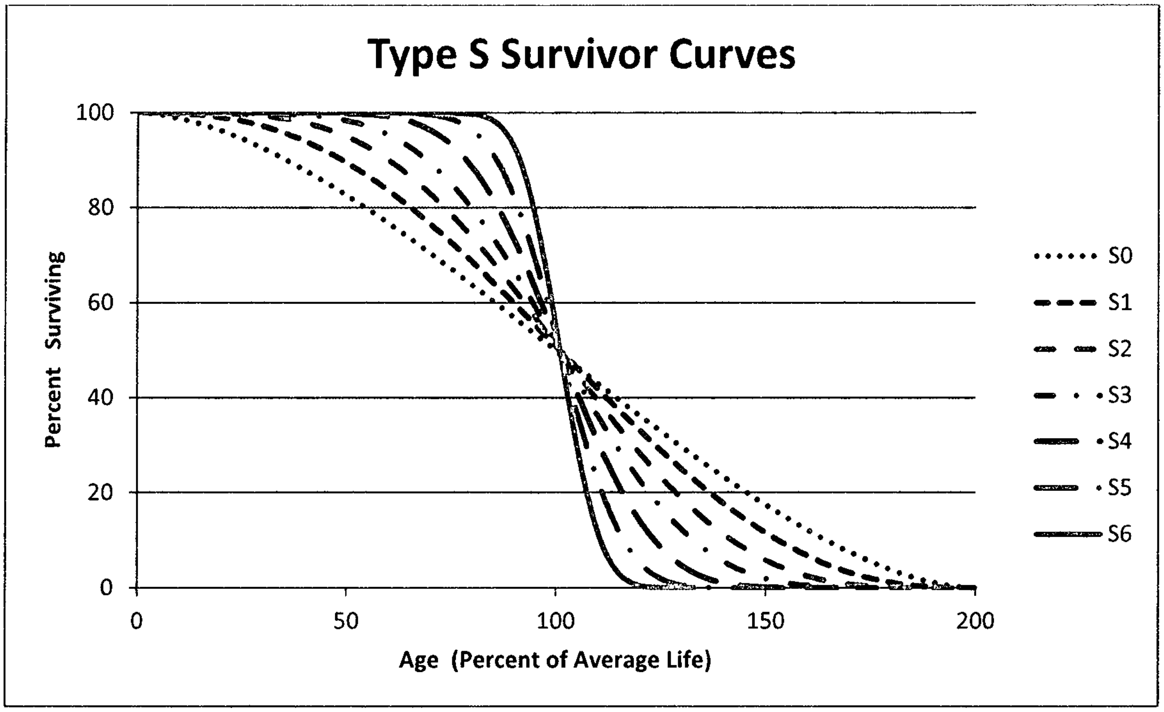


Figure 15:
Type S Survivor and Frequency Curves



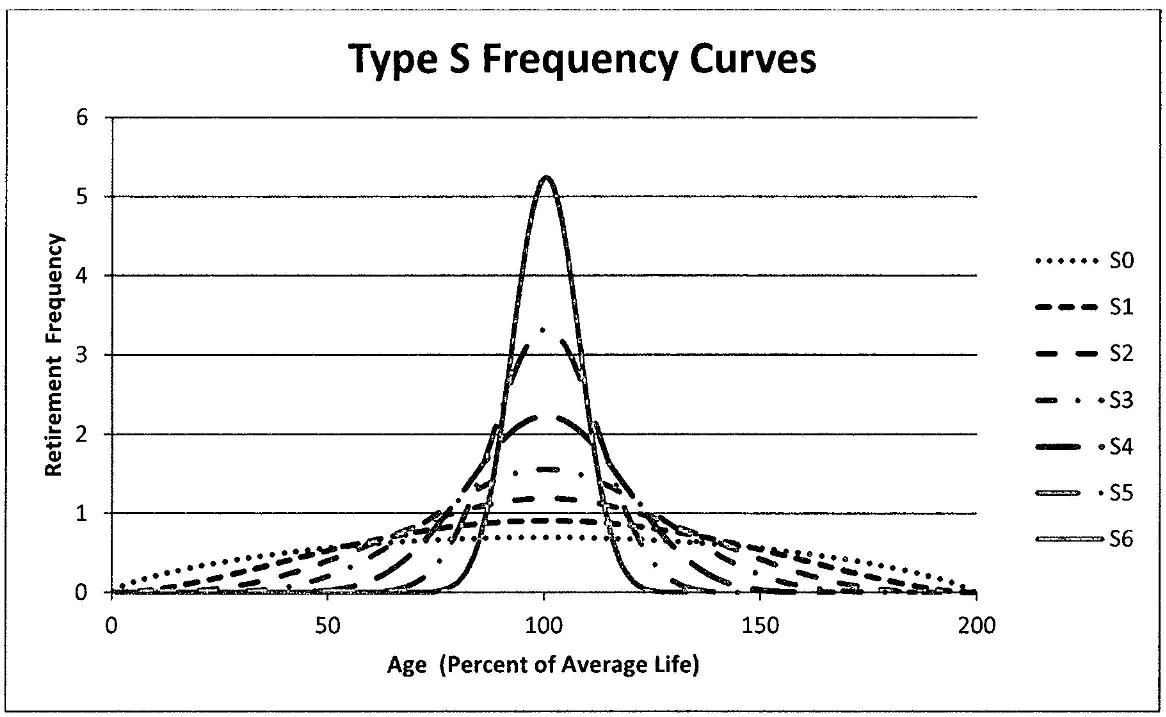
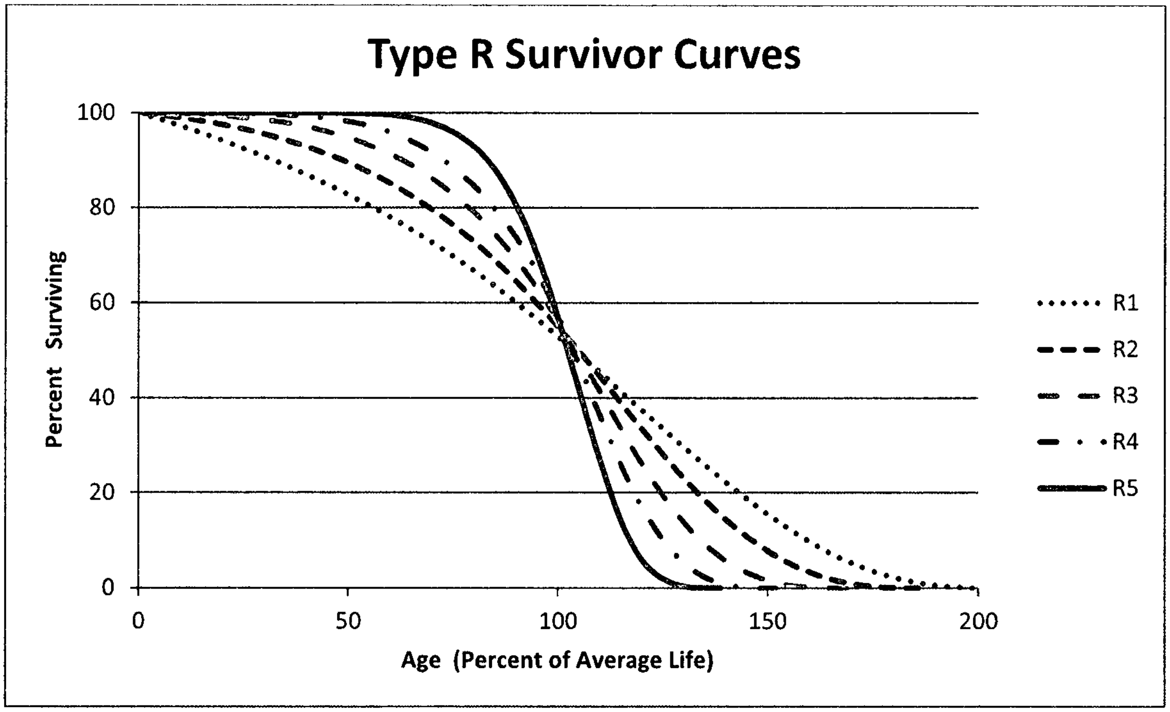
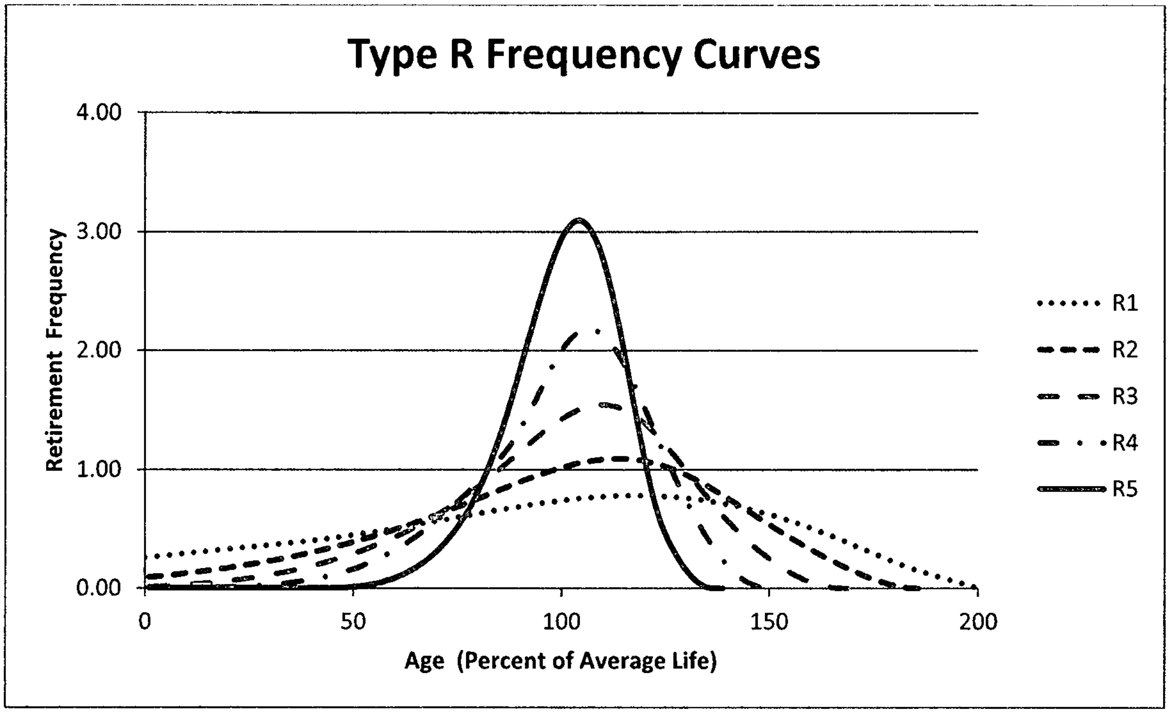


Figure 16:
Type R Survivor and Frequency Curves





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.[54]

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:[55]

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 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).

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[54] 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.

[55] *See* NARUC *supra* n. 7, at 71.

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.[56] 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.[57] 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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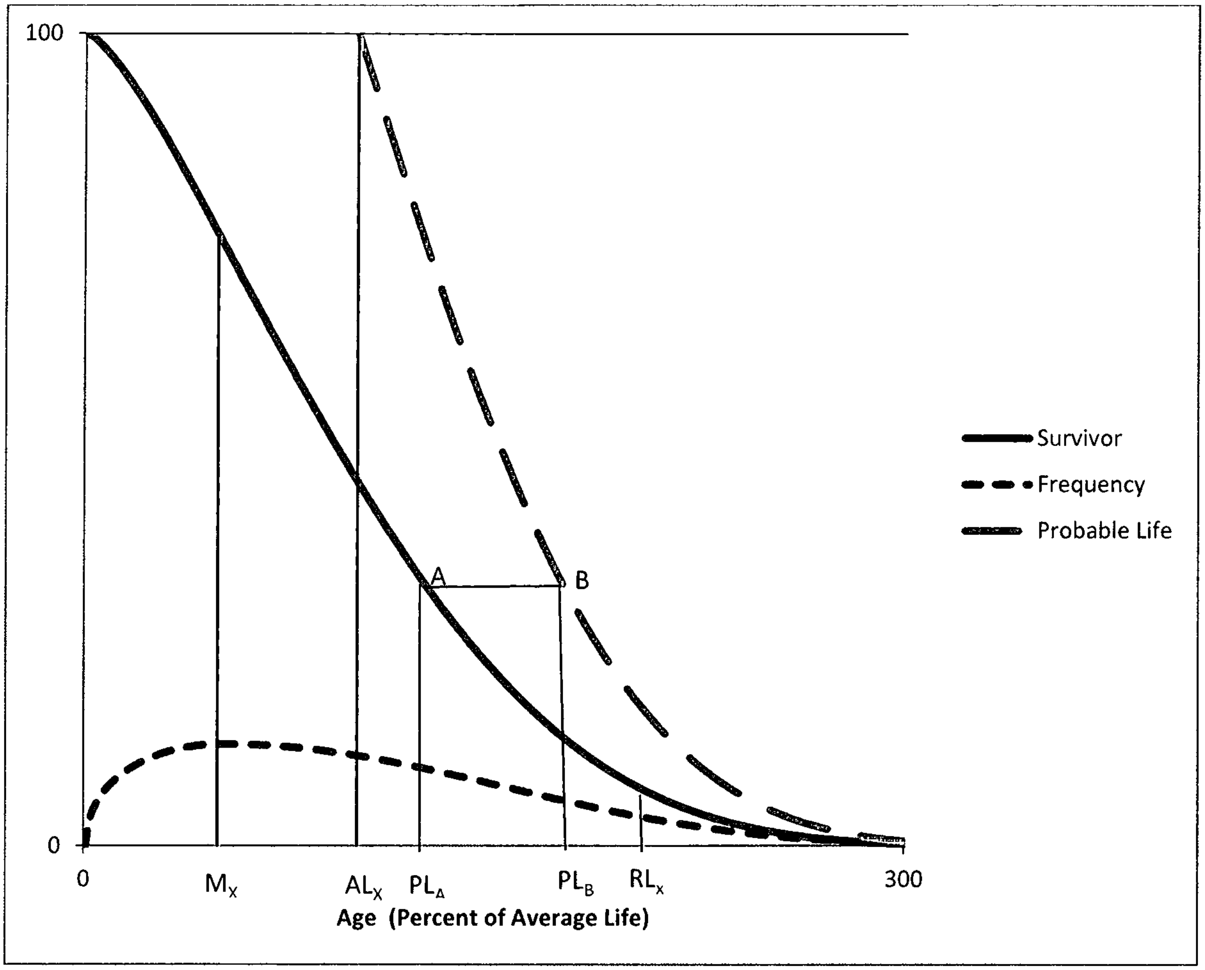
56 *Id.* at 73.

57 *Id.* at 74.

Figure 17:
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.[58] 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 the probable life curve, and back down to the age corresponding to point "B." It is no coincidence

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58 Wolf *supra* n. 6, at 28.

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.

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APPENDIX C:

ACTUARIAL ANALYSIS

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.[59]

Figure 18:
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 Property Records ("CPR"). Generally, a CPR should contain 1) an inventory of property record

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[59] NARUC *supra* n. 7, at 14-15.

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.[60] 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.[61] 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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[60] *Id.* at 112-13.

[61] 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.[62] 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 19:
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	

[62] 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 20:
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.[63] 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). The same calculation is applied to each number in the column. The amounts retired during the year

[63] Wolf *supra* n. 6, at 22.

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 21:
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			

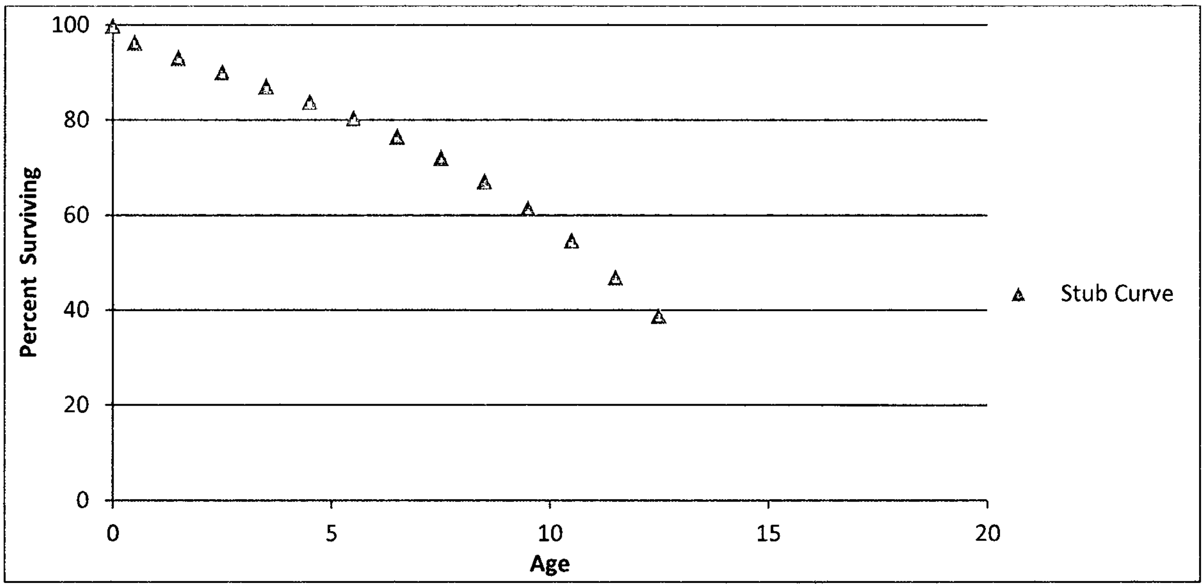
Column F on the right shows the percentages surviving at the beginning of each age interval. This column starts at 100% surviving. Each consecutive number below is calculated by multiplying the percent surviving from the previous age interval by the corresponding survivor ratio for that age interval. 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)[64].

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

[64] 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 22:
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.[65] 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.[66]

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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[65] NARUC *supra* n. 7, at 113.

[66] *Id.*

Figure 23:
Placement Bands

Placement Years	Experience Years Exposures at January 1 of Each Year (Dollars in 000's) 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.[67] 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 bands are very useful in depreciation analysis, they also possess an intrinsic dilemma. A

[67] Wolf *supra* n. 6, at 182.

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.[68]

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.

Figure 24:
Experience 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	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

[68] NARUC *supra* n. 7, at 114.

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.[69] 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 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

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[69] *Id.*

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.

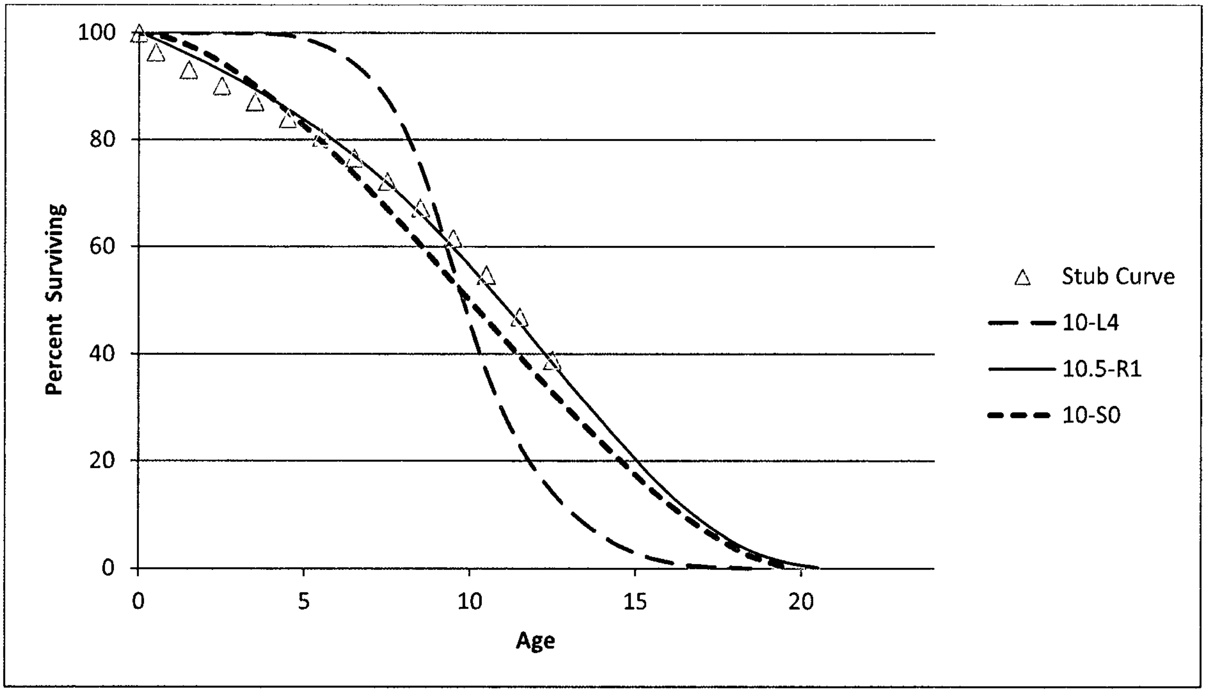
Curve Fitting

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."[70]

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.

[70] Wolf *supra* n. 6, at 46 (22 curves includes Winfrey's 18 original curves plus Cowles's four "O" type curves).

Figure 25:
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.[71]

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."[72]

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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71 Wolf *supra* n. 6, at 47.

72 *Id.* at 48.

Figure 26:
Mathematical Fitting

Age Interval	Stub Curve	Iowa Curves 10-L4	Iowa Curves 10-S0	Iowa Curves 10.5-R1	Squared Differences 10-L4	Squared Differences 10-S0	Squared Differences 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**

SOAH DOCKET NO. 473-21-0538
PUC DOCKET NO. 51415

APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-1:

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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

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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 – 2018
Participate in management of operations, attend meetings, review performance, compensation, and financial records. Assist in fundraising events.

Group Facilitator & Fundraiser — 2014 – 2018
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

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Maryland Public Service Commission	Washington Gas Light Company	9651	Cost of capital and authorized rate of return	Maryland Office of People's Counsel
Florida Public Service Commission	Utilities, Inc of Florida	20200139-WS	Cost of capital and authorized rate of return	Florida Office of Public Counsel
New Mexico Public Regulatory Commission	El Paso Electric Company	20-00104-UT	Cost of capital, depreciation rates, net salvage	City of Las Cruces and Doña Ana County
Public Utilities Commission of Nevada	Nevada Power Company	20-06003	Cost of capital, awarded rate of return, capital structure, earnings sharing	MGM Resorts International, Caesars Enterprise Services, LLC, Wynn Las Vegas, LLC, Smart Energy Alliance, and Circus Circus Las Vegas, LLC
Wyoming Public Service Commission	Rocky Mountain Power	20000-578-ER-20	Cost of capital and authorized rate of return	Wyoming Industrial Energy Consumers
Florida Public Service Commission	Peoples Gas System	20200051-GU 20200166-GU	Cost of capital, depreciation rates, net salvage	Florida Office of Public Counsel
Wyoming Public Service Commission	Rocky Mountain Power	20000-539-EA-18	Depreciation rates, service lives, net salvage	Wyoming Industrial Energy Consumers
Public Service Commission of South Carolina	Dominion Energy South Carolina	2020-125-E	Depreciation rates, service lives, net salvage	South Carolina Office of Regulatory Staff
Pennsylvania Public Utility Commission	The City of Bethlehem	2020-3020256	Cost of capital, awarded rate of return, capital structure	Pennsylvania Office of Consumer Advocate
Railroad Commission of Texas	Texas Gas Services Company	GUD 10928	Depreciation rates, service lives, net salvage	Gulf Coast Service Area Steering Committee
Public Utilities Commission of the State of California	Southern California Edison	A 19-08-013	Depreciation rates, service lives, net salvage	The Utility Reform Network
Massachusetts Department of Public Utilities	NSTAR Gas Company	D P U. 19-120	Depreciation rates, service lives, net salvage	Massachusetts Office of the Attorney General, Office of Ratepayer Advocacy
Georgia Public Service Commission	Liberty Utilities (Peach State Natural Gas)	42959	Depreciation rates, service lives, net salvage	Public Interest Advocacy Staff
Florida Public Service Commission	Florida Public Utilities Company	20190155-EI 20190156-EI 20190174-EI	Depreciation rates, service lives, net salvage	Florida Office of Public Counsel

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Illinois Commerce Commission	Commonwealth Edison Company	20-0393	Depreciation rates, service lives, net salvage	The Office of the Illinois Attorney General
Public Utility Commission of Texas	Southwestern Public Service Company	PUC 49831	Depreciation rates, service lives, net salvage	Alliance of Xcel Municipalities
Public Service Commission of South Carolina	Blue Granite Water Company	2019-290-WS	Depreciation rates, service lives, net salvage	South Carolina Office of Regulatory Staff
Railroad Commission of Texas	CenterPoint Energy Resources	GUD 10920	Depreciation rates and grouping procedure	Alliance of CenterPoint Municipalities
Pennsylvania Public Utility Commission	Aqua Pennsylvania Wastewater	A-2019-3009052	Fair market value estimates for wastewater assets	Pennsylvania Office of Consumer Advocate
New Mexico Public Regulation Commission	Southwestern Public Service Company	19-00170-UT	Cost of capital and authorized rate of return	The New Mexico Large Customer Group, Occidental Permian
Indiana Utility Regulatory Commission	Duke Energy Indiana	45253	Cost of capital, depreciation rates, net salvage	Indiana Office of Utility Consumer Counselor
Maryland Public Service Commission	Columbia Gas of Maryland	9609	Depreciation rates, service lives, net salvage	Maryland Office of People's Counsel
Washington Utilities & Transportation Commission	Avista Corporation	UE-190334	Cost of capital, awarded rate of return, capital structure	Washington Office of Attorney General
Indiana Utility Regulatory Commission	Indiana Michigan Power Company	45235	Cost of capital, depreciation rates, net salvage	Indiana Office of Utility Consumer Counselor
Public Utilities Commission of the State of California	Pacific Gas & Electric Company	18-12-009	Depreciation rates, service lives, net salvage	The Utility Reform Network
Oklahoma Corporation Commission	The Empire District Electric Company	PUD 201800133	Cost of capital, authorized ROE, depreciation rates	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Arkansas Public Service Commission	Southwestern Electric Power Company	19-008-U	Cost of capital, depreciation rates, net salvage	Western Arkansas Large Energy Consumers
Public Utility Commission of Texas	CenterPoint Energy Houston Electric	PUC 49421	Depreciation rates, service lives, net salvage	Texas Coast Utilities Coalition

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Massachusetts Department of Public Utilities	Massachusetts Electric Company and Nantucket Electric Company	D P.U 18-150	Depreciation rates, service lives, net salvage	Massachusetts Office of the Attorney General, Office of Ratepayer Advocacy
Oklahoma Corporation Commission	Oklahoma Gas & Electric Company	PUD 201800140	Cost of capital, authorized ROE, depreciation rates	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Public Service Commission of the State of Montana	Montana-Dakota Utilities Company	D2018.9.60	Depreciation rates, service lives, net salvage	Montana Consumer Counsel and Denbury Onshore
Indiana Utility Regulatory Commission	Northern Indiana Public Service Company	45159	Depreciation rates, grouping procedure, demolition costs	Indiana Office of Utility Consumer Counselor
Public Service Commission of the State of Montana	NorthWestern Energy	D2018 2 12	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Oklahoma Corporation Commission	Public Service Company of Oklahoma	PUD 201800097	Depreciation rates, service lives, net salvage	Oklahoma Industrial Energy Consumers and Wal-Mart
Nevada Public Utilities Commission	Southwest Gas Corporation	18-05031	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	Texas-New Mexico Power Company	PUC 48401	Depreciation rates, service lives, net salvage	Alliance of Texas-New Mexico Power Municipalities
Oklahoma Corporation Commission	Oklahoma Gas & Electric Company	PUD 201700496	Depreciation rates, service lives, net salvage	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Maryland Public Service Commission	Washington Gas Light Company	9481	Depreciation rates, service lives, net salvage	Maryland Office of People's Counsel
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lives, net salvage	Indiana Office of Utility Consumer Counselor
Public Utility Commission of Texas	Entergy Texas, Inc	PUC 48371	Depreciation rates, decommissioning costs	Texas Municipal Group
Washington Utilities & Transportation Commission	Avista Corporation	UE-180167	Depreciation rates, service lives, net salvage	Washington Office of Attorney General
New Mexico Public Regulation Commission	Southwestern Public Service Company	17-00255-UT	Cost of capital and authorized rate of return	HollyFrontier Navajo Refining; Occidental Permian

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Public Utility Commission of Texas	Southwestern Public Service Company	PUC 47527	Depreciation rates, plant service lives	Alliance of Xcel Municipalities
Public Service Commission of the State of Montana	Montana-Dakota Utilities Company	D2017 9 79	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Florida Public Service Commission	Florida City Gas	20170179-GU	Cost of capital, depreciation rates	Florida Office of Public Counsel
Washington Utilities & Transportation Commission	Avista Corporation	UE-170485	Cost of capital and authorized rate of return	Washington Office of Attorney General
Wyoming Public Service Commission	Powder River Energy Corporation	10014-182-CA-17	Credit analysis, cost of capital	Private customer
Oklahoma Corporation Commission	Public Service Co of Oklahoma	PUD 201700151	Depreciation, terminal salvage, risk analysis	Oklahoma Industrial Energy Consumers
Public Utility Commission of Texas	Oncor Electric Delivery Company	PUC 46957	Depreciation rates, simulated analysis	Alliance of Oncor Cities
Nevada Public Utilities Commission	Nevada Power Company	17-06004	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	El Paso Electric Company	PUC 46831	Depreciation rates, interim retirements	City of El Paso
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-24	Accelerated depreciation of North Valmy plant	Micron Technology, Inc
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-23	Depreciation rates, service lives, net salvage	Micron Technology, Inc
Public Utility Commission of Texas	Southwestern Electric Power Company	PUC 46449	Depreciation rates, decommissioning costs	Cities Advocating Reasonable Deregulation
Massachusetts Department of Public Utilities	Eversource Energy	D P U. 17-05	Cost of capital, capital structure, and rate of return	Sunrun Inc., Energy Freedom Coalition of America
Railroad Commission of Texas	Atmos Pipeline - Texas	GUD 10580	Depreciation rates, grouping procedure	City of Dallas

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Public Utility Commission of Texas	Sharyland Utility Company	PUC 45414	Depreciation rates, simulated analysis	City of Mission
Oklahoma Corporation Commission	Empire District Electric Company	PUD 201600468	Cost of capital, depreciation rates	Oklahoma Industrial Energy Consumers
Railroad Commission of Texas	CenterPoint Energy Texas Gas	GUD 10567	Depreciation rates, simulated plant analysis	Texas Coast Utilities Coalition
Arkansas Public Service Commission	Oklahoma Gas & Electric Company	160-159-GU	Cost of capital, depreciation rates, terminal salvage	Arkansas River Valley Energy Consumers, Wal-Mart
Florida Public Service Commission	Peoples Gas	160-159-GU	Depreciation rates, service lives, net salvage	Florida Office of Public Counsel
Arizona Corporation Commission	Arizona Public Service Company	E-01345A-16-0036	Cost of capital, depreciation rates, terminal salvage	Energy Freedom Coalition of America
Nevada Public Utilities Commission	Sierra Pacific Power Company	16-06008	Depreciation rates, net salvage, theoretical reserve	Northern Nevada Utility Customers
Oklahoma Corporation Commission	Oklahoma Gas & Electric Co	PUD 201500273	Cost of capital, depreciation rates, terminal salvage	Public Utility Division
Oklahoma Corporation Commission	Public Service Co of Oklahoma	PUD 201500208	Cost of capital, depreciation rates, terminal salvage	Public Utility Division
Oklahoma Corporation Commission	Oklahoma Natural Gas Company	PUD 201500213	Cost of capital, depreciation rates, net salvage	Public Utility Division

SOAH DOCKET NO. 473-21-0538
PUC DOCKET NO. 51415

APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-2:

SUMMARY DEPRECIATION ACCRUAL ADJUSTMENT

Summary Accrual Adjustment

Exhibit DJG-2

	[1]	[2]	[3]	[4]
Plant Function	Plant Balance 12/31/2019	SWEPCO Proposed Accrual	CARD Proposed Accrual	**CARD Adjustment**
Production	$ 4,276,623,503	$ 115,877,699	$ 110,908,141	$ (4,969,558)
Transmission	2,056,196,799	47,890,727	43,360,540	(4,530,187)
Distribution	2,271,709,069	63,573,769	55,268,012	(8,305,757)
General	209,693,771	6,441,093	6,441,091	(2)
Total	$ 8,814,223,142	$ 233,783,288	$ 215,977,784	**$ (17,805,504)**

SOAH DOCKET NO. 473-21-0538
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APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	**§ § §**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-3:

DETAILED RATE COMPARISON

Detailed Rate Comparison

Account No	Description	[1] Plant 12/31/2019	[2] SWEPCO's Proposal Iowa Curve Type	AL	Rate	Annual Accrual	[3] CARD'S Proposal Iowa Curve Type	AL	Rate	Annual Accrual	[4] Difference Rate	Annual Accrual
	STEAM PRODUCTION PLANT											
	Gas & Oil Plants											
	Arsenal Hill											
311 00	Structures & Improvements	6,523,578			5 53%	360,589			4 94%	321,979	-0 59%	-38,610
312 00	Boiler Plant Equipment	7,190,747			5 84%	419,809			5 25%	377,250	-0 59%	-42,559
314 00	Turbogenerator Units	5,437,070			5 29%	287,582			4 70%	255,402	-0 59%	-32,180
315 00	Accessory Electrical Equipment	1,250,953			6 32%	79,075			5 73%	71,671	-0 59%	-7,404
316 00	Misc Power Plant Equip	7,211,222			8 46%	610,322			7 87%	567,642	-0 59%	-42,680
	Total	27,613,570			6 36%	1,757,377			5 77%	1,593,944	-0 59%	-163,433
	Knox Lee											
311 00	Structures & Improvements	9,069,087			3 28%	297,836			2 24%	203,391	-1 04%	-94,445
312 00	Boiler Plant Equipment	30,014,534			3 73%	1,120,248			2 69%	807,677	-1 04%	-312,571
314 00	Turbogenerator Units	15,603,354			3 62%	564,697			2 58%	402,203	-1 04%	-162,494
315 00	Accessory Electrical Equipment	4,663,877			4 03%	187,998			2 99%	139,429	-1 04%	-48,569
316 00	Misc Power Plant Equip	2,008,192			4 55%	91,277			3 50%	70,364	-1 04%	-20,913
	Total	61,359,044			3 69%	2,262,056			2 65%	1,623,064	-1 04%	-638,992
	Liberman											
311 00	Structures & Improvements	5,407,423			7 76%	419,717			5 43%	293,801	-2 33%	-125,916
312 00	Boiler Plant Equipment	19,379,730			8 19%	1,587,750			5 86%	1,136,478	-2 33%	-451,272
314 00	Turbogenerator Units	10,770,201			7 54%	812,473			5 22%	561,681	-2 33%	-250,792
315 00	Accessory Electrical Equipment	3,471,047			8 22%	285,198			5 89%	204,372	-2 33%	-80,826
316 00	Misc Power Plant Equip	2,320,380			11 37%	263,938			9 05%	209,906	-2 33%	-54,032
	Total	41,348,781			8 15%	3,369,076			5 82%	2,406,239	-2 33%	-962,837
	Stall											
311 00	Structures & Improvements	54,049,867			2 70%	1,460,357			2 66%	1,437,477	-0 04%	-22,880
312 00	Boiler Plant Equipment	86,638,497			2 70%	2,340,390			2 66%	2,303,716	-0 04%	-36,674
314 00	Turbogenerator Units	167,305,849			2 75%	4,604,652			2 71%	4,533,831	-0 04%	-70,821
315 00	Accessory Electrical Equipment	39,669,289			2 69%	1,065,214			2 64%	1,048,421	-0 04%	-16,793
316 00	Misc Power Plant Equip	83,804,940			2 69%	2,253,488			2 65%	2,218,014	-0 04%	-35,474
	Total	431,468,442			2 72%	11,724,101			2 67%	11,541,460	-0 04%	-182,641
	Wilkes											
311 00	Structures & Improvements	8,345,659			2 89%	241,584			2 58%	215,048	-0 32%	-26,536

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			SWEPCO's Proposal				CARD'S Proposal				Difference	
Account		Plant	Iowa Curve			Annual	Iowa Curve			Annual		Annual
No	Description	12/31/2019	Type	AL	Rate	Accrual	Type	AL	Rate	Accrual	Rate	Accrual
312 00	Boiler Plant Equipment	53,895,276			3 58%	1,931,657			3 27%	1,760,290	-0 32%	-171,367
314 00	Turbogenerator Units	37,889,001			3 22%	1,219,666			2 90%	1,099,193	-0 32%	-120,473
315 00	Accessory Electrical Equipment	10,316,197			4 11%	423,661			3 79%	390,859	-0 32%	-32,802
316 00	Misc Power Plant Equip	9,145,772			4 76%	435,216			4 44%	406,136	-0 32%	-29,080
	Total	119,591,905			3 56%	4,251,784			3 24%	3,871,526	-0 32%	-380,258
	Total Gas & Oil Plants	681,381,742			3 43%	23,364,394			3 09%	21,036,232	-0 34%	-2,328,162
	Coal and Lignite Plants											
	Flint Creek											
311 00	Structures & Improvements	27,330,924			2 83%	774,569			2 77%	756,125	-0 07%	-18,444
312 00	Boiler Plant Equipment	295,403,376			4 16%	12,285,271			4 09%	12,085,922	-0 07%	-199,349
314 00	Turbogenerator Units	15,318,616			2 97%	455,250			2 90%	444,912	-0 07%	-10,338
315 00	Accessory Electrical Equipment	10,970,647			3 30%	362,430			3 24%	355,026	-0 07%	-7,404
316 00	Misc Power Plant Equip	6,258,411			3 13%	195,646			3 06%	191,423	-0 07%	-4,223
	Total	355,281,974			3 96%	14,073,166			3 89%	13,833,410	-0 07%	-239,756
	Pirkey											
311 00	Structures & Improvements	109,344,557			2 19%	2,399,778			2 09%	2,289,987	-0.10%	-109,791
312 00	Boiler Plant Equipment	379,562,731			2 49%	9,464,375			2 39%	9,083,261	-0 10%	-381,114
314.00	Turbogenerator Units	50,950,757			2 19%	1,118,345			2 09%	1,067,186	-0 10%	-51,159
315 00	Accessory Electrical Equipment	18,401,272			2 41%	443,142			2 31%	424,665	-0 10%	-18,477
316 00	Misc Power Plant Equip	19,401,615			2 39%	464,173			2 29%	444,692	-0 10%	-19,481
	Total	577,660,932			2 40%	13,889,813			2 30%	13,309,792	-0 10%	-580,021
	Turk											
311 00	Structures & Improvements	287,492,517			1 91%	5,498,192			1 89%	5,422,018	-0 03%	-76,174
312 00	Boiler Plant Equipment	992,441,092			1 91%	18,921,076			1 88%	18,658,119	-0 03%	-262,957
314 00	Turbogenerator Units	232,629,873			1 90%	4,427,930			1 88%	4,366,292	-0 03%	-61,638
315 00	Accessory Electrical Equipment	93,354,798			1 90%	1,777,986			1 88%	1,753,251	-0 03%	-24,735
316 00	Misc Power Plant Equip	48,553,150			1 91%	925,675			1 88%	912,810	-0 03%	-12,865
	Total	1,654,471,430			1 91%	31,550,859			1 88%	31,112,491	-0 03%	-438,368
	Welsh											
311 00	Structures & Improvements	72,936,301			2 77%	2,021,902			2 63%	1,918,563	-0 14%	-103,339
312 00	Boiler Plant Equipment	583,599,604			3 52%	20,565,023			3 38%	19,738,158	-0 14%	-826,865
314 00	Turbogenerator Units	142,048,909			3 13%	4,452,215			2 99%	4,250,955	-0 14%	-201,260
315 00	Accessory Electrical Equipment	47,084,699			3 52%	1,659,559			3 38%	1,592,848	-0 14%	-66,711
316 00	Misc Power Plant Equip	21,423,993			3 17%	679,486			3 03%	649,131	-0 14%	-30,355

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			SWEPCO's Proposal				CARD'S Proposal				Difference	
			Iowa Curve			Annual	Iowa Curve			Annual		Annual
Account No.	Description	Plant 12/31/2019	Type	AL	Rate	Accrual	Type	AL	Rate	Accrual	Rate	Accrual
	Total	867,093,506			3 39%	29,378,185			3 25%	28,149,655	-0 14%	-1,228,530
	Total Coal and Lignite Plants	3,454,507,842			2 57%	88,892,023			2 50%	86,405,347	-0 07%	-2,486,676
	Rail Cars											
312 11	Rail Cars - Flint Creek	3,989,549			3.12%	124,555			3 12%	124,555	0 00%	0
312.11	Rail Cars - Welsh Plant	12,114,203			2 75%	332,995			2 75%	332,995	0 00%	0
	Total	16,103,752			2 84%	457,550			2 84%	457,550	0 00%	0
	Total Steam Production Plant	4,151,993,336			2 71%	112,713,967			2 60%	107,899,129	-0 12%	-4,814,838
	OTHER PRODUCTION PLANT											
	Mattison											
341 00	Structures & Improvements	30,793,285			2 53%	780,152			2 41%	741,924	-0 12%	-38,228
344 00	Generators	84,008,692			2 53%	2,126,890			2 41%	2,022,599	-0 12%	-104,291
345 00	Accessory Electrical Equip	8,998,287			2 60%	233,926			2 48%	222,756	-0 12%	-11,170
346 00	Misc Power Plant Equip	829,903			2 74%	22,764			2 62%	21,734	-0 12%	-1,030
	Total Other Production Plant	124,630,167			2 54%	3,163,732			2 41%	3,009,012	-0 12%	-154,720
	Total Production Plant	4,276,623,503			2.71%	115,877,699			2.59%	110,908,141	-0 12%	-4,969,558
	TRANSMISSION PLANT											
350 10	Land Rights	98,424,907	R5	70	1 33%	1,309,421	R5	70	1 33%	1,309,421	0 00%	0
352.00	Structures & Improvements	25,073,646	R3 5	70	1 46%	366,151	R3 5	70	1 46%	366,151	0 00%	0
353.00	Station Equipment	702,710,223	S0	68	1 54%	10,795,690	L0 5	75	1 35%	9,477,621	-0 19%	-1,318,069
354 00	Towers & Fixtures	40,325,282	L3	65	1 46%	588,741	S1 5	74	1 14%	457,867	-0 32%	-130,874
355 00	Poles & Fixtures	759,166,339	S0 5	46	3 42%	25,929,483	L1 5	49	3 18%	24,133,984	-0 24%	-1,795,499
356 00	OH Conductor & Devices	426,450,498	R2	70	2 07%	8,821,574	L1 5	80	1 77%	7,535,828	-0 30%	-1,285,746
357.00	Underground Conduit	3,826,324	R1 5	50	1 99%	76,143	R1 5	50	1 99%	76,143	0 00%	0
358 00	Underground Conductor & Devices	87,633	R1 5	50	1 99%	1,742	R1 5	50	1 99%	1,742	0 00%	0
359 00	Roads and Trails	131,947	R4	65	1 35%	1,782	R4	65	1 35%	1,782	0 00%	0
	Total Transmission Plant	2,056,196,799			2 33%	47,890,727			2.11%	43,360,540	-0.22%	-4,530,187
	DISTRIBUTION PLANT											
360 10	Land Rights	3,593,142	R4	60	1 41%	50,489	R4	60	1 41%	50,489	0 00%	0

Detailed Rate Comparison

		[1]	[2]				[3]				[4]	
			SWEPCO's Proposal				CARD'S Proposal				Difference	
Account		Plant	Iowa Curve			Annual	Iowa Curve			Annual		Annual
No	Description	12/31/2019	Type	AL	Rate	Accrual	Type	AL	Rate	Accrual	Rate	Accrual
361 00	Structures & Improvements	9,551,154	R3	75	1 43%	136,646	R3	75	1 43%	136,646	0 00%	0
362 00	Station Equipment	331,732,959	S0 5	57	1 95%	6,468,354	S0 5	57	1 95%	6,468,354	0 00%	0
364 00	Poles, Towers, & Fixtures	470,031,668	S0.5	55	2.83%	13,284,509	L0	62	2 24%	10,542,941	-0 58%	-2,741,568
365 00	Overhead Conductor & Devices	474,074,113	R1	44	3 03%	14,343,412	R1	44	3 03%	14,343,412	0 00%	0
366 00	Underground Conduit	71,650,932	R4	70	1 37%	978,511	R4	80	1 16%	829,597	-0 21%	-148,914
367 00	Underground Conductor	234,750,023	R3	46	2 36%	5,529,687	R1	62	1 47%	3,448,342	-0 89%	-2,081,345
368 00	Line Transformers	406,858,746	L0	44	2 40%	9,781,672	L0	44	2 40%	9,781,672	0 00%	0
369 00	Services	96,876,860	R3	59	2.80%	2,711,191	R1.5	76	1 97%	1,905,138	-0 83%	-806,053
370.00	Meters	85,774,920	L0	15	7 88%	6,761,591	O2	21	4 94%	4,233,713	-2 95%	-2,527,878
371 00	Installations on Custs Prem	44,016,257	L0	25	4 92%	2,164,602	L0	25	4 92%	2,164,602	0 00%	0
373 00	Street Lighting & Signal Sys	42,798,295	L0	40	3 18%	1,363,105	L0	40	3 18%	1,363,105	0 00%	0
	Total Distribution Plant	2,271,709,069			2 80%	63,573,769			2 43%	55,268,012	-0 37%	-8,305,757
	GENERAL PLANT											
390 00	Structures & Improvements	106,506,342	L0	58	1.86%	1,982,475	L0	58	1 86%	1,982,475	0 00%	0
391 00	Office Furniture & Equipment	9,282,784	SQ	30	4 34%	402,583	SQ	30	4 34%	402,583	0 00%	0
391 11	Office Equipment - Computers	45,523	SQ	7	16 55%	7,534	SQ	7	16 55%	7,534	0 00%	0
392 00	Transportation Equipment	4,118,518	SQ	20	5 41%	222,839	SQ	20	5 41%	222,839	0 00%	0
393 00	Stores Equipment	3,121,778	SQ	30	3 91%	121,953	SQ	30	3 91%	121,953	0 00%	0
394 00	Tools Shop & Garage Equipment	28,793,058	SQ	35	3 05%	879,487	SQ	35	3 05%	879,487	0 00%	0
395 00	Laboratory Equipment	5,501,275	SQ	35	3 72%	204,550	SQ	35	3 72%	204,550	0 00%	0
396 00	Power Operated Equipment	698,227	SQ	20	5.35%	37,368	SQ	20	5 35%	37,368	0 00%	0
397.00	Communication Equipment	43,330,733	SQ	20	5 31%	2,301,434	SQ	20	5 31%	2,301,434	0 00%	0
398 00	Miscellaneous Equipment	2,423,516	SQ	20	5 51%	133,635	SQ	20	5.51%	133,635	0 00%	0
399 30	Alliance Rail	5,872,017			2 51%	147,235			2 51%	147,235	0 00%	0
	Total General Plant	209,693,771			3.07%	6,441,093			3 07%	6,441,091	0 00%	-2
	TOTAL DEPRECIABLE PLANT	$ 8,814,223,142			2 65%	$ 233,783,288			2 45%	$ 215,977,784	-0 20%	$ (17,805,504)

[1], [2] Depreciation study
[3] From DJG Rate Development exhibit
[4] = [3] [2]

SOAH DOCKET NO. 473-21-0538
PUC DOCKET NO. 51415

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DAVID J. GARRETT

EXHIBIT DJG-4:

DEPRECIATION RATE DEVELOPMENT

Depreciation Rate Development
(SL-AL-RL-BG System)

Account No	Description	[1] Plant 12/31/2019	[2] Iowa Curve Type	[2] Iowa Curve AL	[3] Net Salvage	[4] Depreciable Base	[5] Book Reserve	[6] Future Accruals	[7] Remaining Life	[8] Service Life Accrual	[9] Service Life Rate	[10] Net Salvage Accrual	[11] Net Salvage Rate	[12] Total Accrual	[13] Total Rate
	STEAM PRODUCTION PLANT														
	Gas & Oil Plants														
	Arsenal Hill														
311 00	S ructures & Improvements	6,523,578			10 7%	7 224,522	5,453,637	1 770,885	5 50	194,535	2 98%	127,444	1 95%	321,979	4 94%
312 00	Boiler Plant Equipment	7,190,747			-10 7%	7,963,377	5,888,501	2 074 876	5.50	236 772	3 29%	140 478	1 95%	377,250	5 25%
314 00	Turbogenerator Units	5,437 070			-10 7%	6 021 271	4,616,560	1 404 711	5 50	149,184	2 7-%	106 218	1 95%	255 402	4 70%
315 00	Accessory Elec.ncal Equipment	1,250,953			-10 7%	1,385,365	991,174	394,191	5 50	47,233	3 78%	24 439	1 95%	71,671	5 73%
316 00	Misc Power Plant Equip	7 211 222			-10 7%	7,986,052	4 864,023	3,122,029	5 50	426 763	5 92%	140 878	1 95%	567 642	7.87%
	Total	27,613 570			-10 7%	30,580,586	21,813,895	8,766,691	5 50	1 054 486	3 82%	539,457	1 95%	1,593,944	5 77%
	Knox Lee														
311 00	Structures & Improvements	9,069,087			24 7%	11 308 488	7 342,365	3,966,123	19 50	88,550	0 98%	114 841	1 27%	203 391	2.24%
312 00	Boiler Plant Equipment	30 014 534			24 7%	37,425,929	21,676,235	15,749,694	19 50	427 605	1 42%	380 072	1 27%	807,677	2 69%
314 00	Turbogenerator Units	15,603,354			24 7%	19 456,241	11 613,277	7 842 964	19 50	204,619	1 31%	197,584	1 27%	402,203	2 58%
315 00	Accessory Electrical Equipment	4 663,877			24 7%	5,815,514	3,096,652	2,718,862	19 50	80 371	1 72%	59 058	1 27%	139,429	2 99%
316 00	Misc Power Plant Equip	2,008 192			24 7%	2 504,069	1 131,968	1 372,101	19 50	44 935	2 24%	25 430	1 27%	70,364	3 50%
	Total	61,359,044			24 7%	76,510,241	44,860,497	31,649 744	19 50	846 079	1 38%	776,984	1 27%	1,623 064	2 65%
	Lieberman														
311 00	Structures & Improvements	5,407,423			7 8%	5,831,905	4 803,602	1,028,303	3 50	172,520	3 19%	121,281	2 24%	293 801	5 43%
312 00	Boiler Plant Equipment	19 379 730			7 8%	20,901,036	16,923,362	3,977,674	3 50	701,819	3 62%	434 659	2 24%	1,136,478	5 86%
314 00	Turbogenerator Units	10 770 201			-7 8%	11,615 660	9,649,776	1,965,884	3 50	320,121	2 97%	241 560	2 24%	561,681	5 22%
315 00	Accessory Electrical Equipment	3,471,047			-7 8%	3 743,524	3 028,221	715,303	3 50	126,522	3 65%	77 850	2 24%	204 372	5 89%
316 00	Misc Power Plant Equip	2,320,380			-7 8%	2,502,530	1,767,858	734,672	3 50	157 863	6 80%	52 043	2 24%	209,906	9 05%
	Total	41 348 781			7 8%	44 594,655	36,172,819	8,421,836	3 50	1 478 846	3 58%	927,393	2 24%	2,406,239	5 82%
	Stall														
311 00	Structures & Improvements	54,049,867			-0 7%	54,433,044	10,589,990	43 843,054	30 50	1 424,914	2 64%	12,563	0 02%	1,437,477	2 66%
312 00	Boiler Plant Equipment	86 638 497			0 7%	87 252 706	16 989,366	70 263,340	30 50	2 283 578	2 64%	20 138	0 02%	2,303,716	2.66%
314 00	Turbogenerator Units	167 305,849			-0 7%	168 491 935	30,210,078	138,281 857	30 50	4,494,943	2 69%	38 888	0 02%	4,533 831	2 71%
315 00	Accessory Electrical Equipment	39,669 289			-0 7%	39,950,518	7 973,662	31 976,856	30 50	1,039 201	2 62%	9,221	0 02%	1,048,421	2 64%
316 00	Misc Power Plant Equip	83 804 940			0 7%	84,399,061	16,749 648	67 649,413	30 50	2 198 534	2 62%	19 479	0 02%	2,218 014	2 65%
	Total	431 468 442			0 7%	434 527,263	82 512 744	352 014 519	30 50	11 441 170	2 65%	100 289	0 02%	11,541,460	2 67%
	Wilkes														
31. 00	Structures & Improvements	8,345 659			-4 3%	8,706,686	5,545,480	3,161,206	14 70	190,488	2 28%	24 560	0 29%	215 048	2 58%
312 00	Boiler Plant Equipment	53,895,276			-4 3%	56,226 748	30 350 488	25 876 260	14 70	1,601,686	2 97%	158 604	0 29%	1,760,290	3 27%
314 00	Turbogenerator Units	37 889 001			4 3%	39,528,053	23,369,915	16,158 138	14 70	987 693	2 61%	111 500	0 29%	1 099,193	2 90%
315 00	Accessory Electrical Equipment	10,316 197			-4 3%	10 762,468	5,016,841	5,745,627	14 70	360,500	3 49%	30 359	0 29%	390,859	3 79%
316 00	Misc Power Plant Equip	9 145 772			-4 3%	9,541,412	3 571 209	5 970,203	14 70	379,222	4 15%	26,914	0 29%	406 136	4 44%
	Total	119 591 905			-4 3%	124,765,367	67,853,933	56,911,434	14 70	3 519 590	2 94%	351,936	0 29%	3,871,526	3 24%
	Total Gas & Oil Plants	681 381 742			4 3%	710,978,112	253,213,888	457,764 224	21 76	18 340 172	2 69%	2 696,060	0 40%	21,036,232	3 09%
	Coal and Lignite Plants														
	Flint Creek														
311 00	Structures & Improvements	27 330,924			-1 8%	27,809,641	13,821,319	13,988,322	18 50	730,249	2 67%	25 877	0 09%	756,125	2 77%
312 00	Boiler Plant Equipment	295 403,376			-1 8%	300 577,533	76 987,969	223,589,564	18 50	11,806,238	4 00%	279 684	0 09%	12,085,922	4.09%
314 00	Turbogenerator Units	15,318,616			1 8%	15,586,930	7 356 054	8,230,876	18 50	430,409	2 81%	14,503	0 09%	444,912	2 90%
315 00	Accessory Electrical Equipment	10 970,647			1 8%	11,162,804	4,594,816	6,567,988	18 50	344 640	3 14%	10,387	0 09%	355,026	3 24%
316 00	Misc Power Plant Equip	6,258 411			-1 8%	6 368 031	2,826 704	3,541 327	18 50	185,498	2 96%	5,925	0 09%	191,423	3.06%
	Total	355,281,974			1 8%	361 504,939	105,586 862	255 918 077	18 50	13,497,033	3 80%	336 376	0 09%	13,833,410	3.89%

Depreciation Rate Development
(SL-AL-RL-BG System)

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Account No	Description	Plant 12/31/2019	Iowa Curve Type	Iowa Curve AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Service Life Accrual	Service Life Rate	Net Salvage Accrual	Net Salvage Rate	Total Accrual	Total Rate
	Pirkey														
311 00	Structures & Improvements	109,344 557			-2 4%	112,012 108	53,617,451	58,394,657	25 50	2,185,377	2 00%	104 610	0 10%	2,289,987	2 09%
312 00	Boiler Plant Equipment	379,562,731			-2 4%	388,822,478	157,199,317	231,623,161	25 50	8,720,134	2 30%	363 127	0 10%	9,083,261	2.39%
314 00	Turbogenerator Units	50,950,757			-2 4%	52,193,743	24,980,491	27,213,252	25 50	1 018,442	2 00%	48,745	0 10%	1,067,186	2 09%
315 00	Accessory Electrical Equipment	18,401 272			-2.4%	18,850,186	8,021,220	10 828,966	25 50	407,061	2 21%	17,604	0 10%	424,665	2.31%
316 00	Misc Power Plant Equip	19 401 615			-2.4%	19,874 933	8,535 279	11,339,654	25 50	426 131	2 20%	18 562	0 10%	444,692	2 29%
	Total	577 660 932			-2 4%	591,753,448	252,353 758	339,399,690	25 50	12,757,144	2 21%	552,648	0 10%	13,309,792	2.30%
	Turk														
311 00	Structures & Improvements	287,492,517			-0 7%	289,624,112	32,078,264	257,545,848	47.50	5,377,142	1 87%	44,876	0 02%	5,422,018	1.89%
312 00	Boiler Plant Equipment	992,441,092			-0 7%	999,799 482	113 538,806	886,260,676	47.50	18,503,206	1 86%	154,913	0 02%	18,658,119	1.88%
314 00	Turbogenerator Units	232 629,873			-0 7%	234,354 692	26,955,813	207,398,879	47.50	4,329,980	1 86%	36 312	0 02%	4 366,292	1.88%
315 00	Accessory Electrical Equipment	93,354 798			-0 7%	94,046,971	10,767,555	83,279,416	47 50	1,738,679	1 86%	14,572	0 02%	1,753,251	1.88%
316 00	Misc Power Plant Equip	48 553 150			-0 7%	48,913 144	5,554,654	43,358,490	47 50	905,231	1 86%	7 579	0 02%	912,810	1.88%
	Total	1 654,471,433			-0 7%	1,666,738,401	188,895,092	1 477,843,309	47.50	30,854,239	1 86%	258,252	0 02%	31,112,491	1.88%
	Welsh														
311 00	Structures & Improvements	72,936 301			-2 2%	74,516 339	36,145,083	38,371,256	20 00	1,839,561	2 52%	79,002	0 11%	1,918,563	2.63%
312 00	Boiler Plant Equipment	583,599,604			-2.2%	596,242 272	201,479,120	394,763,152	20 00	19,106,024	3 27%	632,133	0 11%	19,738,158	3.38%
314 00	Turbogenerator Units	142 048,909			-2.2%	145,126 151	60,107,045	85,019,106	20 00	4,097,093	2 88%	153,862	0 11%	4 250,955	2 99%
315 00	Accessory Electrical Equipment	47,084,699			2 2%	48,104,707	16,247,747	31,856,960	20 00	1,541,848	3 27%	51,000	0 11%	1,592,848	3.38%
316 00	Misc Power Plant Equip	21,423,993			-2 2%	21,888 106	8,905,482	12,982,624	20 00	625,926	2 92%	23 206	0 11%	649,131	3.03%
	Total	867,093,506			-2 2%	885,877,575	322,884,477	562,993,098	20 00	27,210,451	3 14%	939 203	0 11%	28,149 655	3.25%
	Total Coal and Lignite Plants	3 454 507,842			-1.5%	3,505,874 362	869,720 189	2,636,154,173	30 51	84,318,867	2 44%	2 086,480	0 06%	86,405 347	2.50%
	Rail Cars														
312 11	Rail Cars - Flint Creek	3,989,549			0 0%	3,989,549	1,685,281	2,304,268	18 50	124,555	3 12%	0	0 00%	124,555	3 12%
312 11	Rail Cars - Welsh Plant	12 114 203			0 0%	12,114 203	4,621 814	7,492,389	22.50	332,995	2 75%	0	0 00%	332,995	2 75%
	Total	16,103,752			0 0%	16,103,752	6,307 095	9,796 657	21 41	457 550	2 84%	0	0 00%	457,550	2.84%
	Total Steam Production Plant	4,151 993,336			-1 9%	4 232 956,226	1 129,241 172	3 103 715 054	28 76	103 116 590	2 48%	4 782,540	0 12%	107,899 129	2 60%
	OTHER PRODUCTION PLANT														
	Mattison														
341 00	Structures & Improvements	30 793 285			-3 0%	31,706,408	7,593,862	24,112,546	32 50	713,828	2 32%	28,096	0 09%	741,924	2 41%
344 00	Generators	84,008,692			3 0%	86,499,828	20,765,375	65,734,453	32 50	1,945,948	2 32%	76,650	0 09%	2,022,599	2 41%
345 00	Accessory Electrical Equip	8,998 287			3 0%	9,265 116	2 025,558	7,239,558	32 50	214,546	2 38%	8,210	0 09%	222,756	2.48%
346 00	Misc Power Plant Equip	829 903			3.0%	854,512	148,172	706 340	32 50	20,976	2 53%	757	0 09%	21 734	2 62%
	Total Other Production Plant	124 630 167			3 0%	128,325 864	30,532,967	97,792,897	32 50	2,895,298	2 32%	113 714	0 09%	3 009,012	2.41%
	Total Production Plant	**4,276,623,503**			**-2.0%**	**4,361,282,090**	**1,159,774 139**	**3,201,507,951**	**28.87**	**106 011,888**	**2.48%**	**4 896,253**	**0.11%**	**110,908,141**	**2 59%**
	TRANSMISSION PLANT														
350 10	Land Rights	98 424,907	R5	70	0 0%	98,424,907	27,572,110	70,852,797	54 11	1,309,421	1 33%	0	0 00%	1,309,421	1.33%
352.00	Structures & Improvements	25,073,646	R3 5	70	-7 0%	26,828,801	5,310,124	21,518,677	58 77	336,286	1 34%	29 865	0 12%	366,151	1.46%
353 00	Station Equipment	702,710 223	L0 5	75	9 0%	765,954,143	142,611,017	623,343,126	65 77	8 516,029	1 21%	961,592	0 14%	9,477,621	1 35%
354 00	Towers & Fixtures	40,325,282	S1.5	74	-18 0%	47,583,833	26,760,051	20,823,782	45.48	298,268	0 74%	159 599	0 40%	457,867	1 14%
355 00	Poles & Fixtures	759,166,339	L1 5	49	-64 0%	1,245,032,796	234,301,530	1,010,731,266	41.88	12,532,589	1 65%	11 601 396	1 53%	24,133,984	3 18%
356 00	OH Conductor & Devices	426 450 498	L1.5	80	53 0%	652,469 262	142,670,509	509,798,753	67 65	4,194,826	0 98%	3 341,002	0 78%	7,535,828	1.77%
357 00	Underground Conduit	3,826,324	R1 5	50	0 0%	3,826,324	99,878	3,726,446	48 94	76 143	1 99%	0	0 00%	76,143	1.99%
358 00	Underground Conductor & Devices	87,633	R1 5	50	0 0%	87,633	2 718	84,915	48 74	1,742	1 99%	0	0 00%	1,742	1 99%
359 00	Roads and Trails	131,947	R4	65	0 0%	131,947	55,815	76,132	42 72	1 782	1 35%	0	0 00%	1,782	1 35%

Depreciation Rate Development
(SL-AL-RL-BG System)

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
			Iowa Curve							Service Life		Net Salvage		Total	
Account No	Description	Plant 12/31/2019	Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	Total Transmission Plant	2,056,196,799			-38 1%	2,840,339,646	579,383,752	2,260,955,894	52.14	27,267,086	1 33%	16,093,453	0 78%	43,360,540	2 11%
	DISTRIBUTION PLANT														
360 10	Land Rights	3,593,142	R4	60	0 0%	3,593 142	2 034,542	1,558,600	30 87	50,489	1 41%	0	0 00%	50,489	1 41%
361 00	Structures & Improvements	9,551,154	R3	75	-11 0%	10,601,781	2,064,155	8,537,626	62 48	119,830	1 25%	16,815	0 18%	136,646	1 43%
362 00	Station Equipment	331,732,959	S0 5	- 57	-16 0%	384,810,232	90,176,696	294,633,536	45 55	5,303,101	1 60%	1,165 253	0 35%	6 468,354	1 95%
364.00	Poles, Towers, & Fixtures	470,031,668	L0	- 62	-64 0%	770,851,936	215,028 099	555,823,837	52 72	4,836,942	1 03%	5,705,999	1 21%	10,542,941	2.24%
365 00	Overhead Conductor & Devices	474,074,113	R1	- 44	-40 0%	663,703 758	176,744 924	486,958,834	33 95	8,757,855	1.85%	5,585 557	1 18%	14,343,412	3 03%
366 00	Underground Conduit	71,650 932	R4	- 80	0 0%	71,650,932	17,519,720	54,131,212	65 25	829,597	1 16%	0	0 00%	829,597	1 16%
367 00	Underground Conductor	234,750,023	R1	- 62	17 0%	274 657,527	98,481 711	176,175,816	51 09	2,667,221	1 14%	781,122	0 33%	3,448,342	1 47%
368 00	Line Transformers	406,858,746	L0	- 44	10 0%	447,544,621	98,045,465	349,499,156	35 73	8,642,969	2 12%	1,138 703	0 28%	9,781,672	2 40%
369 00	Services	96,876,860	R1.5	- 76	74 0%	168,565,736	46,236,808	122,328,928	64 21	788,663	0 81%	1,116,475	1 15%	1,905,138	1 97%
370 00	Meters	85,774,920	O2	- 21	26 0%	108,076 399	33,901 749	74 174 650	17,52	2 960,797	3 45%	1,272 915	1 48%	4,233,713	4 94%
371 00	Installations on Custs Prem	44 016,257	L0	- 25	31 0%	57,661,297	18,135,668	39,525,629	18 26	1,417,338	3 22%	747 264	1 70%	2,164,602	4 92%
373 00	Street Lighting & Signal Sys	42,798,295	L0	- 40	34 0%	57,349,715	15,311,554	42,038,161	30 84	891,269	2 08%	471 836	1 10%	1 363,105	3 18%
	Total Distribution Plant	2,271,709,069			-32.9%	3,019,067,076	813,681,091	2,205,385,985	39 90	37,266,072	1.64%	18,001,940	0 79%	55,268,012	2 43%
	GENERAL PLANT														
390 00	Structures & Improvements	106,506,342	L0	- 58	5 0%	111,831,659	19,706,068	92,125,591	46 47	1,867,878	1 75%	114 597	0 11%	1,982,475	1.86%
391 00	Office Furniture & Equipment	9,282,784	SQ	- 30	0 0%	9 282,784	5,965,503	3,317,281	8 24	402,583	4 34%	0	0 00%	402,583	4 34%
391 11	Office Equipment - Computers	45,523	SQ	- 7	0 0%	45,523	23,373	22 150	2 94	7,534	16 55%	0	0 00%	7,534	16.55%
392 00	Transportation Equipment	4,118 518	SQ	- 20	3 0%	3,994,962	1,782,172	2,212,790	9 93	235,282	5 71%	-12,443	-0 30%	222,839	5.41%
393 00	Stores Equipment	3,121,778	SQ	- 30	-2 0%	3,184,214	1,597,610	1,586,604	13 01	117,154	3.75%	4,799	0 15%	121,953	3 91%
394 00	Tools Shop & Garage Equipment	28,793 058	SQ	- 35	-1 0%	29,080,989	8,738,451	20,342,538	23 13	867,039	3 01%	12,448	0 04%	879,487	3.05%
395 00	Laboratory Equipment	5,501,275	SQ	- 35	2 0%	5,611,301	3,516,707	2,094,594	10 24	193,805	3.52%	10 745	0 20%	204,550	3 72%
396 00	Power Operated Equipment	698,227	SQ	- 20	2 0%	684,262	271,725	412,537	11.04	38,632	5 53%	-1 265	-0 18%	37,368	5.35%
397 00	Communication Equipment	43,330,733	SQ	20	0 0%	43,330 733	13,550,176	29,780,557	12 94	2,301,434	5 31%	0	0 00%	2,301,434	5.31%
398 00	Miscellaneous Equipment	2,423,516	SQ	- 20	0 0%	2,423,516	1,016,338	1,407,178	10.53	133,635	5 51%	0	0 00%	133,635	5.51%
399 30	Alliance Rail	5 872 017			0 0%	5,872,017	2,559,240	3,312,777	22.50	147,235	2.51%	0	0 00%	147,235	2 51%
	Total General Plant	209,693,771			-2 7%	215,341,960	58,727,363	156,614,597	24 31	6,312,210	3 01%	128,881	0 06%	6,441,091	3 07%
	TOTAL DEPRECIABLE PLANT	$ 8,814,223,142			-18 4%	$ 10,436,030 772	$ 2,611,566,345	$ 7,824,464,427	36.23	$ 176,857,257	2.01%	$ 39,120,528	0.44%	$ 215,977,784	2 45%

[1] From depreciation study
[2] Average life and Iowa curve shape developed through actuarial analysis and professional judgment, no interim retirement curves for production units
[3] Mass net salvage rates developed through statistical analysis and professional judgment, terminal net salvage rates for production units are from Exhibit DJG 5
[4] = [1]*(1-[3])
[5] From depreciation study
[6] = [4] - [5]
[7] Composite remaining life based on Iowa curve in [2], see remaining life exhibit for detailed calculations
[8] = ([1]   [5]) / [7]
[9] = [8] / [1]
[10] = [12] - [8]
[11] = [13] - [9]
[12] = [6] / [7]
[13] = [12] / [1]

SOAH DOCKET NO. 473-21-0538
PUC DOCKET NO. 51415

APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-5:

TERMINAL NET SALVAGE ADJUSTMENTS

Terminal Net Salvage

Exhibit DJG-5

[1] Production Units	[2] Plant Balance 12/31/2019	[3] S&L Net Salvage Est.	[4] Contingency Factor (10%)	[5] Net Salvage Less Contingency	[6] SWEPCO Share	[7] Adjusted Net Salvage	[8] Adjusted Net Salvage Ratio
Arsenal Hill	$ 27,613,570	$ 3,558,616	$ 591,600	$ 2,967,016	100%	$ 2,967,016	-10 7%
Knox Lee	61,359,044	18,100,997	2,949,800	15,151,197	100%	15,151,197	-24 7%
Lieberman	41,348,781	4,343,874	1,098,000	3,245,874	100%	3,245,874	-7 8%
Wilkes	119,591,905	7,442,762	2,269,300	5,173,462	100%	5,173,462	-4 3%
Flint Creek	355,281,974	15,159,129	2,713,200	12,445,929	50%	6,222,965	-1 8%
Pirkey	577,660,932	19,702,687	3,304,600	16,398,087	86%	14,092,516	-2 4%
Welsh	867,093,506	24,129,069	5,345,000	18,784,069	100%	18,784,069	-2.2%
Mattison	124,630,167	4,192,897	497,200	3,695,697	100%	3,695,697	-3 0%
Stall	431,468,442	3,936,421	877,600	3,058,821	100%	3,058,821	-0 7%
Turk	1,654,471,430	19,786,548	3,058,100	16,728,448	73%	12,266,971	-0.7%
Total	$ 4,260,519,751	$ 120,353,000	$ 22,704,400	$ 97,648,600		$ 84,658,587	

[1], [2] Company production units and plant balances - see depreciation study
[3], [4] Sargent & Lundy net salvage estimates and contingency cost estimates - see Exhibit PME-2
[5] = [4] - [3]
[6] = Company share of plant unit
[7] = [5] * [6] ; also does not include escalation or inflation of cost
[8] = [7] / [2] * -1

SOAH DOCKET NO. 473-21-0538
PUC DOCKET NO. 51415

APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-6:

ACCOUNT 353 CURVE FITTING

Account 353 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO S0-68	[5] CARD L0.5-75	[6] SWEPCO SSD	[7] CARD SSD
0.0	732,782,476	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	678,613,099	99.95%	99.99%	99.94%	0 0000	0 0000
1.5	639,081,025	99.85%	99.92%	99.78%	0 0000	0 0000
2.5	596,551,661	99 21%	99.80%	99.57%	0 0000	0.0000
3.5	514,363,677	98.91%	99 64%	99 33%	0.0001	0 0000
4 5	480,971,030	98.78%	99 43%	99.06%	0 0000	0.0000
5 5	442,639,867	98 63%	99 20%	98 75%	0 0000	0.0000
6.5	420,728,630	98 37%	98.93%	98.43%	0.0000	0.0000
7.5	385,157,691	98 28%	98.63%	98 08%	0 0000	0.0000
8.5	361,848,098	98 12%	98.30%	97.70%	0.0000	0.0000
9 5	329,984,210	97 71%	97.94%	97.30%	0.0000	0 0000
10 5	302,912,819	97 51%	97.55%	96.88%	0.0000	0 0000
11 5	288,084,396	97.38%	97.14%	96 44%	0 0000	0 0001
12 5	261,164,854	97.16%	96.70%	95 97%	0 0000	0 0001
13 5	254,270,736	96.94%	96.24%	95.49%	0.0000	0 0002
14 5	248,497,218	96.67%	95.75%	94 98%	0 0001	0.0003
15.5	245,146,717	96.53%	95 25%	94 45%	0 0002	0 0004
16 5	229,013,645	96.09%	94 72%	93 91%	0.0002	0.0005
17.5	212,981,014	95.84%	94 17%	93.33%	0.0003	0.0006
18.5	204,404,144	95 22%	93.60%	92.74%	0.0003	0.0006
19.5	199,925,953	94.83%	93 00%	92.13%	0.0003	0 0007
20.5	188,698,028	94 42%	92 40%	91.50%	0 0004	0 0009
21.5	185,606,311	94.14%	91.77%	90 85%	0.0006	0 0011
22 5	166,931,939	88.64%	91.12%	90 18%	0.0006	0.0002
23 5	157,733,139	88 34%	90 46%	89.50%	0.0004	0 0001
24.5	139,730,200	88.11%	89 77%	88 79%	0.0003	0 0000
25 5	131,767,848	87.77%	89 08%	88 07%	0.0002	0.0000
26.5	128,569,674	87 30%	88 36%	87.32%	0.0001	0 0000
27.5	126,118,209	87 14%	87.63%	86.56%	0.0000	0 0000
28 5	122,726,492	86.45%	86.89%	85.79%	0 0000	0 0000
29 5	119,369,006	86.13%	86.13%	85.00%	0.0000	0 0001
30 5	116,953,672	85.64%	85.36%	84.20%	0 0000	0 0002
31 5	115,434,727	85 15%	84 57%	83 38%	0 0000	0.0003
32 5	114,138,418	84 43%	83 77%	82 55%	0 0000	0.0004
33.5	106,986,043	83 32%	82.96%	81 70%	0.0000	0.0003
34.5	99,021,453	82 68%	82.14%	80.85%	0 0000	0.0003
35.5	88,361,860	81.85%	81.30%	79.98%	0.0000	0.0003
36.5	84,734,829	81 12%	80 45%	79 11%	0.0000	0 0004
37.5	71,877,809	80.29%	79.60%	78.23%	0.0000	0.0004
38.5	62,693,239	78.45%	78.73%	77.34%	0 0000	0.0001
39.5	58,675,924	77.57%	77.85%	76.44%	0.0000	0.0001
40 5	54,691,520	76 31%	76.96%	75.54%	0 0000	0.0001
41.5	38,821,529	75.77%	76.06%	74.64%	0.0000	0.0001
42.5	37,540,916	75 42%	75.15%	73 73%	0.0000	0.0003
43.5	35,319,190	75 19%	74.23%	72.82%	0.0001	0.0006
44.5	32,230,733	73 70%	73.31%	71.91%	0.0000	0.0003
45.5	30,873,076	72.96%	72.37%	71.00%	0.0000	0.0004
46.5	28,635,644	72 27%	71.43%	70.09%	0.0001	0.0005
47.5	23,745,454	71.58%	70.48%	69.18%	0.0001	0.0006
48 5	22,513,144	70.15%	69.53%	68.27%	0.0000	0.0004
49.5	18,478,417	68.65%	68 57%	67.37%	0.0000	0.0002
50.5	17,431,261	67 60%	67 60%	66 46%	0.0000	0 0001
51.5	15,915,620	66.62%	66.62%	65 56%	0.0000	0.0001
52.5	15,015,041	65.59%	65 64%	64 65%	0.0000	0.0001
53.5	14,031,118	64.49%	64.66%	63.76%	0.0000	0 0001
54 5	13,084,857	63 81%	63.67%	62 86%	0 0000	0.0001
55 5	11,271,194	62.31%	62.68%	61 96%	0 0000	0.0000
56 5	10,894,807	61.41%	61.68%	61.07%	0 0000	0 0000
57 5	10,233,990	60 34%	60.67%	60 18%	0.0000	0 0000
58 5	9,379,527	59.79%	59.67%	59.29%	0.0000	0.0000
59.5	8,508,191	58.65%	58 66%	58 41%	0.0000	0.0000
60 5	7,621,134	56 96%	57.65%	57 53%	0 0000	0.0000

Account 353 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**SWEPCO S0-68**	**CARD L0.5-75**	**SWEPCO SSD**	**CARD SSD**
61 5	6,334,245	56.31%	56.63%	56.65%	0.0000	0.0000
62.5	5,962,033	55.35%	55.62%	55.78%	0.0000	0.0000
63.5	4,992,636	54.84%	54.60%	54.91%	0.0000	0.0000
64.5	4,416,024	53.71%	53.58%	54.04%	0.0000	0.0000
65.5	3,887,793	52.40%	52.56%	53.18%	0.0000	0.0001
66.5	3,174,643	51.79%	51.54%	52.32%	0.0000	0.0000
67.5	2,697,632	50.50%	50.51%	51.47%	0.0000	0.0001
68.5	2,322,561	49.54%	49.49%	50.62%	0 0000	0.0001
69.5	1,874,168	47.87%	48.47%	49.78%	0.0000	0 0004
70.5	1,654,864	47.24%	47.45%	48.94%	0.0000	0.0003
71.5	999,085	45.75%	46.43%	48.11%	0.0000	0.0006
72.5	724,345	44.42%	45.41%	47.28%	0.0001	0.0008
73.5	443,833	44.35%	44.39%	46.46%	0.0000	0.0004
74.5	388,162	41.30%	43.37%	45.64%	0.0004	0.0019
75.5	382,273	41.21%	42.36%	44 83%	0.0001	0.0013
76.5	333,440	37.48%	41.35%	44.02%	0.0015	0.0043
77.5	234,631	31.86%	40.34%	43.22%	0.0072	0.0129
78.5	199,086	31.86%	39.33%	42.43%	0.0056	0.0112
79.5	190,453	31.08%	38.33%	41.64%	0.0053	0.0112
80.5	185,051	30.61%	37.33%	40.86%	0.0045	0.0105
81.5	183,887	30.60%	36.34%	40.09%	0.0033	0.0090
82.5	168,110	30.06%	35.35%	39.32%	0.0028	0.0086
83.5	156,907	29.03%	34.36%	38.56%	0.0028	0.0091
84.5	155,818	28.94%	33.38%	37.81%	0.0020	0.0079
85.5	120,245	24.92%	32 41%	37.06%	0.0056	0.0147
86.5	117,048	24.30%	31.44%	36 32%	0.0051	0.0144
87.5	116,648	24.24%	30.48%	35.59%	0.0039	0.0129
88.5	62,408	24.24%	29.52%	34.86%	0.0028	0.0113
89.5	62,116	24.24%	28.58%	34 14%	0 0019	0 0098
90 5	25,010	20.11%	27 63%	33.43%	0 0057	0.0178
91.5	4,525	20.11%	26.70%	32.73%	0.0043	0.0159
92.5	1,968	20.11%	25.77%	32.04%	0.0032	0.0142
93.5	0	20.11%	24.86%	31.35%	0.0023	0 0126
94.5	0	20.11%	23.95%	30.67%	0.0015	0.0111
95.5	0	20.11%	23.05%	30.00%	0.0009	0.0098
96.5	0	20.11%	22.16%	29.33%	0.0004	0.0085
97.5	0	20 11%	21.28%	28.68%	0.0001	0.0073
98.5			20.41%	28.03%		
Sum of Squared Differences				[8]	0.0784	0.2640
Up to 1% of Beginning Exposures				[9]	0.0050	0.0131

[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.

SOAH DOCKET NO. 473-21-0538
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DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-7:

ACCOUNT 354 CURVE FITTING

Account 354 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO L3-65	[5] CARD S1.5-74	[6] SWEPCO SSD	[7] CARD SSD
0.0	43,154,545	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	43,158,544	99.96%	100.00%	100.00%	0.0000	0.0000
1.5	42,879,567	99.67%	100.00%	100.00%	0.0000	0.0000
2.5	41,794,623	99.67%	100.00%	100.00%	0.0000	0.0000
3.5	41,113,484	99.50%	100.00%	99.99%	0.0000	0.0000
4.5	40,942,101	99.50%	100.00%	99.98%	0.0000	0.0000
5 5	40,859,941	99.50%	100.00%	99.96%	0.0000	0.0000
6.5	40,842,338	99.40%	100.00%	99.94%	0.0000	0.0000
7.5	39,791,959	99.40%	100.00%	99.91%	0.0000	0.0000
8.5	38,980,820	99.10%	99.99%	99.88%	0.0001	0.0001
9.5	38,702,610	98.77%	99.99%	99.83%	0.0001	0.0001
10.5	38,685,124	98.73%	99.98%	99.78%	0.0002	0.0001
11.5	38,618,825	98.73%	99.96%	99.71%	0.0002	0.0001
12.5	38,434,688	98.61%	99.93%	99.64%	0.0002	0.0001
13.5	37,980,972	98.48%	99.90%	99.55%	0.0002	0.0001
14.5	37,269,384	97.26%	99.86%	99.45%	0.0007	0.0005
15.5	37,164,666	97.02%	99.80%	99.33%	0.0008	0.0005
16.5	37,104,637	96.94%	99.74%	99.20%	0.0008	0.0005
17.5	36,201,809	96.94%	99.66%	99.05%	0.0007	0.0004
18.5	35,571,695	96.94%	99.56%	98.89%	0.0007	0.0004
19.5	35,571,456	96.94%	99.45%	98.71%	0.0006	0.0003
20.5	35,469,316	96.94%	99.32%	98.51%	0.0006	0.0002
21.5	35,461,403	96.94%	99.17%	98.29%	0.0005	0.0002
22.5	34,985,705	96.94%	99.00%	98.04%	0.0004	0.0001
23.5	33,260,348	96.81%	98.81%	97.78%	0.0004	0.0001
24.5	29,516,064	96.49%	98.60%	97.50%	0.0004	0.0001
25.5	29,516,064	96.49%	98.36%	97.19%	0.0003	0.0000
26.5	29,510,789	96.47%	98.10%	96.85%	0.0003	0.0000
27.5	29,510,789	96.47%	97.81%	96.50%	0.0002	0.0000
28.5	29,510,789	96.47%	97.49%	96 11%	0.0001	0 0000
29.5	29,153,216	96.44%	97.13%	95.70%	0.0000	0.0001
30.5	29,125,052	96.35%	96.74%	95.27%	0.0000	0.0001
31.5	27,624,913	96.35%	96.31%	94.80%	0.0000	0.0002
32.5	27,624,912	96.35%	95.83%	94.31%	0.0000	0.0004
33.5	27,315,865	95.42%	95.30%	93.79%	0.0000	0.0003
34.5	24,859,318	95.42%	94.71%	93.24%	0.0000	0.0005
35.5	24,859,318	95.42%	94.06%	92.66%	0.0002	0 0008
36.5	24,714,482	95.42%	93.35%	92.05%	0 0004	0.0011
37.5	20,274,818	95.42%	92.55%	91.41%	0.0008	0.0016
38.5	8,256,223	92.65%	91.68%	90.74%	0.0001	0.0004
39.5	8,023,719	90.33%	90.72%	90.04%	0 0000	0.0000
40.5	7,769,231	87 46%	89.67%	89.30%	0.0005	0.0003
41.5	7,665,902	86 75%	88.52%	88.54%	0.0003	0.0003
42.5	5,569,470	85.52%	87.28%	87.75%	0.0003	0.0005
43 5	2,820,021	85.52%	85.94%	86.92%	0.0000	0 0002
44.5	2,794,324	85.16%	84.50%	86.06%	0.0000	0.0001
45 5	2,788,832	85.10%	82.97%	85.18%	0.0005	0.0000
46.5	2,621,319	83.21%	81.33%	84.26%	0.0004	0.0001
47.5	2,600,127	83.21%	79.61%	83.31%	0.0013	0.0000
48.5	881,251	82.40%	77.80%	82.34%	0.0021	0.0000
49.5	84,186	82.40%	75.92%	81.33%	0 0042	0.0001
50.5	84,186	82.40%	73.97%	80.30%	0.0071	0.0004
51 5	84,186	82.40%	71.95%	79.24%	0 0109	0.0010
52.5	84,186	82.40%	69.89%	78.15%	0.0157	0.0018
53.5	67,580	66.15%	67.78%	77.03%	0.0003	0.0118
54.5	53,877	66.15%	65.65%	75.89%	0.0000	0.0095
55.5	38,129	66 15%	63.49%	74.72%	0.0007	0.0073

Account 354 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO L3-65	[5] CARD S1.5-74	[6] SWEPCO SSD	[7] CARD SSD
56.5	38,129	66.15%	61.32%	73.53%	0.0023	0.0054
57.5	29,295	66.15%	59.16%	72.32%	0.0049	0.0038
58.5	28,215	66.15%	57.00%	71.08%	0.0084	0.0024
59.5	23,422	54.91%	54.87%	69.82%	0.0000	0.0222
60.5	23,422	54.91%	52.76%	68.55%	0.0005	0.0186
61.5	23,422	54.91%	50.69%	67.25%	0.0018	0.0152
62.5	23,422	54.91%	48.66%	65.94%	0.0039	0.0122
63.5	23,422	54.91%	46.68%	64.61%	0.0068	0.0094
64.5	23,422	54.91%	44.75%	63.26%	0.0103	0.0070
65.5	23,422	54.91%	42.88%	61.90%	0.0145	0.0049
66.5	14,891	54.91%	41.07%	60.53%	0.0191	0.0032
67.5	14,891	54.91%	39.33%	59.15%	0.0243	0.0018
68.5	14,891	54.91%	37.64%	57.76%	0.0298	0.0008
69.5	14,891	54.91%	36.02%	56.36%	0.0357	0.0002
70.5	14,891	54.91%	34.46%	54.95%	0.0418	0.0000
71.5	14,891	54.91%	32.96%	53.54%	0.0482	0.0002
72.5	12,429	54.91%	31.53%	52.13%	0.0547	0.0008
73.5	12,429	54.91%	30.14%	50.71%	0.0613	0.0018
74.5	12,429	54.91%	28.83%	49.29%	0.0680	0.0032
75.5	4,218	18.64%	27.56%	47.87%	0.0080	0.0855
76.5	4,218	18.64%	26.34%	46.46%	0.0059	0.0774
77.5	4,218	18.64%	25.18%	45.05%	0.0043	0.0697
78.5	4,218	18.64%	24.06%	43.64%	0.0029	0.0625
79.5	4,218	18.64%	22.98%	42.24%	0.0019	0.0557
80.5	4,218	18.64%	21.95%	40.85%	0.0011	0.0493
81.5	4,218	18.64%	20.95%	39.47%	0.0005	0.0434
82.5	4,218	18.64%	19.99%	38.10%	0.0002	0.0379
83.5	4,218	18.64%	19.07%	36.74%	0.0000	0.0328
84.5	4,218	18.64%	18.18%	35.39%	0.0000	0.0281
85.5	4,218	18.64%	17.32%	34.06%	0.0002	0.0238
86.5	4,218	18 64%	16.49%	32.75%	0.0005	0.0199
87.5	4,218	18.64%	15.69%	31.45%	0.0009	0.0164
88.5			14.92%	30.18%		
Sum of Squared Differences				[8]	0.5172	0.7586
Up to 1% of Beginning Exposures				[9]	0.0157	0.0112

[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.

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DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-8:

ACCOUNT 355 CURVE FITTING

Account 355 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO S0.5-46	[5] CARD L1.5-49	[6] SWEPCO SSD	[7] CARD SSD
0.0	792,485,712	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	708,149,489	99.99%	99.99%	99.97%	0.0000	0.0000
1.5	611,271,999	99.96%	99.92%	99.90%	0.0000	0.0000
2.5	549,675,679	99.75%	99.78%	99.81%	0.0000	0.0000
3.5	475,556,396	99.60%	99.60%	99.69%	0.0000	0.0000
4.5	432,975,820	99.32%	99.37%	99.54%	0.0000	0.0000
5.5	375,526,664	98.87%	99.08%	99.36%	0.0000	0.0000
6.5	353,170,532	98.64%	98.74%	99.14%	0.0000	0.0000
7.5	294,738,689	98.38%	98.35%	98.88%	0.0000	0.0000
8.5	281,424,158	98.17%	97.91%	98.57%	0.0000	0.0000
9.5	256,013,768	97.80%	97.42%	98.21%	0.0000	0.0000
10.5	225,997,813	97.53%	96.87%	97.81%	0.0000	0.0000
11.5	202,926,703	96.70%	96.28%	97.35%	0.0000	0.0000
12.5	187,732,645	95.72%	95.62%	96.84%	0.0000	0.0001
13.5	168,984,738	95.36%	94.92%	96.27%	0.0000	0.0001
14.5	158,755,373	94.00%	94.17%	95.65%	0.0000	0.0003
15.5	150,905,010	93.35%	93.36%	94.97%	0.0000	0.0003
16.5	136,538,015	92.26%	92.50%	94.24%	0.0000	0.0004
17.5	128,418,486	91.81%	91.59%	93.44%	0.0000	0.0003
18.5	115,259,903	91.13%	90.64%	92.58%	0.0000	0.0002
19.5	98,560,952	90.67%	89.63%	91.65%	0.0001	0.0001
20.5	92,809,320	90.13%	88.57%	90.65%	0.0002	0.0000
21.5	90,318,400	89.57%	87.47%	89.58%	0.0004	0.0000
22.5	85,608,113	88.40%	86.33%	88.43%	0.0004	0.0000
23.5	75,246,014	87.23%	85.13%	87.20%	0.0004	0.0000
24.5	65,007,472	85.48%	83.90%	85.90%	0.0003	0.0000
25.5	58,465,703	84.44%	82.62%	84.53%	0.0003	0.0000
26.5	55,359,557	83.15%	81.30%	83.09%	0.0003	0.0000
27.5	50,646,422	81.27%	79.94%	81.59%	0.0002	0.0000
28.5	46,176,454	79.93%	78.55%	80.03%	0.0002	0.0000
29.5	42,737,692	77.84%	77.12%	78.43%	0.0001	0.0000
30.5	40,182,252	75.86%	75.65%	76.79%	0.0000	0.0001
31.5	38,462,572	75.19%	74.15%	75.10%	0.0001	0.0000
32.5	34,873,258	73.92%	72.62%	73.39%	0.0002	0.0000
33.5	33,369,540	73.04%	71.06%	71.66%	0.0004	0.0002
34.5	29,934,961	71.77%	69.48%	69.90%	0.0005	0.0003
35.5	27,600,764	70.84%	67.87%	68.13%	0.0009	0.0007
36.5	24,234,325	68.03%	66.24%	66.35%	0.0003	0.0003
37.5	22,838,386	66.47%	64.59%	64.56%	0.0004	0.0004
38.5	19,657,343	64.12%	62.91%	62.78%	0.0001	0.0002
39.5	18,676,210	62.18%	61.23%	60.99%	0.0001	0.0001
40.5	17,234,000	60.39%	59.52%	59.22%	0.0001	0.0001
41.5	14,044,748	57.37%	57.81%	57.46%	0.0000	0.0000
42.5	13,470,935	55.66%	56.08%	55.72%	0.0000	0.0000
43.5	12,657,713	54.74%	54.35%	54.00%	0.0000	0.0001
44.5	11,409,487	53.25%	52.61%	52.29%	0.0000	0.0001
45.5	8,900,304	51.56%	50.87%	50.62%	0.0000	0.0001
46.5	7,593,428	47.87%	49.13%	48.97%	0.0002	0.0001
47.5	6,890,957	45.54%	47.39%	47.34%	0.0003	0.0003
48.5	6,198,443	43.78%	45.65%	45.75%	0.0004	0.0004
49.5	5,897,276	42.45%	43.92%	44.18%	0.0002	0.0003
50.5	5,180,371	40.47%	42.19%	42.65%	0.0003	0.0005
51.5	4,063,643	38.40%	40.48%	41.15%	0.0004	0.0008
52.5	3,570,188	35.85%	38.78%	39.68%	0.0009	0.0015
53.5	3,137,861	33.87%	37.09%	38.25%	0.0010	0.0019
54.5	2,782,339	31.95%	35.42%	36.84%	0.0012	0.0024
55.5	2,448,056	30.52%	33.76%	35.47%	0.0011	0.0025
56.5	2,130,102	27.86%	32.13%	34.14%	0.0018	0.0039
57.5	1,980,486	26.59%	30.52%	32.83%	0.0015	0.0039

Account 355 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO S0.5-46	[5] CARD L1.5-49	[6] SWEPCO SSD	[7] CARD SSD
58.5	1,497,761	25.45%	28.94%	31 55%	0 0012	0.0037
59.5	1,424,252	24.44%	27.38%	30.31%	0.0009	0.0034
60.5	1,251,044	22.76%	25.85%	29.10%	0.0010	0.0040
61.5	1,165,024	22.08%	24.35%	27.92%	0.0005	0.0034
62.5	1,061,815	20.88%	22.89%	26.77%	0.0004	0.0035
63.5	960,870	19.84%	21.46%	25.64%	0.0003	0.0034
64.5	740,131	17.48%	20.06%	24.55%	0.0007	0.0050
65.5	655,885	15.80%	18.70%	23.49%	0.0008	0.0059
66.5	495,651	13.51%	17.39%	22.46%	0.0015	0.0080
67.5	419,892	11.91%	16.11%	21.45%	0.0018	0.0091
68.5	366,535	11.33%	14.87%	20.47%	0.0013	0.0084
69.5	341,194	10.77%	13.68%	19.53%	0.0008	0.0077
70.5	246,871	10.41%	12.53%	18.61%	0.0004	0.0067
71.5	241,413	10.32%	11.43%	17.71%	0.0001	0.0055
72.5	232,165	10.24%	10.37%	16.85%	0.0000	0.0044
73.5	192,330	8.59%	9.37%	16.01%	0.0001	0.0055
74.5	169,070	7.56%	8.41%	15.19%	0.0001	0.0058
75.5	166,475	7.47%	7.50%	14.41%	0.0000	0.0048
76.5	162,128	7.34%	6.64%	13.65%	0.0000	0.0040
77.5	89,280	7.11%	5.84%	12.92%	0.0002	0 0034
78.5	85,585	6.82%	5.08%	12.21%	0.0003	0.0029
79.5	78,456	6.29%	4.38%	11.53%	0.0004	0.0027
80.5	67,775	5.57%	3.73%	10.87%	0.0003	0.0028
81.5	62,901	5.18%	3.13%	10 24%	0.0004	0.0026
82.5	60,195	4.96%	2.58%	9.64%	0.0006	0.0022
83 5	56,437	4 65%	2.09%	9 06%	0.0007	0 0019
84.5	49,982	4.12%	1.65%	8.50%	0.0006	0.0019
85.5	49,327	4.08%	1.26%	7.97%	0.0008	0.0015
86.5	35,654	2.95%	0.92%	7.46%	0.0004	0.0020
87.5	28,651	2.37%	0.64%	6.97%	0.0003	0.0021
88.5	17,842	1.81%	0.40%	6.51%	0.0002	0.0022
89.5	12,136	1.78%	0.22%	6.06%	0.0002	0.0018
90.5	2,296	1.51%	0.09%	5.64%	0.0002	0.0017
91.5	1,811	1.28%	0.01%	5.25%	0 0002	0.0016
92.5	1,853	1.28%	0.00%	4.87%	0.0002	0.0013
93.5			0.00%	4.51%		
Sum of Squared Differences				[8]	0.0334	0.1600
Up to 1% of Beginning Exposures				[9]	0.0064	0.0047

[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.

SOAH DOCKET NO. 473-21-0538
PUC DOCKET NO. 51415

APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS OF

DAVID J. GARRETT

EXHIBIT DJG-9:

ACCOUNT 356 CURVE FITTING

Account 356 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO R2-70	[5] CARD L1.5-80	[6] SWEPCO SSD	[7] CARD SSD
0.0	429,240,042	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	401,571,245	99.98%	99.93%	99.98%	0.0000	0.0000
1.5	350,614,373	99.96%	99.79%	99.94%	0.0000	0.0000
2.5	340,603,914	99.93%	99.65%	99.90%	0.0000	0.0000
3.5	312,373,801	99.90%	99.49%	99.84%	0.0000	0.0000
4.5	297,468,663	99.86%	99.33%	99.78%	0.0000	0.0000
5.5	271,726,962	99.76%	99.16%	99.71%	0.0000	0.0000
6.5	260,717,737	99.63%	98.98%	99.62%	0.0000	0.0000
7.5	228,594,938	99.36%	98.80%	99.52%	0.0000	0.0000
8.5	222,118,767	99.25%	98.61%	99.42%	0.0000	0.0000
9.5	208,834,615	99.12%	98.40%	99.29%	0.0001	0.0000
10.5	193,309,460	98.99%	98.19%	99.15%	0.0001	0.0000
11.5	177,822,779	98.53%	97.97%	99.00%	0.0000	0.0000
12.5	162,895,692	98.02%	97.74%	98.83%	0.0000	0.0001
13.5	156,364,704	97.80%	97.50%	98.65%	0.0000	0.0001
14.5	152,836,212	97.18%	97.25%	98.44%	0.0000	0.0002
15.5	149,109,197	96.79%	96.98%	98.22%	0.0000	0.0002
16.5	143,417,627	96.70%	96.71%	97.98%	0.0000	0.0002
17.5	137,209,768	96.56%	96.42%	97.72%	0.0000	0.0001
18.5	129,259,425	96.49%	96.13%	97.43%	0.0000	0.0001
19.5	118,626,450	95.93%	95.82%	97.13%	0.0000	0.0001
20.5	115,739,093	95.73%	95.49%	96.81%	0.0000	0.0001
21.5	115,185,209	95.66%	95.16%	96.47%	0.0000	0.0001
22.5	113,886,291	95.54%	94.81%	96.11%	0.0001	0.0000
23.5	108,762,942	95.45%	94.45%	95.72%	0.0001	0.0000
24.5	103,428,066	95.09%	94.07%	95.31%	0.0001	0.0000
25.5	97,252,371	94.97%	93.68%	94.89%	0.0002	0.0000
26.5	96,500,115	94.67%	93.27%	94.44%	0.0002	0.0000
27.5	94,800,012	94.48%	92.85%	93.97%	0.0003	0.0000
28.5	91,840,699	94.30%	92.41%	93.48%	0.0004	0.0001
29.5	88,455,504	93.50%	91.95%	92.96%	0.0002	0.0000
30.5	87,228,055	92.96%	91.48%	92.42%	0.0002	0.0000
31.5	83,331,604	92.88%	90.99%	91.85%	0.0004	0.0001
32.5	80,570,768	91.49%	90.48%	91.25%	0.0001	0.0000
33.5	79,337,233	91.19%	89.95%	90.63%	0.0002	0.0000
34.5	70,773,075	91.06%	89.41%	89.98%	0.0003	0.0001
35.5	67,559,403	90.77%	88.84%	89.30%	0.0004	0.0002
36.5	65,041,213	90.31%	88.25%	88.59%	0.0004	0.0003
37.5	55,822,623	89.93%	87.65%	87.86%	0.0005	0.0004
38.5	41,195,904	89.62%	87.02%	87.10%	0.0007	0.0006
39.5	40,297,232	88.64%	86.37%	86.30%	0.0005	0.0005
40.5	38,190,706	88.20%	85.70%	85.48%	0.0006	0.0007
41.5	33,515,209	86.43%	85.00%	84.64%	0.0002	0.0003
42.5	30,131,431	86.05%	84.28%	83.77%	0.0003	0.0005
43.5	24,518,616	85.27%	83.54%	82.88%	0.0003	0.0006
44.5	22,834,679	84.70%	82.77%	81.96%	0.0004	0.0008
45.5	20,678,264	83.90%	81.98%	81.02%	0.0004	0.0008
46.5	18,759,396	81.12%	81.17%	80.06%	0.0000	0.0001
47.5	17,724,136	80.21%	80.32%	79.09%	0.0000	0.0001
48.5	13,689,215	78.60%	79.45%	78.09%	0.0001	0.0000
49.5	13,021,220	78.20%	78.56%	77.09%	0.0000	0.0001
50.5	11,492,193	78.07%	77.64%	76.07%	0.0000	0.0004
51.5	9,076,550	76.67%	76.68%	75.03%	0.0000	0.0003
52.5	8,297,858	76.17%	75.71%	73.98%	0.0000	0.0005
53.5	7,415,814	75.12%	74.70%	72.93%	0.0000	0.0005
54.5	6,489,032	74.27%	73.66%	71.86%	0.0000	0.0006
55.5	5,893,313	73.99%	72.60%	70.79%	0.0002	0.0010
56.5	5,505,228	71.92%	71.51%	69.71%	0.0000	0.0005
57.5	5,232,608	71.41%	70.38%	68.63%	0.0001	0.0008

Account 356 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] SWEPCO R2-70	[5] CARD L1.5-80	[6] SWEPCO SSD	[7] CARD SSD
58.5	3,717,201	70 17%	69.23%	67.54%	0.0001	0.0007
59.5	3,616,257	69.83%	68.05%	66.45%	0.0003	0.0011
60.5	3,053,668	68.24%	66.84%	65.35%	0.0002	0.0008
61.5	2,497,238	64.58%	65.61%	64.26%	0.0001	0.0000
62.5	2,286,541	62.56%	64.34%	63.17%	0.0003	0.0000
63.5	2,194,510	61.56%	63.05%	62.07%	0.0002	0.0000
64.5	1,967,174	59.80%	61.73%	60.98%	0 0004	0.0001
65.5	1,892,446	58.40%	60.38%	59.90%	0.0004	0.0002
66.5	1,500,114	56.34%	59.01%	58.81%	0.0007	0.0006
67.5	1,421,373	54.85%	57.61%	57.74%	0.0008	0.0008
68 5	1,144,532	54.70%	56.20%	56.67%	0.0002	0.0004
69.5	1,098,056	54.12%	54.75%	55.60%	0.0000	0.0002
70.5	839,187	51.84%	53.29%	54.54%	0.0002	0.0007
71.5	758,791	50.35%	51.81%	53.49%	0 0002	0.0010
72.5	666,033	47.95%	50.31%	52.45%	0.0006	0.0020
73 5	655,505	47.19%	48.79%	51.42%	0.0003	0.0018
74.5	646,860	46.57%	47.26%	50.40%	0.0000	0.0015
75.5	646,662	46.56%	45.72%	49.39%	0.0001	0.0008
76.5	646,261	46.54%	44.17%	48.38%	0.0006	0.0003
77.5	477,089	46.50%	42.62%	47.39%	0.0015	0.0001
78.5	474,200	46.24%	41.06%	46.41%	0.0027	0.0000
79.5	465,323	45.37%	39.49%	45.44%	0.0035	0.0000
80.5	462,294	45.13%	37.93%	44.49%	0.0052	0.0000
81.5	461,385	45.05%	36.37%	43.54%	0.0075	0.0002
82.5	453,064	44.25%	34.82%	42.61%	0.0089	0.0003
83.5	443,672	43.33%	33.28%	41.68%	0.0101	0.0003
84.5	432,336	42.22%	31.75%	40.77%	0.0110	0.0002
85.5	422,998	41.31%	30.24%	39.87%	0.0123	0.0002
86.5	395,177	38.59%	28.74%	38.99%	0.0097	0.0000
87.5	394,250	38.50%	27.27%	38.12%	0.0126	0.0000
88.5	359,447	37.20%	25.82%	37.25%	0.0130	0.0000
89.5	353,737	37.06%	24.40%	36.40%	0.0160	0.0000
90.5	187,894	36.23%	23.00%	35.57%	0.0175	0.0000
91.5	146,708	35.08%	21.65%	34.74%	0.0180	0.0000
92.5	142,625	34.42%	20.32%	33.93%	0.0199	0.0000
93.5			19.03%	33.13%		
Sum of Squared Differences				[8]	0.1832	0.0272
Up to 1% of Beginning Exposures				[9]	0.0082	0.0124

[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.