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ENTERGY TEXAS, INC.'S STATEMENT OF INTENT AND APPLICATION FOR AUTHORITY TO CHANGE RATES	§ § §	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY AND EXHIBITS

OF

DAVID J. GARRETT

ON BEHALF OF THE CITIES OF

Anahuac, Beaumont, Bridge City, Cleveland, Conroe, Dayton, Groves, Houston, Huntsville, Liberty, Montgomery, Navasota, Nederland, Oak Ridge North, Orange, Pinehurst, Port Arthur, Port Neches, Roman Forest, Shenandoah, Splendora, Sour Lake, Vidor, and West Orange

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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. degree with a major in Finance, an M.B.A. degree, and a Juris Doctor degree 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 ("Oklahoma Commission" or "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 and state agencies 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] Direct Exhibit DJG-1.

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

A. I am testifying on behalf of the Cities of Anahuac, Beaumont, Bridge City, Cleveland, Conroe, Dayton, Groves, Houston, Huntsville, Liberty, Montgomery, Navasota, Nederland, Oak Ridge North, Orange, Pinehurst, Port Arthur, Port Neches, Roman Forest, Shenandoah, Splendora, Sour Lake, Vidor, and West Orange (collectively "Cities").

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

A. I am testifying in response to the direct testimonies of two witnesses for Entergy Texas, Inc. ("ETI" or the "Company"). I will address the depreciation rates proposed by Mr. Dane A. Watson. I will also address the demolition costs proposed by Mr. Sean C. McHone.

II. EXECUTIVE SUMMARY

Q. Summarize the key points of your testimony.

A. In this case, ETI is proposing a substantial increase in excess of $30 million to its annual depreciation accrual, which represents an increase of more than 30%. As demonstrated by the evidence presented in this testimony, it would not be reasonable to accept ETI's filed position regarding its proposed depreciation rates. ETI's proposed increase is unreasonably high due to several factors, which are summarized as follows:

1. The Company's proposed demolition costs are arbitrarily inflated by 10% using contingency factors. The Commission should disallow the inclusion of contingency costs in demolition cost estimates.

2. The Company's proposed demolition costs are escalated to the future estimated retirement date of each generating facility, thereby increasing the proposed costs by about $50 million. These escalation factors ignore the time value of money and seek to charge current ratepayers for inflated future values. The Commission should disallow demolition cost escalation without the inclusion of a discount rate to bring the costs back to present value.

3. Mr. Watson's calculations of ETI's production plant depreciation rates include unrecovered balances for the Company's retired Sabine Unit 2 and Neches plants. Specifically, Mr. Watson reallocated the unrecovered balances for these retired production units to generating units that are still in service. It is more appropriate for the Commission to address the unrecovered balances for these units separately through a regulatory asset.

4. Contrary to Commission precedent, Mr. Watson proposes the immediate inclusion of more than $120 million of interim retirements in the Company's production net salvage rates. The inclusion of such a substantial amount of interim retirements in this case would unfairly burden current ratepayers.

5. Mr. Watson proposes a reserve reallocation for the Company's mass property accounts. This procedure is unnecessary and is not in conformance with standard depreciation practices. Both Mr. Watson and I propose depreciation rates calculated under the remaining life technique, which means that any imbalance between the book reserve and the theoretical reserve will be automatically rebalanced over the remaining life of plant.

6. For several transmission and distribution "mass" property accounts, ETI is proposing service lives that are shorter than those indicated by the Company's historical retirement data, and as a result, the corresponding depreciation rates proposed for these accounts are too high.

For these reasons, it would not be reasonable to accept the Company's proposed increase to its depreciation rates and expense. The following table summarizes ETI's and Cities' proposed depreciation accruals for plant at December 31, 2017.[2]

[2] Exhibit DJG-2.

Figure 1:
Summary Proposed Depreciation Accrual Comparison

Plant Function	Plant Balance 12/31/2017	ETI Proposed Accrual	Cities Proposed Accrual	Accrual Difference
Steam Production	$ 1,120,362,756	$ 48,272,808	$ 37,947,178	$ (10,325,630)
Hydraulic Production	251,207	-	-	-
Transmission	1,336,760,060	26,977,342	23,931,276	(3,046,066)
Distribution	1,756,611,334	53,924,650	52,382,272	(1,542,378)
General	68,608,524	1,619,828	1,679,380	59,551
Total	$ 4,282,593,881	$ 130,794,629	$ 115,940,106	**$ (14,854,523)**

As shown in the table above, Cities recommend a depreciation accrual of $115.9 million, which represents a decrease of $14.9 million to ETI's proposed accrual for plant as of December 31, 2017.[3]

Q. Please discuss and illustrate the dollar impacts of each major issue presented in your testimony.

A. While the table above shows the dollar impacts of my proposed adjustments by plant function, the table below shows the estimated dollar impacts of my adjustments categorized by the main issues raised in my testimony.[4]

[3] *See* Direct Testimony of Cities witness Karl J. Nalepa for Cities' depreciation expense adjustment.

[4] These figures represent estimated adjustments to the Company's proposed depreciation accrual at 12-31-17, and not necessarily adjustments to the revenue requirement. The numbers in this table represent estimates. It is difficult to exactly isolate the four factors affecting ETI's production (contingency, escalation, reserve reallocation, and interim retirements) because these factors can affect each other.

Figure 2:
Estimated Impact of Adjustment by Issue

Issue	Adjustment ($Mil)
Remove Contingency Factor	0.8
Remove Escalation Factor	1.4
Accept ETI Production Reserve Without Sabine and Neches	4.9
Remove Interim Retirements	3.1
Mass Property Service Life Adjustments	4.6
Total	**$14.8**

Each of these issues will be discussed in more detail in the sections 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 required to provide service. Depreciation systems are designed to allocate those costs in a systematic and rational manner – specifically, over the service life of the utility's assets. If depreciation rates are overestimated (i.e., service lives are underestimated), it encourages economic inefficiency. Unlike competitive firms, regulated utility companies are not always incentivized by natural market forces to make the most economically efficient decisions. If a utility is allowed to recover the cost of an asset before the end of its useful life, this could incentivize the utility to unnecessarily replace the asset in order to increase rate base, which results in economic waste. Thus, from a public policy perspective, it is preferable for regulators to ensure that assets are not depreciated before the end of their true useful lives. While underestimating the useful lives of depreciable assets could financially harm current ratepayers and encourage economic waste, unintentionally overestimating depreciable lives (i.e., underestimating depreciation rates) does not harm the Company. This is because if an asset's life is overestimated, there are a variety of measures that regulators can use to ensure the utility is not financially harmed. One such measure would be the use of a regulatory asset account. In that case, the Company's original cost investment in these assets would remain in the Company's rate base until they are recovered. Thus, the process of depreciation strives for a perfect match between actual and estimated useful life. However, when these estimates are not exact, it is better to ensure that service lives are not underestimated.

III. DEPRECIATION 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."[5] 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.[6] Moreover, the *Lindheimer* Court found:

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

[6] *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.[7]

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

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

A. Yes. While the *Lindheimer* case and other early literature recognized depreciation as a necessary expense, the language indicated that depreciation was primarily a mechanism to determine loss of value.[8] 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.[9] The definition of "depreciation accounting" published by the American Institute of Certified Public Accountants ("AICPA") properly reflects the cost allocation concept:

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[7] *Id.* at 169 (emphasis added).

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

[9] 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.[10]

Thus, the concept of depreciation as "the allocation of cost has proven to be the most useful and most widely used concept."[11]

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 analysis. 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.[12] 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 standards set forth

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

[11] Wolf *supra* n. 8, at 73.

[12] *See id.* at 140.

above and is commonly used by depreciation analysts in regulatory proceedings. I provide a more detailed discussion of depreciation system parameters, theories, and equations in Appendix A.

Q. Did Mr. Watson use the same depreciation system that you used?

A. Yes. Therefore, the differences in our depreciation rate proposals are driven by different service life and other parameter assumptions, rather than by a difference in the depreciation system.

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

A. The study of retirement patterns of industrial property is derived from the actuarial process used to study human mortality. Just as actuarial scientists study historical human mortality data in order to predict how long a group of people will live, depreciation analysts study historical plant data in order to estimate the average lives of property groups. The most common actuarial method used by depreciation analysts is called the "retirement rate method." In the retirement rate method, original property data, including additions, retirements, transfers, and other transactions, are organized by vintage and transaction year.[13] The retirement rate method is ultimately used to develop an "observed life table," ("OLT") which shows the percentage of property surviving at each age interval. This pattern of property retirement is described as a "survivor curve." The survivor curve derived from the observed life table, however, must be fitted and smoothed with a complete

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

curve in order to determine the ultimate average life of the group.[14] The most widely used survivor curves for this curve-fitting process were developed at Iowa State University in the early 1900s and are commonly known as the "Iowa curves."[15] A more detailed explanation of how the Iowa curves are used in the actuarial analysis of depreciable property is set forth in Appendix C.

V. RETIRED PLANTS AND THE RESERVE REALLOCATION

Q. Please discuss the difference between the depreciation book reserve and the theoretical reserve.

A. Depreciation accrual rates are calculated using estimates of service life and salvage. The accrual rates based on a particular set of service lives and net salvage parameters will result in a corresponding accumulated depreciation or book reserve balance. However, depreciation parameters for any particular asset or group of assets will necessarily change over time. The changes in these parameters will cause the book reserve to be higher or lower than the "theoretical reserve" (i.e., what the reserve "should be" based on the revised service life and net salvage parameters). Unless some corrective action is taken to address the imbalance between the book reserve and the theoretical reserve, the annual accruals will not equal the original cost of the plant at the time of final retirement.

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

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

Q. What does Mr. Watson propose to correct the imbalance between the book reserve and theoretical reserve?

A. Mr. Watson proposes a separate reserve reallocation within each plant function based on the theoretical reserves for each account. Mr. Watson's estimate of the theoretical reserve is necessarily based on his estimates of service life and net salvage for each account. To the extent that any of Mr. Watson's service life and net salvage estimates are not accepted, it would mathematically affect all of his proposed depreciation rates within a particular plant function.

Q. Describe the most common method depreciation analysts use to correct the imbalance between the book reserve and the theoretical reserve.

A. The most common method for addressing the imbalance between the book reserve and the theoretical reserve is using the remaining life technique to calculate depreciation rates. The remaining life technique allocates plant (less the book reserve) over the remaining life of an asset or group of assets, rather than the average life. Mathematically, use of the remaining life technique automatically allocates the theoretical reserve imbalance over the remaining life of plant. In fact, this is the exact purpose for why the remaining life technique was created and why it is utilized by the vast majority of depreciation analysts.

Q. Do authoritative texts on depreciation analysis confirm that necessary adjustments to rebalance the book reserve and theoretical reserve will happen automatically through use of the remaining life technique?

A. Yes. The authoritative texts are clear that when using the remaining life technique (as both Mr. Watson and I do), no separate reallocation of the theoretical reserve (also known as the Calculated Accumulated Depreciation, or "CAD") is required or even necessary. According to Wolf:

> Users of remaining life depreciation often <u>do not</u> explicitly calculate the CAD. As previously discussed, calculation of the CAD is implicit in the use of the remaining life method of adjustment, because the variation between the CAD and the accumulated provision for depreciation is <u>automatically</u> amortized over the remaining life.[16]

The NARUC manual also agrees that no separate reallocation of the theoretical reserve is required when using the remaining life technique:

> The desirability of using the remaining life technique is that any <u>necessary</u> adjustments of depreciation reserves, because of changes to the estimates of life on net salvage, are accrued <u>automatically</u> over the remaining life of the property.[17]

Thus, it is not necessary to perform a manual reallocation of the reserve when using the remaining life technique. Although Wolf states that users of the remaining life technique do not explicitly calculate the theoretical reserve, that is what Mr. Watson has done in this case.

Q. Has Mr. Watson also acknowledged the self-correcting mechanism inherent in the remaining life technique with regard to the reserve imbalance?

A. Yes. In the depreciation study, Mr. Watson correctly states:

> Use of the remaining life depreciation system adds a self-correcting mechanism, which accounts for any differences between theoretical and book depreciation reserve over the remaining life of the group.[18]

Nonetheless, Mr. Watson disregards this self-correcting mechanism by performing an additional, manual reserve reallocation.

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[16] Wolf *supra* n. 8, at 178 (emphasis added).

[17] NARUC *supra* n. 9, at 65.

[18] Exhibit DAW-2 (Depreciation Study), p. 16.

Q. Do the depreciation rates you propose in this case for ETI's mass property accounts address the Company's reserve imbalance?

A. Yes. By using the remaining life technique to calculate my proposed rates, I am necessarily proposing that the imbalance between the book reserve and theoretical reserve be allocated over the remaining life of the Company's mass property accounts based on the depreciation parameters I've proposed in this case.

Q. Does this case present a unique issue regarding the reserve reallocation in the Company's production plant function?

A. Yes. According to Mr. Watson, there are balances in the production function for Sabine Unit 2 and the Neches plants, which are both retired. Mr. Watson proposes reallocating these unrecovered balances to the generating units that are still in service, and that this practice is consistent with standard depreciation practices.

Q. Do you agree with Mr. Watson that reallocating undepreciated plant balances of retired plants to generating units still in service through a manual theoretical reserve calculation is a "standard" depreciation practice?

A. No. Perhaps this practice is standard for Mr. Watson, but it is the first time that I have seen it. There have been many cases over the past few years addressing undepreciated balances of early-retired plants, and my understanding is that the most common treatment for significant unrecovered balances is the use of a regulatory-asset account.

Q. Are you recommending that the undepreciated balances of these plants be recorded in a regulatory-asset account?

A. Yes. It is preferable to use a regulatory-asset account to isolate the unrecovered balances for ETI's retired generating units, rather than have those balances comingled with the Company's active production units through a reallocated reserve. Through a regulatory-asset account, the Commission can effectively track the treatment it prescribes regarding these unrecovered balances. Essentially, the use of a regulatory asset account is more transparent, and it gives the Commission more flexibility regarding the appropriate ratemaking treatment of these unrecovered balances. Even in this case, I found it difficult to account for exactly how the unrecovered balances for Sabine Unit 2 and Neches were affecting ETI's proposed depreciation rates for its production units in Mr. Watson's workpapers. The proposed recovery of $24 million of undepreciated plant should be transparent, easy to track, and not comingled with the theoretical reserve of the Company's other production units, which is also influenced by separate (and contended) issues such as interim retirements and terminal net salvage.

Q. Has the Commission recently ordered that the undepreciated cost of a retired production unit be recovered through a regulatory asset?

A. Yes. Last year in in Docket No. 46449, the Commission required SWEPCO to remove the undepreciated cost of its retired Welsh Unit 2 power plant from rate base and instead recover it through a regulatory asset account.[19]

Q. Did Mr. Watson also provide ETI's production reserve without Sabine Unit 2 and Neches?

A. Yes. In response to discovery, Mr. Watson provided ETI's production reserve balances excluding the undepreciated balances for Sabine Unit 2 and Neches.[20] In this case, I accepted Mr. Watson's recalculation of the production reserve balances without the

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[19] *See* Application of Southwestern Electric Power Company for Authority to Change Rates, Docket No. 46449, Order on Rehearing, Findings of Fact 65-71 (Mar. 19, 2018).

[20] *See* response to Staff 1-69.

inclusion of Sabine Unit 2 and the Neches plants. I based my proposed depreciation rate calculations for ETI's production unit accounts on these reserve balances.

Q. Over what period of time is ETI proposing to recover the remaining balances on Sabine Unit 2 and Neches?

A. ETI is proposing to recover the remaining investment in these generating units over the composite remaining life of its generation fleet.[21]

Q. Do you agree conceptually with the Company that it is appropriate to recover the unrecovered investments in Sabine Unit 2 and Neches over the remaining life of ETI's production plant?

A. Yes. I think it would be reasonable for ETI to recover the remaining investment in Sabine Unit 2 and Neches over the composite remaining life of the Company's production plant function in this case, which is 15 years.[22]

VI. LIFE SPAN PROPERTY ANALYSIS

Q. Describe the approach to analyzing life span property.

A. For life span property, there are essentially three steps to the analytical process. First, I reviewed the Company's proposed life spans for each of its production units and compared them to life span estimates of other similar production units in other jurisdictions. Second, I examined the Company's proposed interim retirement curves for each account in order to assess the remaining lives and depreciation rates for each production unit. Finally, I analyzed the weighted net salvage for each account, which involved reviewing the

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[21] *See* Direct Testimony and Exhibits of Dane A. Watson, p. 11, lines 14-16.

[22] *See* Exhibit DJG-4 (the composite remaining life of ETI's total steam production plant is 15.16 years); *see also* the Direct Testimony and Exhibits of Cities witness Karl J. Nalepa for the regulatory asset adjustment.

Company's weighting of interim and terminal retirements for each production account, as well as analyzing the Company's proposed interim and terminal net salvage rates.

Q. Describe life span property.

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

A. Interim Retirement Analysis

Q. Discuss the concept of interim retirements.

A. The individual components within a generating unit are retired and replaced throughout the life of the unit. This retirement rate is measured by "interim" survivor curves. Thus, a production plant's remaining life and depreciation rate are not only affected by the terminal retirement date of the entire plant, but also by the retirement rate of the plant's individual components, which are retired during the "interim" of the plant's useful life.

Q. Did you make any adjustments to the Company's proposed interim retirements?

A. Yes. In conformance with Commission precedent on this issue, I calculated my proposed depreciation rates for ETI's production units without including interim retirements. Likewise, I did not include any interim net salvage.[23]

Q. Does the Commission have a well-established precedent of excluding interim retirements in the determination of life span depreciation rates?

A. Yes. In Southwestern Electric Power Company's (SWEPCO) 2012 rate case, the Commission directly upheld its long-standing precedent of excluding interim retirements and found:

> The rate at which interim retirements will be made is not known and measurable. Incorporation of interim retirements would best be done when those retirements are actually made. It is not reasonable to incorporate interim retirements, resulting in a reduction in the depreciation expense of $1 million on a Texas retail basis.[24]

The ALJ in that case found that the "Commission has consistently rejected interim retirements for any production plant account under any methodology."[25]

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[23] *See* Exhibit DJG-4.

[24] *Application of Southwestern Electric Power Company for Authority to Change Rates & Reconcile Fuel Costs*, Docket No. 40443, Final Order 33 (Finding of Fact No. 195) (October 10, 2013).

[25] *Application of Southwestern Electric Power Company for Authority to Change Rates & Reconcile Fuel Costs*, Docket No. 40443, Proposal for Decision at 191 (May 20, 2013).

Q. Did SWEPCO request the inclusion of interim retirements in its most recent rate case?

A. No. In its most recently-filed rate case before the Commission, SWEPCO did not even request the inclusion of interim retirements in its production plant depreciation rates. According to SWEPCO witness David Davis:

> The Commission order in PUC Docket No. 40443 (Finding of Fact, No. 195) indicated that it was not reasonable to include interim retirements in the calculation of production plant depreciation rates since the rate at which interim retirements will be made is not known and measurable. Therefore, interim retirements of production plant were not used in the current study's calculation of production plant depreciation rates.[26]

No party to the case took issue with SWEPCO's decision to exclude interim retirements from its proposed depreciation rates.

Q. Has Mr. Watson presented any compelling evidence why the Commission should deviate from its precedent of excluding interim retirements?

A. No, not in my opinion. According to Mr. Watson, failing to include interim retirements in this case would burden future ratepayers.[27] However, the current ratepayers <u>are</u> the future ratepayers from a past perspective. So according to Mr. Watson's logic, current ratepayers are being burdened by the failure of past ratepayers to pay for interim retirements, and in addition to that, he is proposing that they be burdened even further with the sudden inclusion of interim retirements in this case after 25 years of them being excluded. In other words, there is no intergenerational inequity arising from this issue as long as the Commission remains consistent. If the Commission were to ever deviate from its precedent

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[26] Direct Testimony of David Davis at 11, Docket No. 46449, *Application of Southwestern Electric Power Company for Authority to Change Rates* (December 16, 2016).

[27] *See* Direct Testimony of Dane A. Watson, pp. 7-8.

of excluding interim retirements, it would unfairly burden the current ratepayers at that time. Even if the Commission were to consider deviating from its precedent of excluding interim retirements, this would not be a good case in which to do it given the substantial increase in production depreciation rates in this case (even if my adjustments are adopted).

Q. Have you recommended production plant depreciation rates in other jurisdictions that were calculated with the inclusion of interim retirements?

A. Yes. In jurisdictions that allow interim retirements, I have proposed depreciation rates for production assets that included interim retirements. Thus, I do not think it is "wrong" to include interim retirements in the determination of depreciation rates for production units from a technical standpoint. However, I also believe it is important to be consistent with this issue, and I do not think it is unreasonable to exclude interim retirements. If the Commission were to start including interim retirements after 25 years of excluding them, it would unfairly burden current ratepayers in my opinion.

B. Terminal Net Salvage Analysis (Demolition Costs)

Q. Describe terminal net salvage.

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

Q. Is ETI requesting recovery of terminal net salvage in this case?

A. Yes. In support of ETI's request for terminal net salvage, Mr. McHone sponsored and filed site-specific demolition studies for the Company's generating units.[28]

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

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

[28] *See* Exhibit SCM-2.

some measurable basis upon which to estimate the utility's terminal net salvage and should be viewed as a minimum prerequisite for any recovery of such costs.

Q. Did ETI provide demolition studies in this case in support of its proposed terminal net salvage costs?

A. Yes. The demolition studies were conducted by Sargent & Lundy, LLC and sponsored in the direct testimony of Mr. McHone.[29]

Q. Describe how the demolition costs estimated by Mr. McHone affect the Company's depreciation rates for its production plants.

A. For each of the Company's generating units, Mr. McHone provides estimates for certain direct cost estimates, such as material and labor. Mr. McHone also estimates gross salvage that the Company would receive from selling any assets at the time of retirement (mostly scrap value). Mr. McHone presents the total gross demolition cost for each plant, then applies a contingency factor, which increases the costs by 10%. In calculating his proposed net salvage for each plant, Mr. Watson took the project costs for each plant provided by Mr. McHone and applied an annual growth factor to escalate the demolition costs for each to their future retirement dates. By applying these escalation factors, Mr. Watson added $50 million of present value costs to Mr. McHone's demolition cost estimates.[30] Mr. Watson then used the escalated demolition costs as part of his terminal net salvage rate calculations for each plant.

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[29] *See* Exhibit SCM-2.

[30] *See* Exhibit DAW-2, App. D.

Q. Are you proposing any adjustments to ETI's proposed demolition costs and terminal net salvage rates?

A. Yes. I am essentially proposing two adjustments to ETI's proposed demolition costs and terminal net salvage: (1) removing the 10% contingency factors from the demolition cost estimates; and (2), removing the escalation factors applied to each demolition cost estimate. I will discuss each of these adjustments in more detail below.

1. Contingency Factor

Q. Describe the contingency factor applied by Mr. McHone.

A. ETI's demolition studies include direct and indirect cost estimates to dismantle the Company's generating facilities, which include labor, material, and scrap value estimates. However, in addition to these cost estimates, Mr. McHone applied a 10% contingency factor to all direct costs for each generating unit. In his testimony, Mr. McHone does not offer much support for the contingency factor, other than the fact that a similar contingency factor was approved by the Commission in SWEPCO's recent rate case.[31]

Q. How much additional costs do these contingency factors add to the total demolition cost estimates?

A. The contingency factors applied by Mr. McHone increase his demolition cost estimates by more than $20 million.

[31] *See* Direct Testimony of Sean C. McHone, pp. 8-9.

Q. Do you agree that contingency factors should be included in the demolition cost estimates?

A. No. Though Mr. McHone has not offered many specific arguments in support of the contingency factor in this case, the general argument offered by demolition cost experts is that contingency factors cover "unknowns" or "uncertainties." This is a very problematic argument from a ratemaking standpoint. In fact, I am not aware of any other cost issue in a rate case where an upwardly-biased and arbitrary "factor" is applied to an estimated cost because it "might be" higher than estimated. By definition, any future cost estimate that might be higher might also be lower, yet I am unaware of any utility expert proposing a negative contingency factor on any future cost estimate, even though one could do so using the same logic behind the demolition cost contingency factors. In other words, if a cost is "uncertain" or "unknown," then it could either be higher or lower than estimated. In my opinion, it is unfair to current ratepayers to pay for a future cost that is "unknown" by definition, especially when that cost arbitrarily increases yet another unknown cost (plant demolition) by more than $20 million. If one can use the same logic to support a negative contingency factor as is used to support a positive contingency factor, I think the most appropriate ratemaking treatment is to disallow the contingency factors all together and focus on the specific direct and indirect cost estimates defined in the demolition studies.

Q. Do the depreciation rates you propose for ETI's production accounts exclude the contingency factors?

A. Yes. ETI's demolition costs affect the amounts of the net salvage and depreciation rates for the Company's production accounts. The rates I propose for these accounts have been calculated without the inclusion of the contingency factors.[32]

2. Escalation Factor

Q. Describe the cost escalation factor applied by Mr. Watson.

A. To calculate his proposed net salvage rates for ETI's production accounts, Mr. Watson escalated the demolition cost estimates provided by Mr. McHone by 2.14% each year until the estimated retirement year for each generating facility.[33]

Q. How much additional costs would the escalation factor add to ETI's proposed demolition costs if approved?

A. The escalation factor would add $50 million to ETI's proposed terminal net salvage.[34]

Q. Do you agree with Mr. Watson's proposal to escalate the proposed demolition costs?

A. No. There are two important reasons the Commission should disallow the cost escalation factor applied by Mr. Watson. First, it is not appropriate to escalate a cost that is already too unknown and uncertain. We do not know the actual retirement dates for the Company's generating facilities, and we also do not know whether each facility will be completely dismantled at those retirement dates under the assumptions inherent in the demolition

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[32] *See* Exhibit DJG-5.

[33] *See* Direct Testimony of Dane A. Watson, p. 6, lines 18-19 (Errata).

[34] *See* Exhibit DAW-2, App. D.

studies. Some plants might be sold, converted, or otherwise reused in such a way that would be less costly and not require a complete brownfield demolition. Since we assume that ETI is a going concern, a complete brownfield demolition of each one of ETI's generating facilities at their estimated retirement dates is highly unlikely. The second problem with the Company's cost escalation factor is more technical. In my opinion, it is not proper to charge current ratepayers for a future cost that has not been discounted to present value. The "time value of money" concept is a cornerstone of finance and valuation. For example, the Discounted Cash Flow Model, which is used to estimate the cost of equity, 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. Likewise, accounting for Asset Retirement Obligations ("ARO") involves escalating the present value of an estimated future cost, but then the cost is discounted back to present value by a discount rate in order to calculate the depreciation expense to charge to current ratepayers.[35] In contrast to these calculations, ETI proposes to escalate the present value of its demolition costs decades into the future and expects current ratepayers to pay the future value of these costs with their present-day dollars. This proposal completely disregards the elemental "time value of money" principle. For these reasons, the Commission should exclude the escalation factor applied by Mr. Watson when determining appropriate net salvage and depreciation rates for ETI's production accounts.

[35] *See* Statement of Financial Accounting Standards No. 143.

Q. Do the depreciation rates you propose for ETI's production accounts exclude the escalation factor?

A. Yes. ETI's demolition costs affect the amounts of the net salvage and depreciation rates for the Company's production accounts. The rates I propose for these accounts have been calculated without inclusion of the escalation factor.[36]

Q. Has another commission recently rejected similar proposals for the contingency and escalation factors applied to demolition cost estimates?

A. Yes. For example, in a recent rate case filed by Public Service Company of Oklahoma ("PSO"), the utility proposed similar contingency and escalation factors in calculating its terminal net salvage. The Oklahoma Commission rejected both the contingency and escalation factors, consistent with my recommendation and the recommendations of other intervenors. In rejecting PSO's proposed contingency factors, the ALJ specifically found as follows:

> In its demolition cost study, (Sargent & Lundy) applied a 15% contingency factor to its cost estimates, and a negative 15% contingency factor to its scrap metal value estimates. The Company provides little justification for this contingency factor other than the plants might experience uncertainties and unplanned occurrences. <u>This reasoning fails to consider the fact that certain occurrences could reduce estimated costs</u>.[37]

Likewise, in this case, the contingency factors proposed by Mr. McHone fail to consider the fact that certain occurrences could reduce estimated future costs.

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[36] *See* Exhibit DJG-5.

[37] Report and Recommendation of the Administrative Law Judge p. 164, filed May 31, 2016 in Cause No. PUD 201500208 before the Oklahoma Corporation Commission (emphasis added).

Q. Please summarize your adjustments to ETI's proposed net salvage rates for its production accounts and compare it with the currently approved net salvage rates.

A. Applying the adjustments discussed above to ETI's terminal net salvage calculation results in a composite net salvage rate for steam production of -5%. Coincidentally, this is the same net salvage rate currently approved for ETI's composite steam production plant.[38] While the methods I used to arrive at this level of net salvage are likely different than those that persuaded the Commission in ETI's prior case, the fact that the composite production net salvage rates are the same is an indication of their reasonableness, and leads me to believe there is no compelling reason for the Commission to substantially deviate from the currently-approved composite net salvage rate for ETI's production plant accounts.[39] In contrast, Mr. Watson is proposing substantial increases to the currently approved production net salvage, by as much as six times for certain accounts. The chart below compares the currently-approved net salvage, Mr. Watson's proposed net salvage, and my proposed net salvage.

Figure 3:
Net Salvage Rate Comparison

		Approved Net Salvage	ETI Proposed Net Salvage	Cities Proposed Net Salvage
	Production Plant			
311.0	Structures & Improvements	-5%	-30%	-4%
312.0	Boiler Plant Equip	-5%	-40%	-7%
314.0	Turbogenerator Equip	-5%	-30%	-4%
315.0	Accessory Elect Equip	-5%	-15%	-6%
316.0	Misc Power Plant Equip	-5%	-9%	-4%
	Composite / Total	**-5%**	-14%	**-5%**

[38] *See* Docket No. 39896, Application of Entergy Texas, Inc. for Authority to change Rates, Reconcile Fuel Costs, and Obtain Deferred Accounting Treatment, Order on Rehearing (Nov. 2, 2012), p. 21, ¶ 101.

[39] Note, my recommended net salvage rates for accounts 311, 312, 314, 315, and 316 are -4%, -7%, -4%, -6%, and -4% respectively, but the composite net salvage rate for steam production is -5%, as shown in Exhibit DJG-4.

As shown in the table above, Cities' recommended composite production net salvage rate is the same as the currently-approved rate and includes fair amounts of demolition cost recovery. In my opinion, this provides further support for the reasonableness of my proposed adjustments to ETI's production plant net salvage rates, which include the removal of the escalation and contingency factors discussed above.

VII. MASS PROPERTY SERVICE LIFE ANALYSIS

Q. Describe mass property.

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

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

A. To develop depreciation rates for the Company's mass property accounts, I obtained the Company's historical plant data to develop observed life tables for each account. I used Iowa curves to smooth and complete the observed data to calculate the average remaining life of each account. Finally, I analyzed the Company's proposed net salvage rates for each mass account by reviewing the historical salvage data. After estimating the remaining life and salvage rates for each account, I calculated the corresponding depreciation rates.

Further details about the actuarial analysis and curve-fitting techniques involved in this process are presented in the attached appendices.

A. Service Life Estimates

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

A. I used all of the Company's property data and created an observed life table ("OLT") for each account. The data points on the OLT can be plotted to form a curve (the "OLT curve"). The OLT curve is not a theoretical curve, rather, it is actual observed data from the Company's records that indicate the rate of retirement for each property group. An OLT curve by itself, however, is rarely a smooth curve, and is often not a "complete" curve (i.e., it does not end at zero percent surviving). In order to calculate average life (the area under a curve), a complete survivor curve is needed. The Iowa curves are empirically-derived curves based on the extensive studies of the actual mortality patterns of many different types of industrial property. The curve-fitting process involves selecting the best Iowa curve to fit the OLT curve. This can be accomplished through a combination of visual and mathematical curve-fitting techniques, as well as professional judgment. The first step of my approach to curve-fitting involves visually inspecting the OLT curve for any irregularities. For example, if the "tail" end of the curve is erratic and shows a sharp decline over a short period of time, it may indicate that this portion of the data is less reliable, as further discussed below. After inspecting the OLT curve, I use a mathematical curve-fitting technique which essentially involves measuring the distance between the OLT curve and the selected Iowa curve in order to get an objective, mathematical assessment of how well the curve fits. After selecting an Iowa curve, I observe the OLT curve along with the

Iowa curve on the same graph to determine how well the curve fits. I may repeat this process several times for any given account to ensure that the most reasonable Iowa curve is selected.

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

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

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

A. Not necessarily. Many analysts have observed that the points comprising the "tail end" of the OLT curve may often have less analytical value than other portions of the curve. "Points at the end of the curve are often based on fewer exposures and may be given less weight than points based on larger samples. The weight placed on those points will depend on the size of the exposures."[40] In accordance with this standard, an analyst may decide to truncate the tail end of the OLT curve at a certain percent of initial exposures, such as one percent. Using this approach puts a greater emphasis on the most valuable portions of the curve. For my analysis in this case, I not only considered the entirety of the OLT curve,

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[40] Wolf *supra* n. 8, at 46.

but also conducted further analyses that involved fitting Iowa curves to the most significant part of the OLT curve for certain accounts. In other words, to verify the accuracy of my curve selection, I narrowed the focus of my additional calculation to consider the top 99% of the "exposures" (i.e., dollars exposed to retirement) and to eliminate the tail end of the curve representing the bottom 1% of exposures for applicable accounts.

B. Specific Account Analysis

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

A. Mr. Watson and I used similar curve-fitting approaches in this case. However, for each account to which I propose a service life adjustment, the Iowa curve I selected to calculate the depreciation rate for the account provides a closer mathematical fit to the observed data.[41] For each of the accounts to which I propose service life adjustments, the Company has selected a curve that underestimates the average service life of the assets in the account, which results in unreasonably high depreciation rates.

1. Account 352 – Transmission Structures and Improvements

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

A. For this account, Mr. Watson selected the R3-75 curve and I selected the R2.5-82 curve. The graph below shows these two curves along with the OLT curve.

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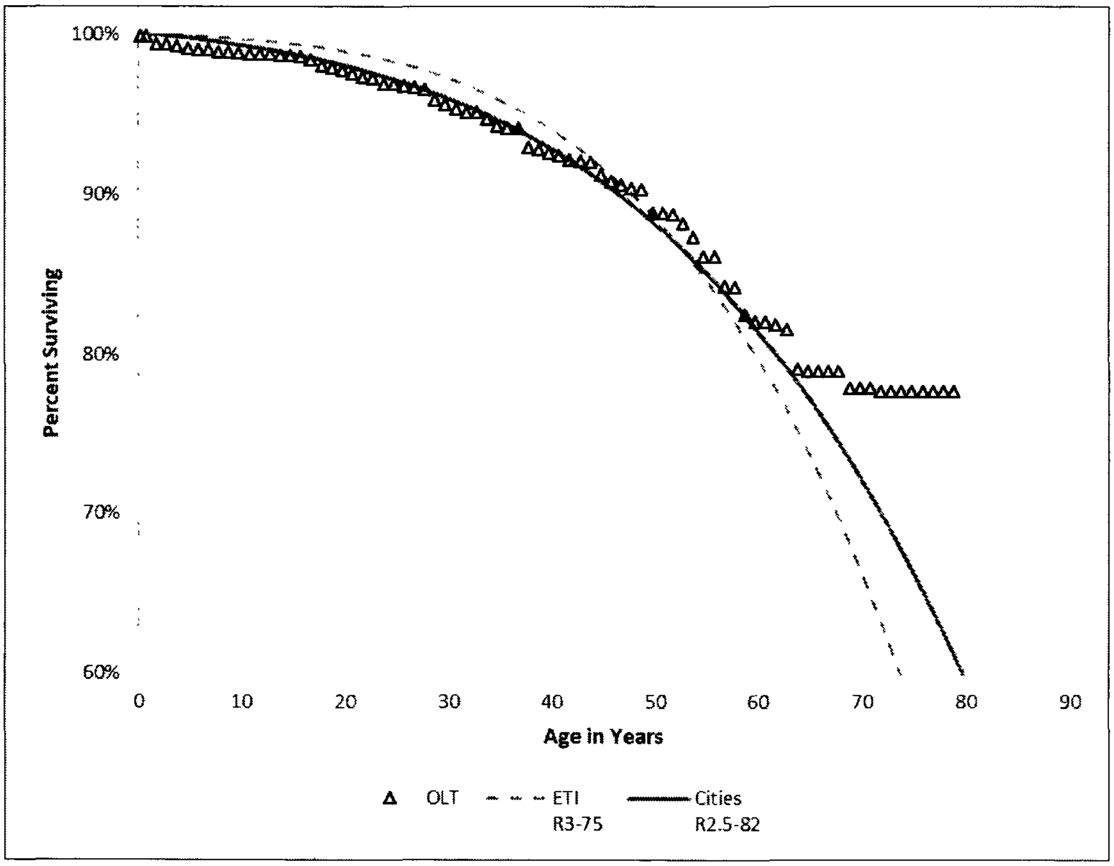
[41] *See* Exhibits DJG-9 thru DJG-21.

Figure 4:
Account 352 – Transmission Structures and Improvements



Both of the selected Iowa curves are similar in shape and average life. However, ETI's R3-75 curve is slightly steeper and more rounded than the R2.5-82 curve, and as a result, it does not track as well through the majority of the historical age intervals when compared with the R2.5-82 curve. Although it is visually apparent that the R2.5-82 curve provides a better fit to the historical data (i.e., the OLT curve), we can also use mathematical curve-fitting techniques to measure which curve provides a better fit.

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

A. Yes. 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. The curve with the lower SSD represents the better mathematical fit. Specifically, the SSD for the Company's curve is 0.5587, while the SSD for the better-fitting R2.5-82 curve is only 0.1905.[42] Likewise, if we consider the most statistically significant portion of the OLT curve (i.e., excluding the tail end beyond about age 61), the Iowa curve I selected still provides a better fit. Applying the R2.5-82 curve to this account results in a remaining life estimate of 70.15 and a depreciation rate of 1.4%.[43]

2. Account 353 – Transmission Station Equipment

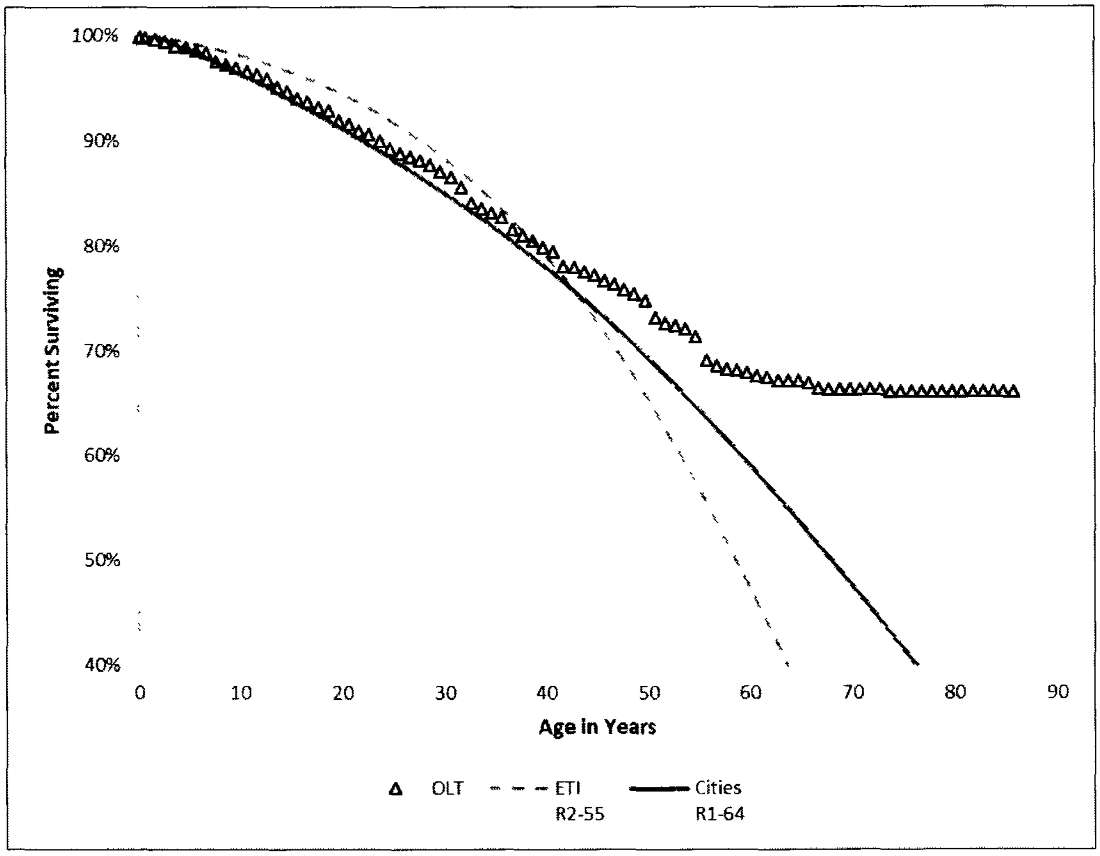
Q. Describe your service life estimate for this account and compare it with the Company's estimate.

A. For this account, I selected the R1-64 curve and Mr. Watson selected the R2-55 curve. The graph below shows these two curves along with the OLT curve.

[42] Exhibit DJG-6.

[43] *See* Exhibit DJG-4; *see also* Exhibit DJG-13 for remaining life development.

Figure 5:
Account 353 – Transmission Station Equipment



As shown in the graph, both curves correctly ignore the data points beyond age interval 65. These data points correspond with insignificant amounts of dollars exposed to retirement, and as a result, are much less statistically significant. However, as with the account discussed above, ETI's curve is too steep and short. Moreover, ETI's curve appears to ignore relevant data points between age intervals 40-60. Although the R1-64 curve I selected may still be too short given the mortality characteristics it represents a good balance between the currently-approved average life of 55 years and the average life indicated by the historical data, which is likely closer to 70 years.

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

A. Yes. The SSD for the Company's curve is 6.0026, while the SSD for the better-fitting R1-64 curve is only 1.8592. The R1-64 is also the closer-fitting curve when analyzing excluding the tail end of the OLT curve from the analysis.[44]

3. <u>Account 361 – Distribution Structures and Improvements</u>

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

A. For this account, I selected the R2.5-83 curve and Mr. Watson selected the R3-75 curve. The graph below shows these two Iowa curves juxtaposed with the OLT curve.

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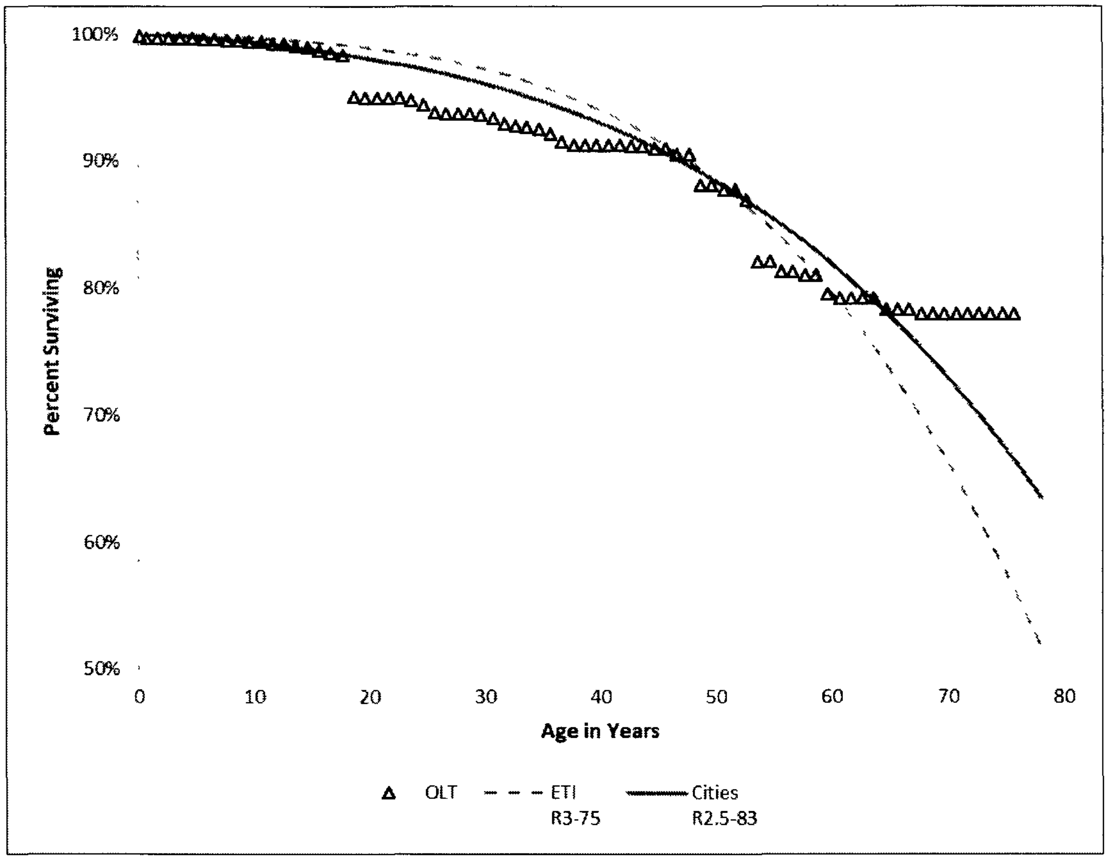
[44] Exhibit DJG-7.

Figure 6:
Account 361 – Distribution Structures and Improvements



As with the accounts discussed above, ETI's curve appears to be too steep and short to provide the best fit to the observed data.

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

A. Yes. The SSD for the Company's curve is 0.3331, while the SSD for the R2.5-83 curve is only 0.0926, which means it is a closer fit to the observed data.[45]

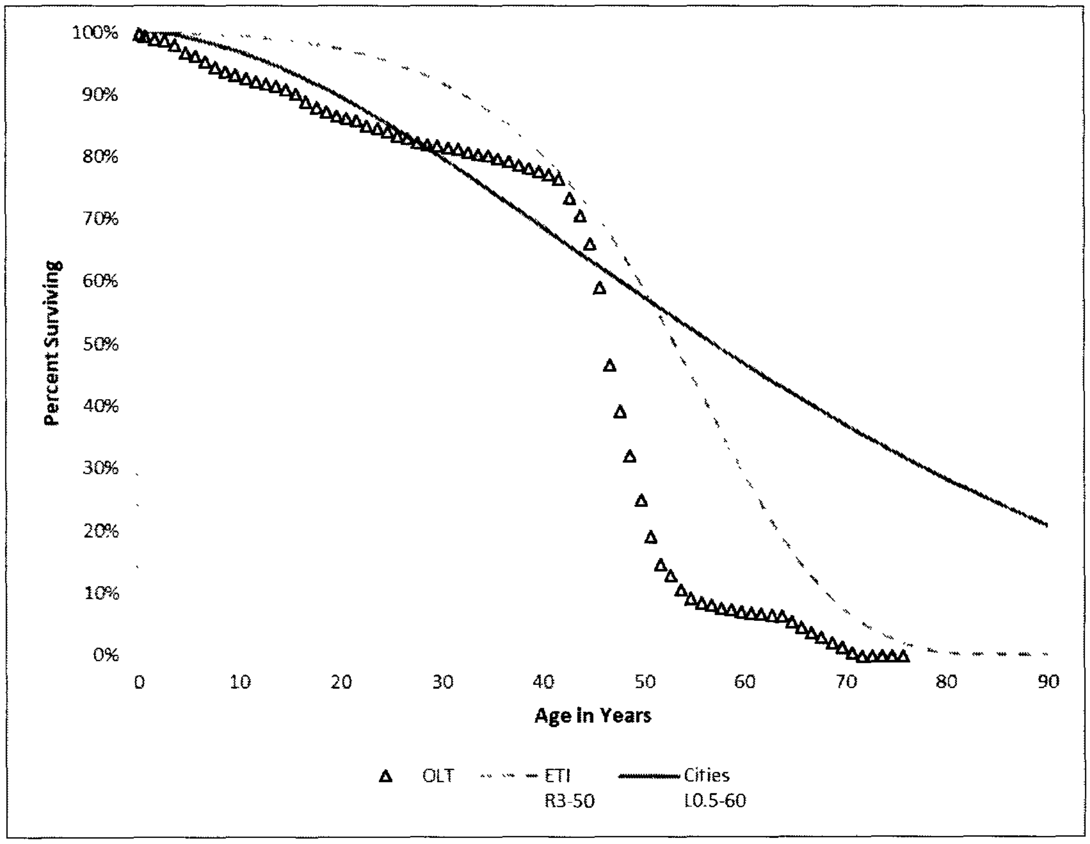
[45] Exhibit DJG-8.

4. <u>Account 366 – Underground Conduit</u>

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

A. For this account I selected the L0.5-65 curve and Mr. Watson selected the R3-50 curve. It is visually apparent that the curve I selected provides a better fit to the OLT curve. This account presents a good example of why it is important to look at the data comprising the observed life table to assess the statistical relevancy of particular portions of the OLT curve. The full OLT curve along with both Iowa curves is presented in the graph below.

Figure 7:
Account 366 – Underground Conduit



Initially, it appears that neither Iowa curve tracks particularly well with the OLT curve. Further examination of the OLT curve, however, reveals that there are many data points on this curve that are not statistically relevant.

Q. Please explain how statistical relevance can be assessed in the Iowa curve fitting process and which data points on the OLT curve for this account are not statistically relevant.

A. We can assess the relevancy of the OLT curve by considering the dollars exposed to retirement at each age interval. For this particular OLT curve, the beginning amounts of dollars exposed to retirement is $32 million.[46] The dollar amount exposed to retirement generally decreases with each age interval under the retirement rate method. For this OLT curve, by the 50th age interval, the dollars exposed to retirement is only $285,812, which is less than one percent of the initial dollars exposed to retirement. As a general rule, it is preferable to exclude from the statistical analysis the data points that correspond with dollars exposed to retirement that are less than one percent of the initial dollars exposed to retirement. Otherwise, the analysis would give the same statistical significance (in this case) to $32 million and a mere $285,812. However, if too many data points are excluded, it could result in an OLT curve that is too short to provide a basis for meaningful statistical analysis.

Q. Please illustrate the curve fitting comparison for this account using the most statistically meaningful portions of the OLT curve.

A. The graph below shows the same OLT curve presented above, except with the statistically irrelevant points excluded.

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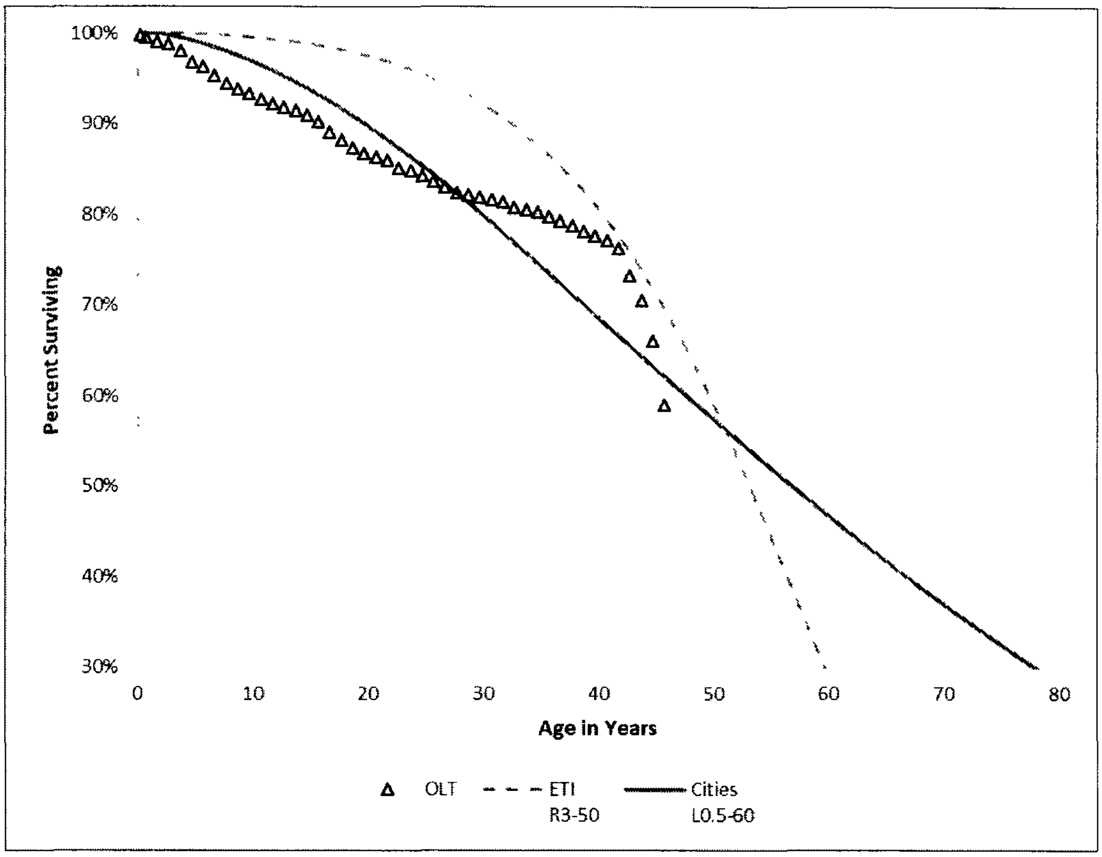
[46] Exhibit DJG94.

Figure 8:
Account 366 – Underground Conduit (Relevant OLT)



When considering the statistically meaningful portion of the OLT curve, it is visually clear that the L0.5-60 provides a much better fit. Based on this analysis, I recommend the Commission retain the currently-approved average life of 60 years for this account, with the L0.5 curve shape.

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

A. Yes. When considering the relevant data points of the OLT curve, the SSD for the Company's Iowa curve is 0.3706, while the SSD for the L0.5-60 curve is 0.2296.[47]

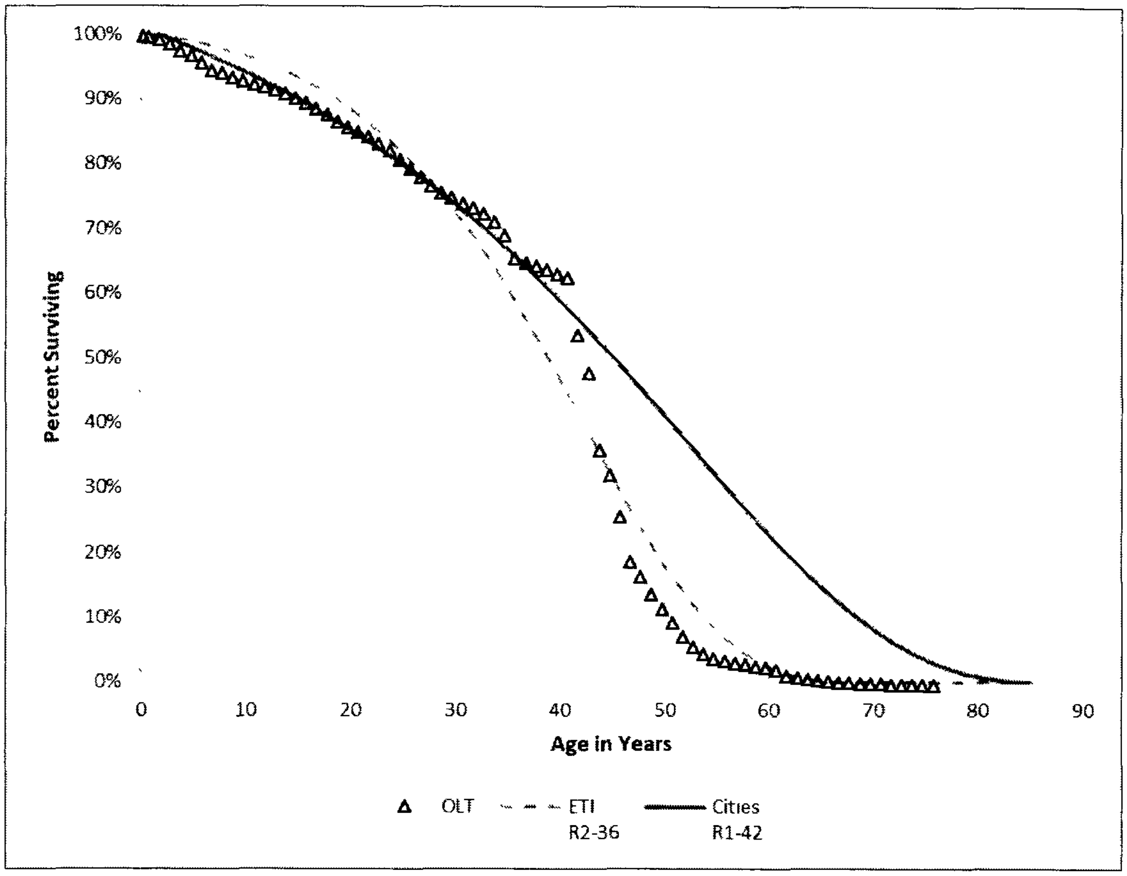
5. Account 367 – Underground Conductors and Devices

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

A. As with Account 366 discussed above, the OLT curve derived for Account 367 presents the same issue regarding statistical relevance and why it is important to examine the data comprising the OLT curve before selecting an Iowa curve based on visual or mathematical curve fitting techniques. For this account I selected the R1-42 curve and Mr. Watson selected the R2-36 curve. The graph below shows these two curves along with the OLT curve.

[47] Exhibit DJG-9.

Figure 9:
Account 367 – Underground Conductors and Devices



Without further examination, it initially appears as though ETI's curve provides the better fit for this account. However, as with the previous account discussed above, there are many data points on this particular OLT curve that are statistically meaningless. In fact, the final 12 data points (black triangles) on this OLT curve correspond to just one dollar of exposures. In stark contrast, the first data point on this OLT curve is associated with $136 million of exposures.[48] Using the one-percent benchmark discussed above, we could exclude all the data points occurring after age interval 47 for this analysis. Although it may

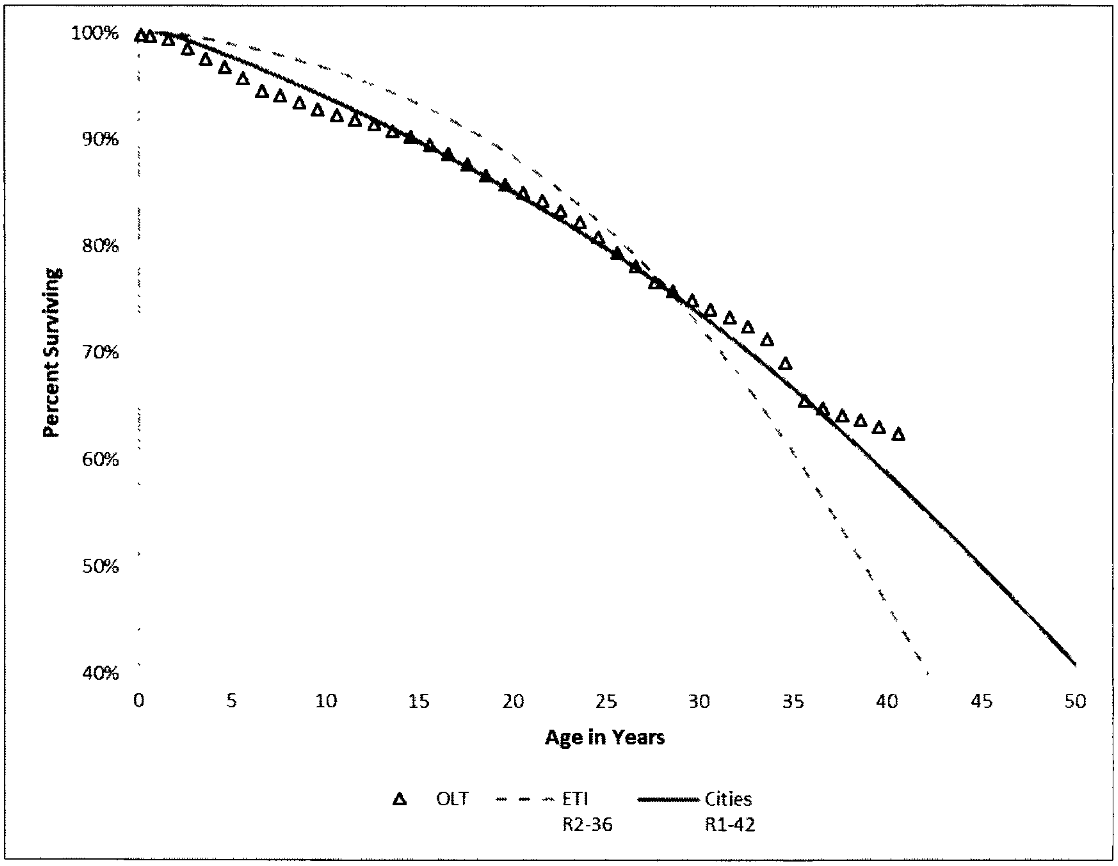
[48] Exhibit DJG-10.

not have been intentional, ETI's R2-36 curves appears to track closely with these insignificant data points on the tail end of the OLT curve.

Q. Please illustrate the curve fitting comparison for this account using the most statistically meaningful portions of the OLT curve.

A. The graph below shows the same OLT curve presented above, except with the statistically irrelevant points excluded.

Figure 10:
Account 367 – Underground Conductors and Devices



When considering the statistically meaningful portion of the OLT curve, it is visually clear that the R1-42 curve I selected provides an excellent fit to the observed data.

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

A. Yes. When considering the relevant data points of the OLT curve, the SSD for the Company's Iowa curve is 0.2704, while the SSD for the R1-42 curve is 0.1875.[49]

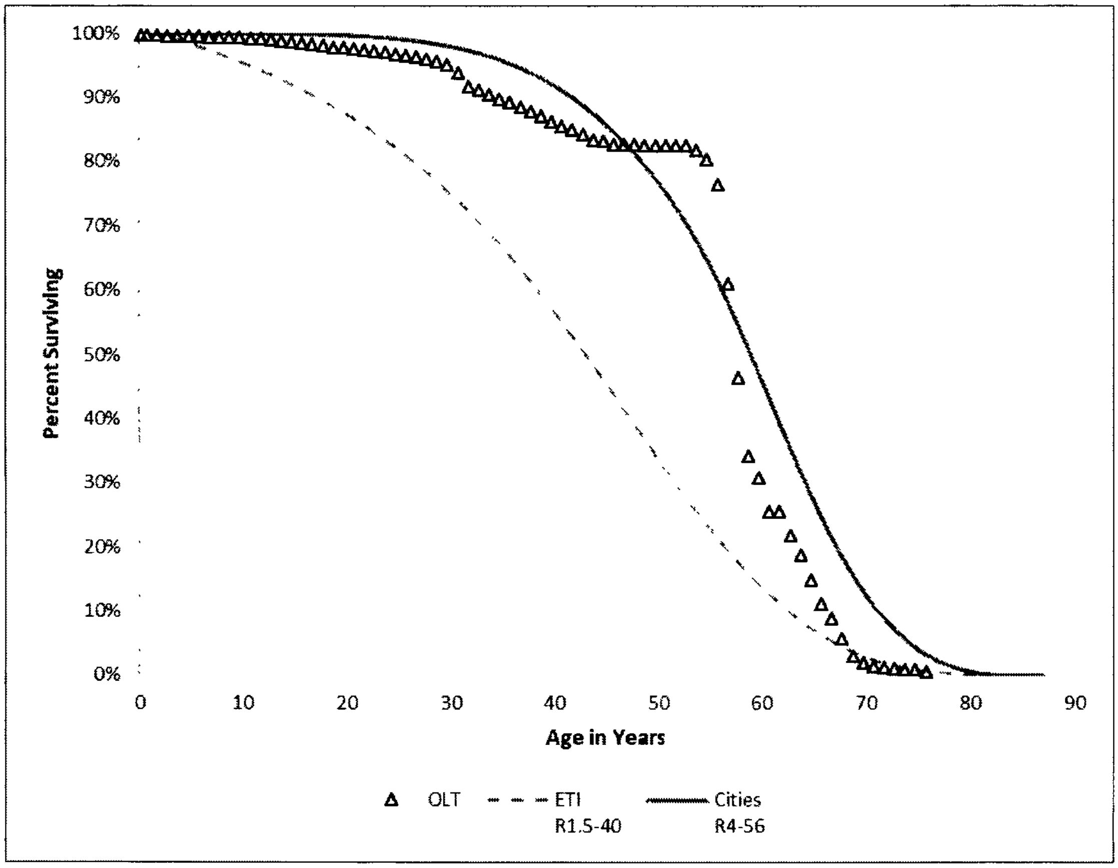
6. Account 371 – Installations on Customer Premises

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

A. The Iowa curve I selected for this account is the R4-56 curve, and the curve Mr. Watson selected is the R1.5-40 curve. The graph below shows these two curves juxtaposed with the OLT curve.

[49] Exhibit DJG-10.

Figure 11:
Account 371 – Installations on Customer Premises



As shown in the graph, ETI's R1.5-40 curve does not track well at all with the observed historical data comprising the OLT curve. According to the depreciation study, Mr. Watson's recommended service life for this account is based in part on the opinions of company personnel and a new Private Area Lighting LED tariff.[50] However, I do not believe Mr. Watson's justification rises to the level of making a "convincing showing" that his proposed service life for this account does not result in an excessive depreciation accrual. Talking with representatives of the applicant about their opinions as to the average

[50] Exhibit DAW-2, p. 64.

service life of a group of assets does not outweigh the objective indications of average life demonstrated in the Company's historical plant data, in my opinion. If in fact the service life of the assets in this account declines in the future, we will observe the new indications of average life in the data provided in future depreciation studies, and we can make adjustments at that time accordingly.

VIII. MASS PROPERTY NET SALVAGE ANALYSIS

Q. Describe the process of estimating net salvage for mass property accounts and how it affects the overall depreciation rate for each account.

A. Net salvage rates for mass property accounts are typically estimated in part by analyzing a utility's historical gross salvage and removal costs. Net salvage refers to the difference between gross salvage and the cost of removal. Since the cost of removal for utility property often exceeds any positive proceeds received from the sale of retired assets, net salvage rates are often negative. The net salvage rates are applied to the plant balance in each account, either increasing or decreasing the total amount to be recovered over the average service life. I examined the historical net salvage data provided by the Company for its mass property accounts.

Q. Are you recommending any adjustments to ETI's proposed net salvage rates for this mass property accounts?

A. No. To be clear, I am recommending several adjustments to the Company's proposed net salvage rates for its production accounts, as discussed above. However, I am not recommending any adjustments to ETI's proposed mass property net salvage rates.

IX. CONCLUSION AND RECOMMENDATION

Q. Summarize the key points of your testimony.

A. In this case, ETI is proposing an increase in depreciation accrual of more than $30 million, including production net salvage rates about three times greater than the currently-approved rates. I recommend several adjustments to ETI's proposed depreciation rates, which are broadly summarized as follows:

1. The Company's proposed demolition costs are arbitrarily inflated by 10% using contingency factors. The Commission should disallow the inclusion of contingency costs in demolition cost estimates.

2. The Company's proposed demolition costs are escalated to the future estimated retirement date of each generating facility, thereby increasing the proposed costs by about $50 million. These escalation factors ignore the time value of money and seek to charge current ratepayers for inflated future values. The Commission should disallow demolition cost escalation without the inclusion of a discount rate to bring the costs back to present value.

3. Mr. Watson's calculations of ETI's production plant depreciation rates include unrecovered balances for the Company's retired Sabine Unit 2 and Neches plants. Specifically, Mr. Watson reallocated the unrecovered balances for these retired production units to generating units that are still in service. It is more appropriate for the Commission to address and track the unrecovered balances for these units separately through a regulatory asset.

4. Contrary to Commission precedent, Mr. Watson proposes the immediate inclusion of more than $120 million of interim retirements in the Company's production net salvage rates. The inclusion of such a substantial amount of interim retirements in this case would unfairly burden current ratepayers.

5. Mr. Watson proposes a reserve reallocation for the Company's mass property accounts. This procedure is unnecessary and is not in conformance with standard depreciation practices. Both Mr. Watson and I propose depreciation rates calculated under the remaining life technique, which means that any imbalance between the book reserve and the theoretical reserve will be automatically rebalanced over the remaining life of each mass property account.

6. For several transmission and distribution accounts, ETI is proposing service lives that are shorter than those indicated by the Company's historical retirement data, and as a result, the corresponding depreciation rates proposed for these accounts are too high.

For these reasons, it would not be reasonable to accept the Company's proposed depreciation rates without adjustments.

Q. What is Cities' recommendation to the Commission regarding ETI's proposed depreciation rates?

A. Cities recommend the Commission adopt the proposed depreciation rates presented in Exhibit DJG-3. These rates have been incorporated into the Direct Testimony and Exhibits of Karl J. Nalepa to calculate Cities' adjustment to the Company's proposed depreciation expense.

Q. Does this conclude your testimony?

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

APPENDIX A:

THE DEPRECIATION SYSTEM

A depreciation accounting system may be thought of as a dynamic system in which estimates of life and salvage are inputs to the system, and the accumulated depreciation account is a measure of the state of the system at any given time.[51] 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.[52] The figure below illustrates the basic concept of a depreciation system and includes some of the available parameters.[53]

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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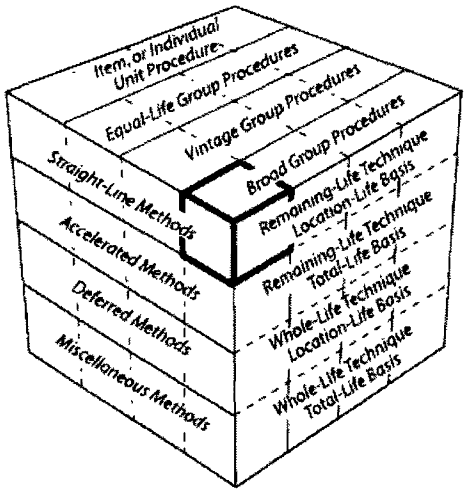
[51] Wolf *supra* n. 8, at 69-70.

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

[53] 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. Allocation Methods

The "method" refers to the pattern of depreciation in relation to the accounting periods. The method most commonly used in the regulatory context is the "straight-line method" – a type of age-life method in which the depreciable cost of plant is charged in equal amounts to each accounting period over the service life of plant.[54] 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.[55] The basic formula for the straight-line method is as follows:[56]

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[54] NARUC *supra* n. 9, at 56.

[55] *Id.*

[56] *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.[57] 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:[58]

Equation 2:
Straight-Line Rate

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

2. Grouping Procedures

The "procedure" refers to the way the allocation method is applied through subdividing the total property into groups.[59] 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

[57] *Id.* at 57.

[58] *Id.* at 56.

[59] Wolf *supra* n. 8, at 74-75.

excessively conducting calculations for each unit. Whereas an individual unit of property has a single life, a group of property displays a dispersion of lives and the life characteristics of the group must be described statistically.[60] 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.[61]

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 depreciated, 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.[62] 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.[63] Under the equal life procedure the property is divided into subgroups that each has a common life.[64]

3. Application Techniques

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

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[60] *Id.* at 74.

[61] NARUC *supra* n. 9, at 61-62.

[62] *See* Wolf *supr*a n. 8, at 74-75.

[63] *Id.* at 75.

[64] *Id.*

technique applies the depreciation rate on the estimated average service life of a group, while the remaining life technique seeks to recover undepreciated costs over the remaining life of the plant.[65]

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.[66] 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.[67] 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

[65] NARUC *supra* n. 9, at 63-64.

[66] Wolf *supra* n. 8, at 83.

[67] NARUC *supra* n. 9, at 325.

in the annual accrual.[68] 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:[69]

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.[70]

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.[71] A continuous property group is created when vintage groups are combined to form a common group. Over time, the characteristics of the property may change, but the continuous property group will continue. The two analysis models

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[68] NARUC *supra* n. 9, 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.").

[69] *Id.* at 64.

[70] Wolf *supra* n. 8, at 178.

[71] *See* Wolf *supra* n. 8, at 139 (I added the term "model" to distinguish this fourth depreciation system parameter from the other three parameters).

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

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

APPENDIX B:

IOWA CURVES

Early work in the analysis of the service life of industrial property was based on models that described the life characteristics of human populations.[72] 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.[73] 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. <u>Development</u>

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.[74] They generalized the 65 curves

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[72] Wolf *supra* n. 8, at 276.

[73] *Id.* at 23.

[74] *Id.* at 34.

into 13 survivor curve types and published their results in *Bulletin 103: Life Characteristics of Physical Property*. The 13 type curves were designed to be used as valuable aids in forecasting probable future service lives of industrial property. Over the next few years, Winfrey continued gathering additional data, particularly from public utility property, and expanded the examined property groups from 65 to 176.[75] 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."[76] 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.[77] Rather than using the original formulas, analysts typically rely on the published tables containing the percentages surviving. This is because absent knowledge of the integration technique applied to each age interval, it is not possible to recreate the exact original published table values. In the 1970s, John Russo collected data from over 2,000 property accounts reflecting

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[75] *Id.*

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

[77] 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. 8, at 305-38 (publishing the percent surviving for each Iowa curve, including "O" type curve, at one percent intervals).

observations during the period 1965 – 1975 as part of his Ph.D. dissertation at Iowa State. Russo essentially repeated Winfrey's data collection, testing, and analysis methods used to develop the original Iowa curves, except that Russo studied industrial property in service several decades after Winfrey published the original Iowa curves. Russo drew three major conclusions from his research:[78]

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.[79]

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

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[78] *See* Wolf *supra* n. 8, at 37.

[79] *Id.*

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

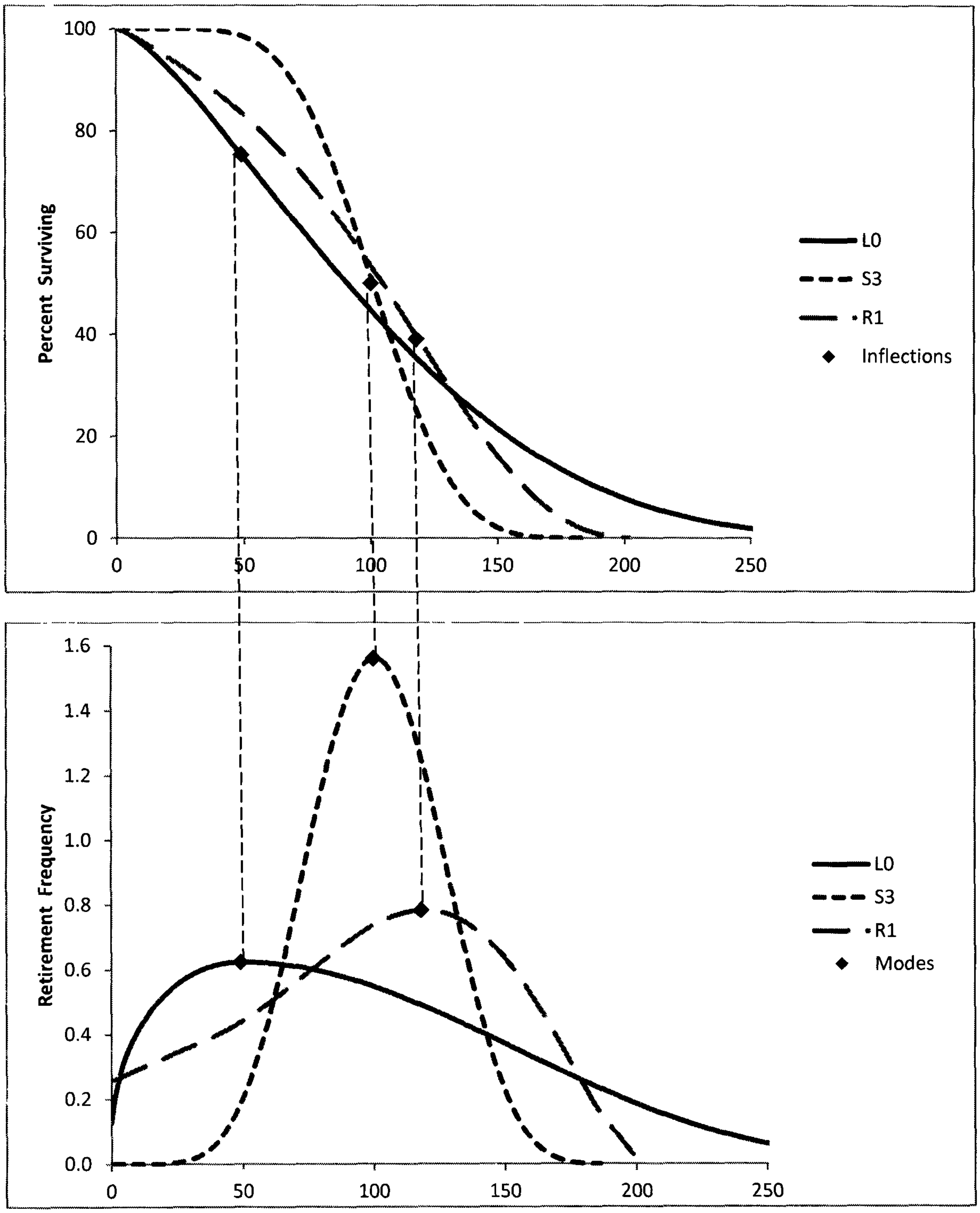
2. <u>Classification</u>

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).[80] 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.

[80] 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. 9, 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."[81]

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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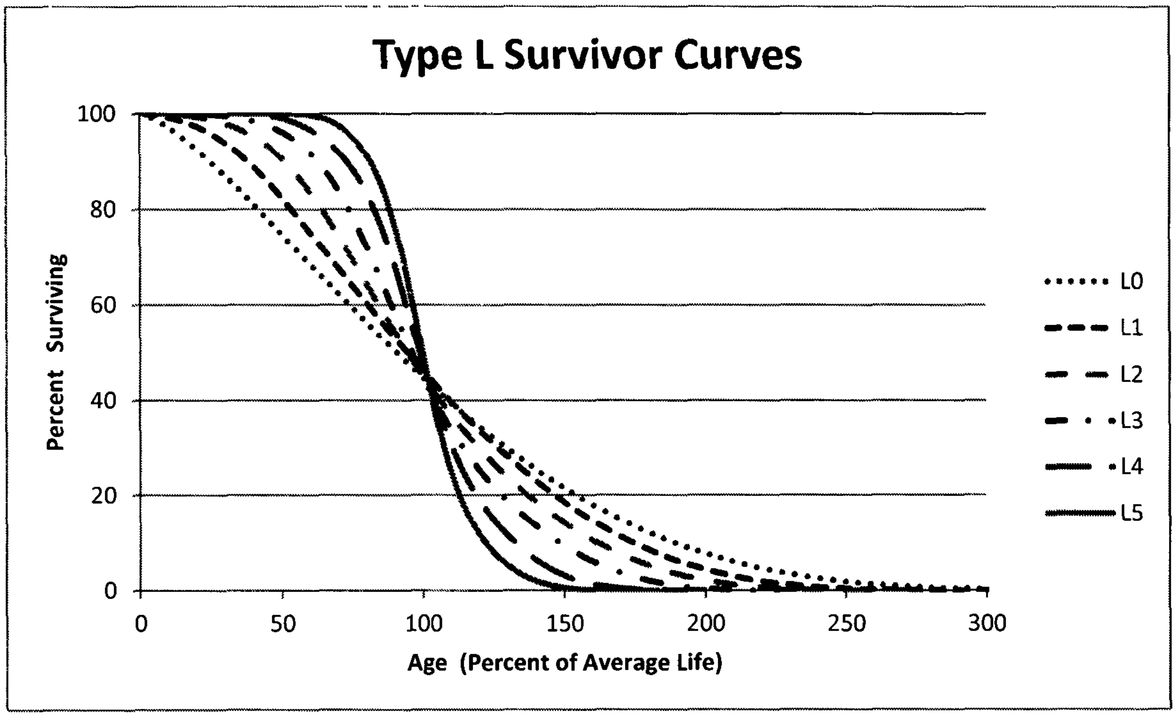
[81] Winfrey *supra* n. 166, at 60.

Figure 14:
Type L Survivor and Frequency Curves



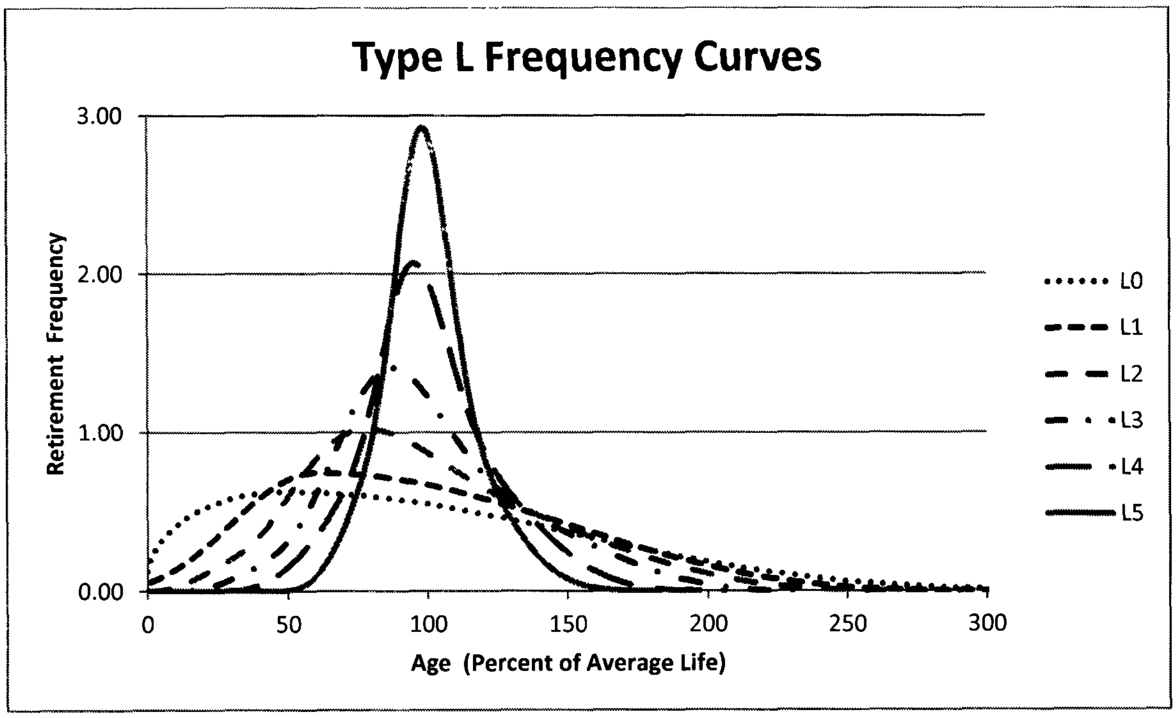
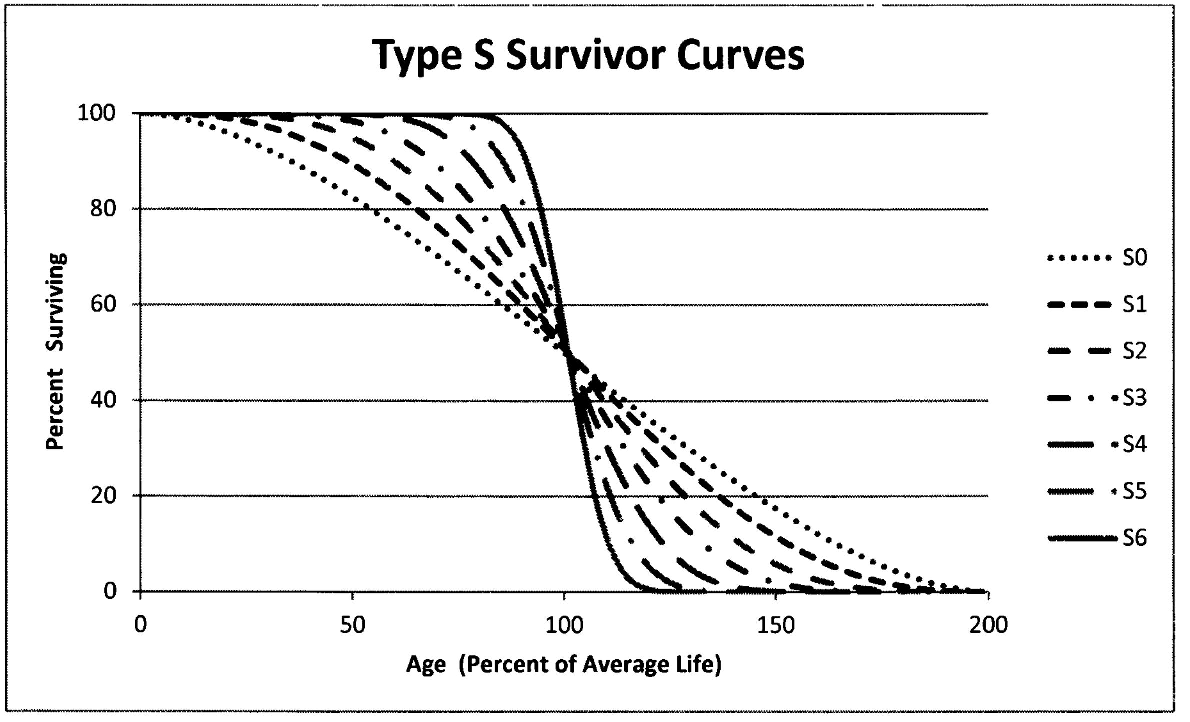


**Figure 15:
Type S Survivor and Frequency Curves**



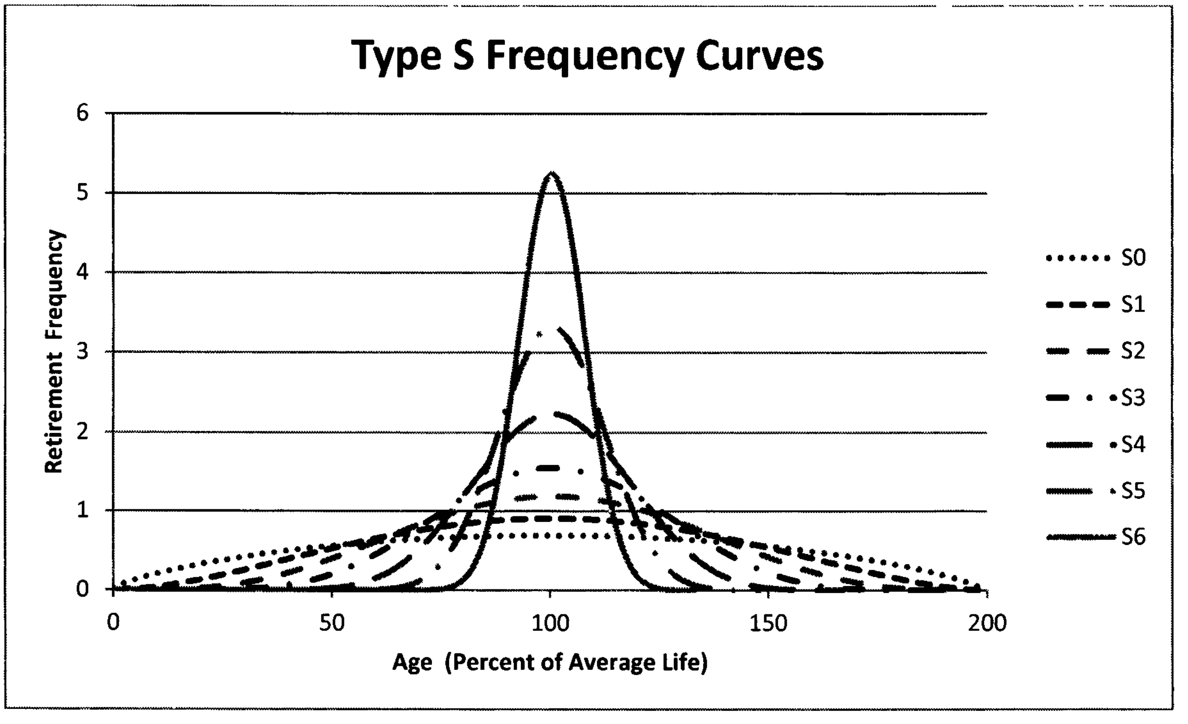
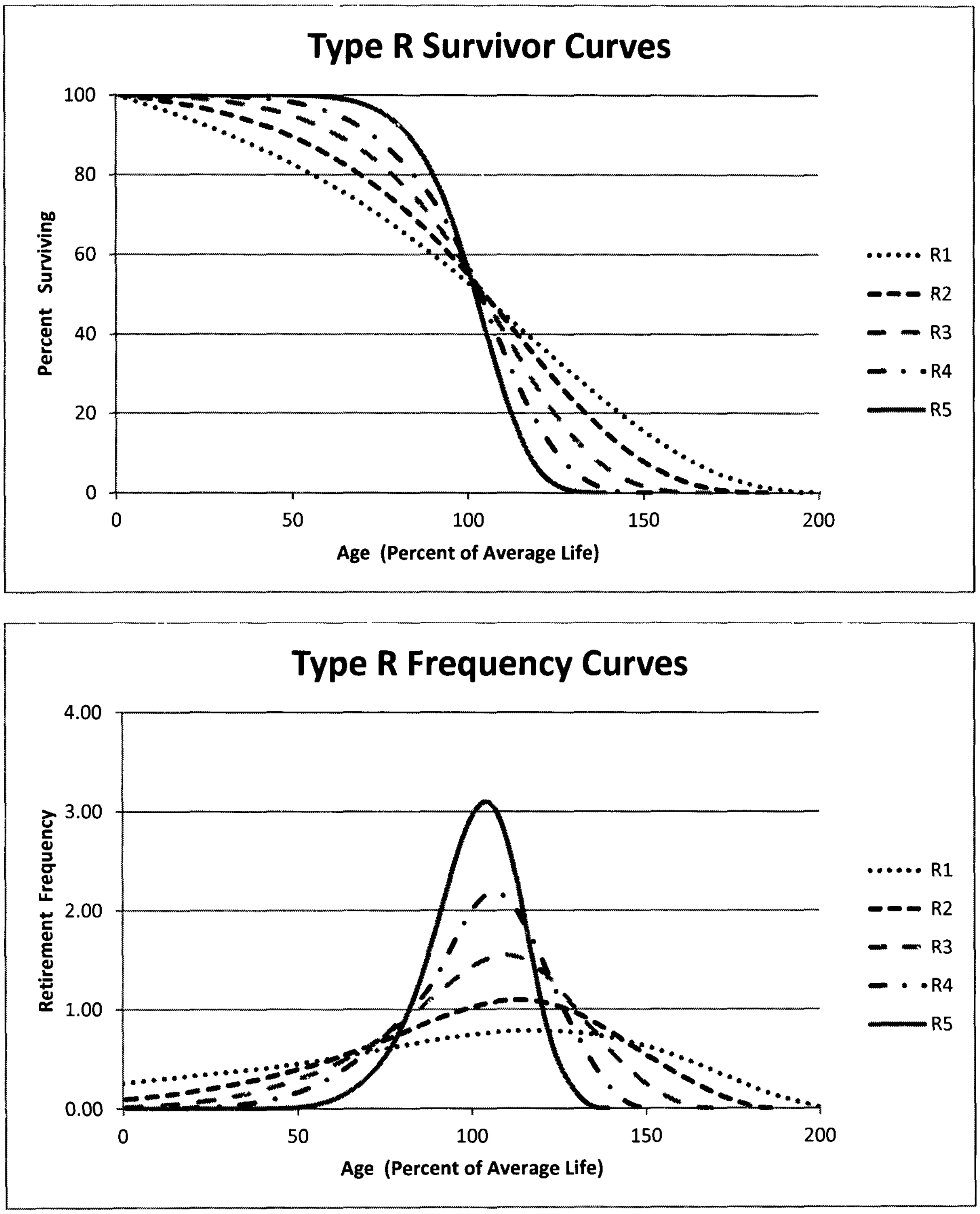


Figure 16:
Type R Survivor and Frequency Curves



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. <u>Types of Lives</u>

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.[82]

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:[83]

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

[82] 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.

[83] *See* NARUC *supra* n. 9, at 71.

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

Realized life is similar to average life, except that realized life is the average years of service experienced to date from the vintage's original installations.[84] As shown in the figure below, realized life is the area under the survivor curve from zero to age RLx. Likewise, unrealized life is the area under the survivor curve from age RLx 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.[85] 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 portion of the survivor curve is divided by the percent surviving at age x (denoted Sx). Thus, the average remaining life formula is:

Equation 5:
Average Remaining Life

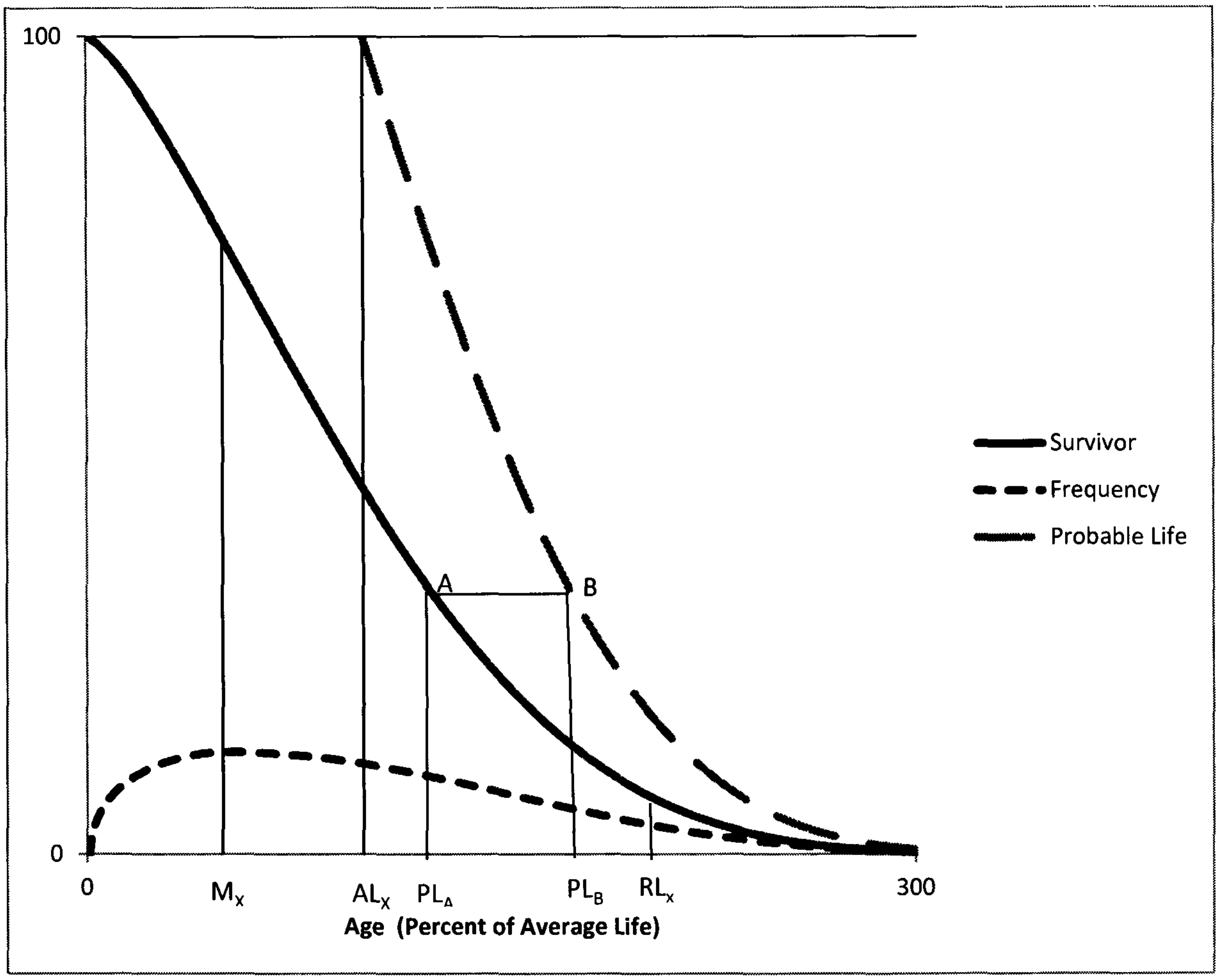
$$Average\ Remaining\ Life = \frac{Area\ Under\ Survivor\ Curve\ from\ Age\ x\ to\ Max\ Life}{S_X}$$

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

[84] *Id.* at 73.

[85] *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.[86] 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

[86] Wolf *supra* n. 8, at 28.

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

APPENDIX C:

ACTUARIAL ANALYSIS

Actuarial science is a discipline that applies various statistical methods to assess risk probabilities and other related functions. Actuaries often study human mortality. The results from historical mortality data are used to predict how long similar groups of people who are alive will live today. Insurance companies rely on 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.[87]

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

[87] NARUC *supra* n. 9, 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.[88] Historical data is used in the retirement rate actuarial method, which is discussed further below.

<u>The Retirement Rate Method</u>

There are several systematic actuarial methods that use historical data in order to calculate observed survivor curves for property groups. Of these methods, the retirement rate method is superior, and is widely employed by depreciation analysts.[89] 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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[88] *Id.* at 112-13.

[89] 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.[90] 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	

[90] 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

Placement Years	Experience Years Retirments During the Year (Dollars in 000's) 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.[91] Adoption of the half-year convention leads to age intervals of 0-0.5 years, 0.5-1.5 years, etc., as shown in the matrices.

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

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[91] Wolf *supra* n. 8, at 22.

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

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

Figure 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			

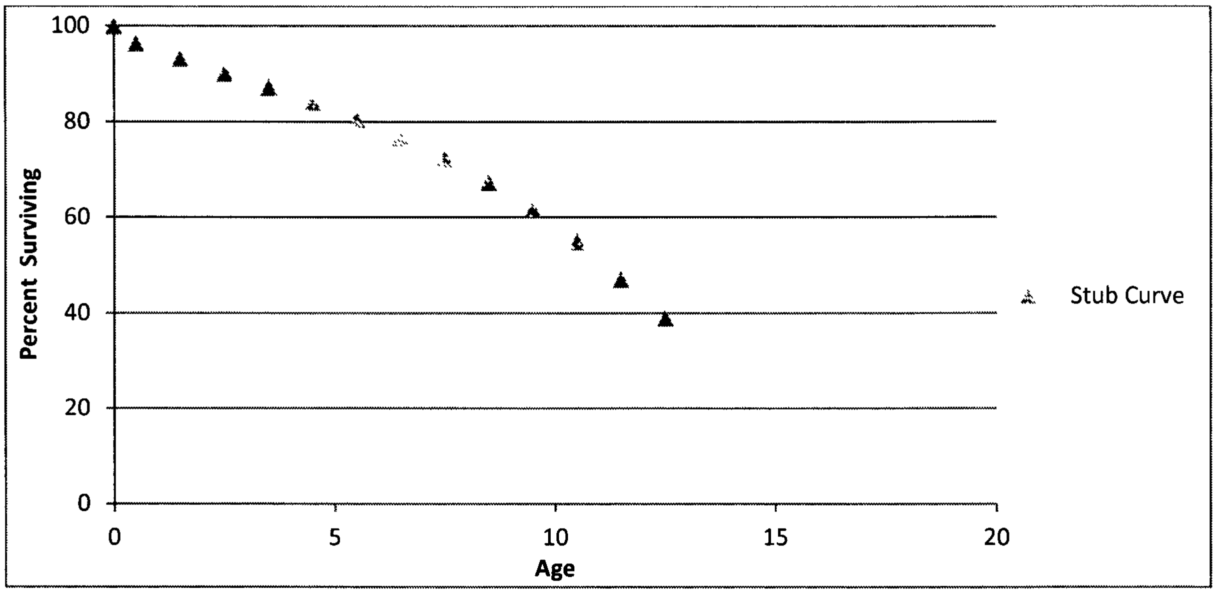
Column F on the right shows the percentages surviving at the beginning of each age interval. This column starts at 100% surviving. Each consecutive number below is calculated by multiplying the percent surviving from the previous age interval by the corresponding survivor ratio for that age interval. 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)[92].

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

[92] 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.[93] 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.[94]

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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[93] NARUC *supra* n. 9, at 113.

[94] *Id.*

Figure 23:
Placement Bands

Placement Years	2008	2009	2010	2011	2012	2013	2014	2015	Total at Start of Age Interval	Age Interval
	Experience Years Exposures at January 1 of Each Year (Dollars in 000's)									
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.[95] 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

[95] Wolf *supra* n. 8, at 182.

bands are very useful in depreciation analysis, they also possess an intrinsic dilemma. A fundamental characteristic of placement bands is that they yield fairly complete survivor curves for older vintages. However, with newer vintages, which are arguably more valuable for forecasting, placement bands yield shorter survivor curves. Longer "stub" curves are considered more valuable for forecasting average life. Thus, an analyst must select a band width broad enough to provide confidence in the reliability of the resulting curve fit yet narrow enough so that an emerging trend may be observed.[96]

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.

[96] NARUC *supra* n. 9, at 114.

Figure 24:
Experience Bands

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

The shaded cells within the experience band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same experience band would be used for the retirement matrix covering the same experience years of 2011 – 2013. This of course would result in a different OLT and original stub survivor than if the band had not been used. Analysts often use experience bands to isolate and analyze the effects of an operating environment over time.[97] 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

[97] *Id.*

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

Depreciation analysts must use professional judgment in determining the types of bands to use and the band widths. In practice, analysts may use various combinations of placement and experience bands in order to increase the data sample size, identify trends and changes in life characteristics, and isolate unusual events. Regardless of which bands are used, observed survivor curves in depreciation analysis rarely reach zero percent. This is because, as seen in the OLT above, relatively newer vintage groups have not yet been fully retired at the time the property is studied. An analyst could confine the analysis to older, fully retired vintage groups in order to get complete survivor curves, but such analysis would ignore some of 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.

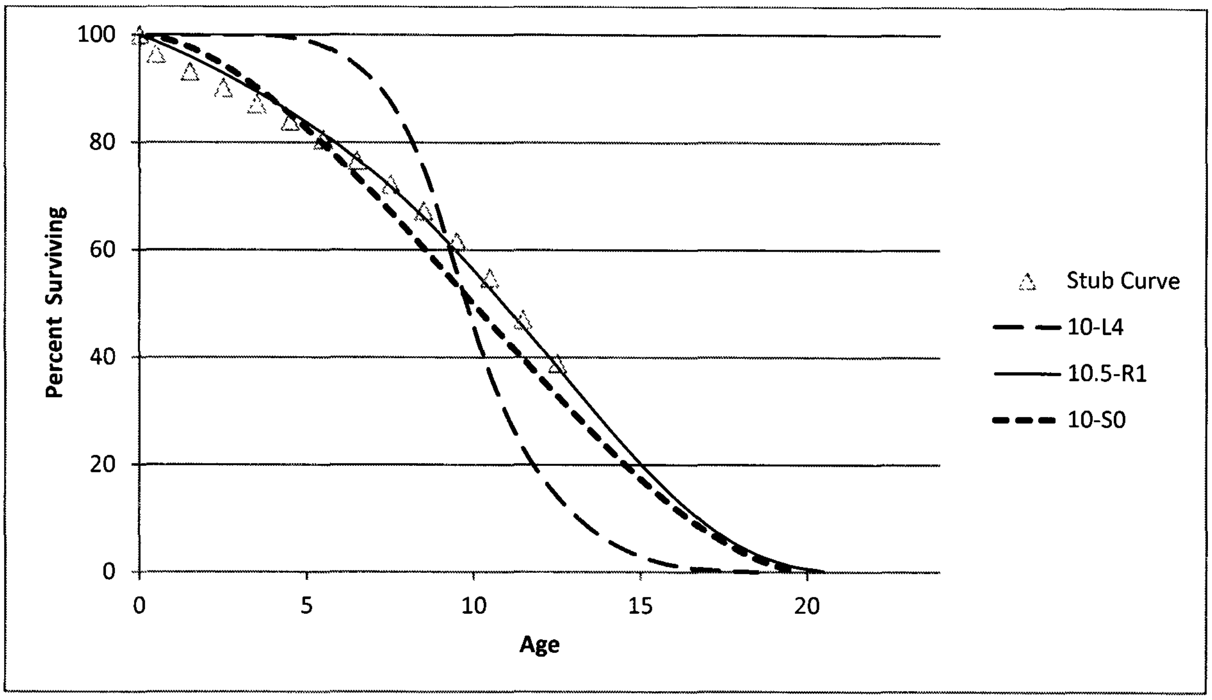
Curve Fitting

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."[98]

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.

[98] Wolf *supra* n. 8, 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.[99]

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."[100]

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.

---

[99] Wolf *supra* n. 8, at 47.

[100] *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**

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EDUCATION

University of Oklahoma — Norman, OK
Master of Business Administration — 2014
Areas of Concentration: Finance, Energy

University of Oklahoma College of Law — Norman, OK
Juris Doctor — 2007
Member, American Indian Law Review

University of Oklahoma — Norman, OK
Bachelor of Business Administration — 2003
Major: Finance

PROFESSIONAL DESIGNATIONS

Society of Depreciation Professionals
Certified Depreciation Professional (CDP)

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

The Mediation Institute
Certified Civil / Commercial & Employment Mediator

WORK EXPERIENCE

Resolve Utility Consulting PLLC — Oklahoma City, OK
Managing Member — 2016 – Present
Provide expert analysis and testimony specializing in depreciation and cost of capital issues for clients in utility regulatory proceedings.

Oklahoma Corporation Commission — Oklahoma City, OK
Public Utility Regulatory Analyst — 2012 – 2016
Assistant General Counsel — 2011 – 2012
Represented commission staff in utility regulatory proceedings and provided legal opinions to commissioners. Provided expert analysis and testimony in depreciation, cost of capital, incentive compensation, payroll and other issues.

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

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

TEACHING EXPERIENCE

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

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

PUBLICATIONS

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

VOLUNTEER EXPERIENCE

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

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

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

PROFESSIONAL ASSOCIATIONS

Oklahoma Bar Association 2007 – Present

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

Society of Utility Regulatory Financial Analysts 2014 – Present

SELECTED CONTINUING PROFESSIONAL EDUCATION

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

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

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

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

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

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

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

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lifes, net salvage	Indiana Office of 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
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 Co.	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

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lifes, net salvage	Indiana Office of 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
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 Co.	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
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
Public Utility Commission of Texas	Sharyland Utility Co.	PUC 45414	Depreciation rates, simulated analysis	City of Mission
Oklahoma Corporation Commission	Empire District Electric Co.	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 Co.	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 Co.	E-01345A-16-0036	Cost of capital, depreciation rates, terminal salvage	Energy Freedom Coalition of America
Nevada Public Utilities Commission	Sierra Pacific Power Co.	16-06008	Depreciation rates, net salvage, theoretical reserve	Northern Nevada Utility Customers

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lifes, net salvage	Indiana Office of 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
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 Co.	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
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 Co.	PUD 201500213	Cost of capital, depreciation rates, net salvage	Public Utility Division

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Exhibit DJG-2

Summary Accrual Comparison

Plant Function		Plant Balance 12/31/2017		ETI Proposed Accrual		Cities Proposed Accrual		Accrual Difference
Steam Production	$	1,120,362,756	$	48,272,808	$	37,947,178	$	(10,325,630)
Hydraulic Production		251,207		-		-		-
Transmission		1,336,760,060		26,977,342		23,931,276		(3,046,066)
Distribution		1,756,611,334		53,924,650		52,382,272		(1,542,378)
General		68,608,524		1,619,828		1,679,380		59,551
Total	$	4,282,593,881	$	130,794,629	$	115,940,106	**$**	**(14,854,523)**

* See Exhibit DJG-4 for detailed calculations

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Detailed Rate and Accrual Comparison

Account No.	Description	[1] Plant 12/31/2017	[2] ETI Proposal Rate	ETI Proposal Annual Accrual	[3] Cities Proposal Rate	Cities Proposal Annual Accrual	[4] Difference Rate	Difference Annual Accrual
	Steam Production Plant							
311.00	STRUCTURES AND IMPROVEMENTS							
	Big Cajun 2 Common	786,876	3.99%	31,408	3.43%	26,974	-0.56%	-4,433
	Big Cajun 2 Unit 3	19,577,844	3.50%	686,126	1.76%	344,770	-1.74%	-341,356
	Lewis Creek Common	80,357,019	5.56%	4,465,705	5.27%	4,235,316	-0.29%	-230,389
	Lewis Creek Unit 1	2,351,252	3.47%	81,649	2.84%	66,829	-0.63%	-14,820
	Lewis Creek Unit 2	1,806,959	3.15%	56,876	2.48%	44,753	-0.67%	-12,123
	Neches	0			0.00%	0	0.00%	0
	Nelson Common	2,940,770	2.62%	77,026	1.81%	53,130	-0.81%	-23,896
	Nelson Unit 6	29,149,564	2.59%	754,287	1.83%	533,566	-0.76%	-220,721
	Sabine Common	25,806,317	2.68%	692,348	2.06%	532,130	-0.62%	-160,217
	Sabine Unit 1	1,861,648	7.91%	147,317	6.10%	113,567	-1.81%	-33,749
	Sabine Unit 3	1,323,325	4.08%	53,931	2.94%	38,855	-1.14%	-15,076
	Sabine Unit 4	7,332,827	4.74%	347,680	3.68%	269,960	-1.06%	-77,720
	Sabine Unit 5	8,263,706	2.53%	208,841	1.91%	158,141	-0.61%	-50,700
	Spindletop	1,503,026	4.91%	73,797	0.00%	0	-4.91%	-73,797
	System Repair	568,326	2.56%	14,545	2.01%	11,444	-0.55%	-3,101
	Spindleltop Acquisition	63,917,624	0.00%	0	0.00%	0	0.00%	0
	TOTAL STRUCTURES AND IMPROVEMENTS	247,547,083	3.11%	7,691,536	2.60%	6,429,435	-0.51%	-1,262,100
312.00	BOILER PLANT EQUIPMENT							
	Big Cajun 2 Common	903,574	3.99%	36,008	3.25%	29,388	-0.73%	-6,620
	Big Cajun 2 Unit 3	60,414,445	4.21%	2,544,147	2.25%	1,358,118	-1.96%	-1,186,029
	Lewis Creek Common	4,817,713	4.14%	199,422	3.43%	165,221	-0.71%	-34,200
	Lewis Creek Unit 1	39,155,544	4.55%	1,781,907	4.00%	1,566,828	-0.55%	-215,078
	Lewis Creek Unit 2	39,912,234	4.49%	1,792,785	3.93%	1,569,616	-0.56%	-223,169
	Nelson Common	2,741,594	2.79%	76,561	1.61%	44,011	-1.19%	-32,551
	Nelson Unit 6	116,690,351	3.16%	3,691,098	2.22%	2,591,442	-0.94%	-1,099,655
	Sabine Common	17,860,728	2.85%	508,541	1.90%	339,109	-0.95%	-169,432
	Sabine Unit 1	15,419,139	7.36%	1,134,462	5.31%	819,022	-2.05%	-315,441
	Sabine Unit 3	31,046,530	5.28%	1,638,067	4.11%	1,276,882	-1.16%	-361,185
	Sabine Unit 4	50,204,926	6.10%	3,062,150	5.04%	2,530,865	-1.06%	-531,285
	Sabine Unit 5	78,346,218	2.77%	2,169,012	1.90%	1,492,024	-0.86%	-676,988
	Spindletop	114,140	4.77%	5,441	3.97%	4,536	-0.79%	-905
	TOTAL BOILER PLANT EQUIPMENT	457,627,135	4.07%	18,639,600	3.01%	13,787,063	-1.06%	-4,852,538
312.10	Nelson Railcars	256,826	3.69%	9,471	3.67%	9,417	-0.02%	-54

Detailed Rate and Accrual Comparison

		[1]	[2]		[3]		[4]	
			ETI Proposal		Cities Proposal		Difference	
Account No.	Description	Plant 12/31/2017	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
314.00	TURBOGENERATOR UNITS							
	Big Cajun 2 Common	316,524	3.90%	12,333	3.20%	10,144	-0.69%	-2,189
	Big Cajun 2 Unit 3	18,427,011	4.04%	744,678	1.76%	324,766	-2.28%	-419,913
	Lewis Creek Common	859,752	4.88%	41,995	4.41%	37,949	-0.47%	-4,045
	Lewis Creek Unit 1	37,269,541	5.04%	1,877,610	4.45%	1,657,451	-0.59%	-220,159
	Lewis Creek Unit 2	40,405,758	5.09%	2,056,595	4.58%	1,852,057	-0.51%	-204,538
	Nelson Common	19,407	4.14%	803	3.11%	603	-1.03%	-200
	Nelson Unit 6	28,627,147	3.47%	993,763	2.46%	704,403	-1.01%	-289,360
	Sabine Common	207,403	4.94%	10,240	4.48%	9,285	-0.46%	-954
	Sabine Unit 1	31,648,004	12.64%	4,000,239	10.85%	3,434,039	-1.79%	-566,200
	Sabine Unit 3	34,201,150	7.68%	2,626,900	6.60%	2,257,892	-1.08%	-369,009
	Sabine Unit 4	42,156,304	6.36%	2,680,471	5.24%	2,210,780	-1.11%	-469,691
	Sabine Unit 5	60,777,873	3.21%	1,953,010	2.28%	1,386,102	-0.93%	-566,908
	TOTAL TURBOGENERATOR UNITS	294,915,874	5.76%	16,998,637	4.71%	13,885,471	-1.06%	-3,113,165
315.00	ACCESSORY ELECTRIC EQUIPMENT							
	Big Cajun 2 Common	836,816	3.89%	32,534	3.16%	26,408	-0.73%	-6,126
	Big Cajun 2 Unit 3	11,956,579	3.85%	460,114	1.97%	235,048	-1.88%	-225,066
	Lewis Creek Common	3,695,662	3.75%	138,746	3.20%	118,251	-0.55%	-20,495
	Lewis Creek Unit 1	5,933,249	4.02%	238,263	3.43%	203,758	-0.58%	-34,505
	Lewis Creek Unit 2	4,703,340	4.42%	207,980	3.86%	181,315	-0.57%	-26,665
	Nelson Common	261,813	2.98%	7,792	2.18%	5,712	-0.79%	-2,080
	Nelson Unit 6	20,938,501	2.83%	592,073	1.98%	415,067	-0.85%	-177,007
	Sabine Common	3,648,107	3.06%	111,452	2.43%	88,718	-0.62%	-22,733
	Sabine Unit 1	7,479,276	8.88%	664,267	7.15%	534,395	-1.74%	-129,872
	Sabine Unit 3	8,954,420	6.49%	580,874	5.61%	502,363	-0.88%	-78,511
	Sabine Unit 4	8,044,461	4.93%	396,696	3.85%	309,431	-1.08%	-87,265
	Sabine Unit 5	23,995,701	2.99%	717,488	2.34%	561,943	-0.65%	-155,545
	Spindletop	5,177,875	4.84%	250,552	4.03%	208,655	-0.81%	-41,897
	System Repair Shop	95,188	2.70%	2,574	2.08%	1,975	-0.63%	-599
	TOTAL ACCESSORY ELECTRIC EQUIPMENT	105,720,989	4.16%	4,401,405	3.21%	3,393,040	-0.95%	-1,008,365
316.00	MISCELLANEOUS POWER PLANT EQUIPMENT							
	Big Cajun 2 Common	508,680	4.06%	20,652	3.29%	16,719	-0.77%	-3,933
	Big Cajun 2 Unit 3	828,894	4.59%	38,046	2.88%	23,891	-1.71%	-14,155
	Lewis Creek Common	2,681,778	4.98%	133,603	4.50%	120,705	-0.48%	-12,898
	Lewis Creek Unit 1	37,257	6.38%	2,375	5.97%	2,223	-0.41%	-152
	Nelson Common	217,405	3.82%	8,311	3.17%	6,889	-0.65%	-1,422
	Nelson Unit 6	1,351,621	2.81%	38,040	2.10%	28,337	-0.72%	-9,702

Detailed Rate and Accrual Comparison

		[1]	[2]		[3]		[4]	
			ETI Proposal		Cities Proposal		Difference	
Account No.	Description	Plant 12/31/2017	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	Sabine Common	5,064,678	3.49%	176,546	2 98%	150,717	-0.51%	-25,829
	Sabine Unit 1	78,771	10.98%	8,653	9 44%	7,440	-1.54%	-1,213
	Sabine Unit 4	22,473	6.07%	1,363	5.17%	1,161	-0.90%	-202
	Spindletop	387,507	4.78%	18,513	3.91%	15,133	-0.87%	-3,380
	System Production Laboratory	201,820	2.80%	5,642	2.27%	4,579	-0.53%	-1,063
	System Production Maintenance	2,082,313	2.76%	57,547	2 23%	46,504	-0.53%	-11,042
	System Production Training	775,378	2.75%	21,299	2.22%	17,180	-0.53%	-4,119
	System Repair	56,275	2.79%	1,569	2.26%	1,273	-0.53%	-296
	TOTAL MISCELLANEOUS POWER PLANT EQUIPMENT	14,294,849	3.72%	532,159	3 10%	442,752	-0.63%	-89,407
	TOTAL STEAM PRODUCTION PLANT	1,120,362,756	4.31%	48,272,808	3.39%	37,947,178	-0 92%	-10,325,630
	Hydraulic Production Plant							
334.00	Accessory Electric Equipment - Toledo Bend Common	218,538	0 00%	0	0.00%	0	0.00%	0
335.10	Misc Power Plant Equipment - Toledo Bend Common	32,669	0.00%	0	0.00%	0	0.00%	0
	TOTAL HYDRAULIC PRODUCTION PLANT	251,207	0 00%	0	0.00%	0	0.00%	0
	Transmission Plant							
350 00	Land Rights	44,351,293	1.14%	507,175	1.12%	498,225	-0.02%	-8,950
352.00	Structures & Improv.	37,130,902	1 58%	585,559	1.40%	518,488	-0.18%	-67,071
353 00	Station Equipment	668,610,518	2.23%	14,906,924	1.83%	12,212,696	-0.40%	-2,694,228
354.00	Towers & Fixtures	33,997,316	1.34%	455,907	1.20%	407,445	-0.14%	-48,462
355.00	Poles & Fixtures	285,514,523	1 97%	5,631,359	1.94%	5,533,115	-0.03%	-98,244
356.00	OH Conductors & Devices	266,631,005	1 83%	4,881,252	1.78%	4,751,945	-0.05%	-129,307
358.00	UG Conductors & Devices	321,717	1 96%	6,303	1.99%	6,406	0.03%	102
359.00	Roads & Trails	202,785	1.41%	2,864	1.46%	2,958	0.05%	93
	TOTAL TRANSMISSION PLANT	1,336,760,060	2.02%	26,977,342	1.79%	23,931,276	-0.23%	-3,046,066
	Distribution Plant							
360.20	Land Rights	11,800,472	1.42%	167,735	1.50%	176,457	0 07%	8,722
361.00	Structures & Improv.	18,557,848	1.46%	271,810	1.28%	236,665	-0.19%	-35,145
362.00	Station Equipment	225,925,641	1.84%	4,164,952	1.82%	4,110,684	-0.02%	-54,268

Detailed Rate and Accrual Comparison

		[1]	[2]		[3]		[4]	
			ETI Proposal		Cities Proposal		Difference	
Account No.	Description	Plant 12/31/2017	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
364.00	Poles, Towers & Fixtures	264,181,249	3.02%	7,967,132	3.07%	8,111,128	0.05%	143,997
365.00	OH Conductors & Devices	309,498,054	3.30%	10,222,668	3.05%	9,441,836	-0.25%	-780,832
366.00	UG Conduit	50,196,843	2.19%	1,101,130	1.77%	889,867	-0.42%	-211,263
367.00	UG Conductors & Devices	135,549,244	2.79%	3,788,244	2.21%	2,989,934	-0.59%	-798,310
368.00	Line Transformers	473,161,091	3.52%	16,678,004	3.51%	16,631,263	-0.01%	-46,740
369.10	Services - Overhead	91,258,666	4.24%	3,872,681	2.57%	2,347,836	-1.67%	-1,524,845
369.20	Services - Underground	72,901,102	3 04%	2,219,227	4.91%	3,579,938	1.87%	1,360,711
370.00	Meters (Customer)	46,715,009	4.02%	1,878,128	4.55%	2,123,762	0.53%	245,634
370 10	Meters (Substation	5,029,930	4.00%	201,039	8.97%	451,156	4.97%	250,118
370.10	Smart Meters	492,364	14.29%	0	14.29%	0	0.00%	0
371.00	I.O.C P	33,240,655	2.74%	910,099	2.11%	702,939	-0.62%	-207,161
373.00	Street Lighting & Signal Systems	18,103,167	2.66%	481,800	3.25%	588,805	0.59%	107,004
	TOTAL DISTRIBUTION PLANT	1,756,611,334	3.07%	53,924,650	2.98%	52,382,272	-0.09%	-1,542,378
	General Plant							
390.00	Structures & Improvements	55,362,670	2.01%	1,111,465	1.93%	1,068,519	-0 08%	-42,946
397 20	Microwave & Fiber Optic	13,245,854	3.84%	508,363	4 61%	610,860	0.77%	102,497
	TOTAL GENERAL PLANT	68,608,524	2.36%	1,619,828	2.45%	1,679,380	0.09%	59,551
	TOTAL DEPRECIABLE PLANT STUDIED	**4,282,593,881**	**3.05%**	**130,794,629**	**2.71%**	**115,940,106**	**-0.35%**	**-14,854,523**

[1], [2] See depreciation study and errata testimony and workpapers of Dane A Watson.
[3] Exhibit DJG-4
[4] = [3] - [2] , Adjustments are to the proposed annual depreciation accrual corresponding to plant balances as of the depreciation study date

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Depreciation Rate Development

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
			Iowa Curve							Service Life		Net Salvage		Total	
Account No	Description	Original Cost	Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	Steam Production Plant														
311 00	STRUCTURES AND IMPROVEMENTS														
	Big Cajun 2 Common	786,876	SQ	26	-10%	867,513	179,671	687,842	25 50	23,812	3 03%	3,162	0 40%	26,974	**3.43%**
	Big Cajun 2 Unit 3	19,577,844	SQ	26	-31%	25,596,686	16,805,052	8,791,635	25 50	108,737	0 56%	236,033	1 21%	344,770	**1.76%**
	Lewis Creek Common	80,357,019	SQ	17	-1%	81,476,751	11,594,043	69,882,709	16 50	4,167,453	5 19%	67,863	0 08%	4,235,316	**5.27%**
	Lewis Creek Unit 1	2,351,252	SQ	17	-1%	2,384,015	1,281,338	1,102,677	16 50	64,843	2 76%	1,986	0 08%	66,829	**2.84%**
	Lewis Creek Unit 2	1,806,959	SQ	17	-1%	1,832,138	1,093,709	738,430	16 50	43,227	2 39%	1,526	0 08%	44,753	**2.48%**
	Neches	0			-5%	0	0								
	Nelson Common	2,940,770	SQ	25	-7%	3,133,444	1,831,755	1,301,689	24 50	45,266	1 54%	7,864	0 27%	53,130	**1 81%**
	Nelson Unit 6	29,149,564	SQ	25	-7%	31,059,392	17,987,035	13,072,357	24 50	455,613	1 56%	77,952	0 27%	533,566	**1 83%**
	Sabine Common	25,806,317	SQ	22	-1%	26,182,565	14,741,765	11,440,800	21 50	514,630	1 99%	17,500	0 07%	532,130	**2 06%**
	Sabine Unit 1	1,861,648	SQ	5	-1%	1,888,790	1,377,736	511,054	4 50	107,536	5 78%	6,032	0 32%	113,567	**6 10%**
	Sabine Unit 3	1,323,325	SQ	9	-1%	1,342,618	1,012,348	330,270	8 50	36,585	2 76%	2,270	0 17%	38,855	**2 94%**
	Sabine Unit 4	7,332,827	SQ	9	-1%	7,439,737	5,145,079	2,294,658	8 50	257,382	3 51%	12,578	0 17%	269,960	**3 68%**
	Sabine Unit 5	8,263,706	SQ	22	-1%	8,384,188	4,984,156	3,400,033	21 50	152,537	1 85%	5,604	0 07%	158,141	**1.91%**
	Spindletop	1,503,026	SQ	22	-11%	1,668,045	289,982	1,378,063	21 50	56,421	3 75%	-56,421	-3 75%	0	**0.00%**
	System Repair	568,326	SQ	22	-1%	576,612	330,571	246,041	21 50	11,058	1 95%	385	0 07%	11,444	**2.01%**
	Spindleltop Acquisition	63,917,624	SQ	22	0%	63,917,624	63,917,624								
	TOTAL STRUCTURES AND IMPROVEMENTS	247,547,083			-4%	257,750,119	142,571,864	115,178,256	17 91	6,045,102	2 44%	384,333	0 16%	6,429,435	**2 60%**
312 00	BOILER PLANT EQUIPMENT														
	Big Cajun 2 Common	903,574	SQ	26	-10%	996,169	246,787	749,382	25 50	25,756	2 85%	3,631	0 40%	29,388	**3 25%**
	Big Cajun 2 Unit 3	60,414,445	SQ	26	-31%	78,987,737	44,355,724	34,632,013	25 50	629,754	1 04%	728,364	1 21%	1,358,118	**2 25%**
	Lewis Creek Common	4,817,713	SQ	17	-1%	4,884,845	2,158,696	2,726,149	16 50	161,153	3 35%	4,069	0 08%	165,221	**3 43%**
	Lewis Creek Unit 1	39,155,544	SQ	17	-1%	39,701,156	13,848,487	25,852,669	16 50	1,533,761	3 92%	33,067	0 08%	1,566,828	**4 00%**
	Lewis Creek Unit 2	39,912,234	SQ	17	-1%	40,468,390	14,569,720	25,898,670	16 50	1,535,910	3 85%	33,706	0 08%	1,569,616	**3 93%**
	Nelson Common	2,741,594	SQ	25	-7%	2,921,218	1,842,959	1,078,260	24 50	36,679	1 34%	7,332	0 27%	44,011	**1 61%**
	Nelson Unit 6	116,690,351	SQ	25	-7%	124,335,695	60,845,356	63,490,339	24 50	2,279,388	1 95%	312,055	0 27%	2,591,442	**2.22%**
	Sabine Common	17,860,728	SQ	22	-1%	18,121,131	10,830,285	7,290,846	21 50	326,997	1 83%	12,112	0 07%	339,109	**1.90%**
	Sabine Unit 1	15,419,139	SQ	5	-1%	15,643,945	11,958,348	3,685,597	4 50	769,065	4 99%	49,957	0 32%	819,022	**5.31%**
	Sabine Unit 3	31,046,530	SQ	9	-1%	31,499,178	20,645,683	10,853,496	8 50	1,223,629	3 94%	53,253	0 17%	1,276,882	**4.11%**
	Sabine Unit 4	50,204,926	SQ	9	-1%	50,936,897	29,424,546	21,512,351	8 50	2,444,751	4 87%	86,114	0 17%	2,530,865	**5.04%**
	Sabine Unit 5	78,346,218	SQ	22	-1%	79,488,480	47,409,958	32,078,522	21 50	1,438,896	1 84%	53,128	0 07%	1,492,024	**1.90%**
	Spindletop	114,140	SQ	22	-11%	126,671	29,139	97,532	21 50	3,954	3 46%	583	0 51%	4,536	**3.97%**
	TOTAL BOILER PLANT EQUIPMENT	457,627,135			-7%	488,111,513	258,165,689	229,945,824	16 68	12,409,691	2 71%	1,377,371	0 30%	13,787,063	**3 01%**
312 10	Nelson Railcars	256,826			0%	256,826	21,407	235,419	25 00	9,417	3 67%	0	0 00%	9,417	**3 67%**
314 00	TURBOGENERATOR UNITS														
	Big Cajun 2 Common	316,524	SQ	26	-10%	348,960	90,287	258,673	25 50	8,872	2 80%	1,272	0 40%	10,144	**3.20%**
	Big Cajun 2 Unit 3	18,427,011	SQ	26	-31%	24,092,051	15,810,526	8,281,526	25 50	102,607	0 56%	222,158	1 21%	324,766	**1.76%**
	Lewis Creek Common	859,752	SQ	17	-1%	871,732	245,569	626,163	16 50	37,223	4 33%	726	0 08%	37,949	**4.41%**
	Lewis Creek Unit 1	37,269,541	SQ	17	-1%	37,788,872	10,440,924	27,347,948	16 50	1,625,977	4 36%	31,475	0 08%	1,657,451	**4.45%**
	Lewis Creek Unit 2	40,405,758	SQ	17	-1%	40,968,791	10,409,855	30,558,936	16 50	1,817,934	4 50%	34,123	0 08%	1,852,057	**4.58%**
	Nelson Common	19,407	SQ	25	-7%	20,679	5,904	14,775	24 50	551	2 84%	52	0 27%	603	**3 11%**
	Nelson Unit 6	28,627,147	SQ	25	-7%	30,502,747	13,244,866	17,257,881	24 50	627,848	2 19%	76,555	0 27%	704,403	**2 46%**
	Sabine Common	207,403	SQ	22	-1%	210,426	10,795	199,631	21 50	9,145	4 41%	141	0 07%	9,285	**4.48%**
	Sabine Unit 1	31,648,004	SQ	5	-1%	32,109,421	16,656,247	15,453,174	4 50	3,331,502	10 53%	102,537	0 32%	3,434,039	**10.85%**
	Sabine Unit 3	34,201,150	SQ	9	-1%	34,699,791	15,507,713	19,192,078	8 50	2,199,228	6 43%	58,664	0 17%	2,257,892	**6.60%**
	Sabine Unit 4	42,156,304	SQ	9	-1%	42,770,929	23,979,297	18,791,632	8 50	2,138,471	5 07%	72,309	0 17%	2,210,780	**5.24%**
	Sabine Unit 5	60,777,873	SQ	22	-1%	61,663,995	31,862,799	29,801,195	21 50	1,344,887	2 21%	41,215	0 07%	1,386,102	**2.28%**
	TOTAL TURBOGENERATOR UNITS	294,915,874			-4%	306,048,394	138,264,784	167,783,611	12 08	13,244,245	4 49%	641,227	0 22%	13,885,471	**4 71%**
315 00	ACCESSORY ELECTRIC EQUIPMENT														
	Big Cajun 2 Common	836,816	SQ	26	-10%	922,570	249,162	673,408	25 50	23,045	2 75%	3,363	0 40%	26,408	**3 16%**
	Big Cajun 2 Unit 3	11,956,579	SQ	26	-31%	15,632,406	9,638,683	5,993,723	25 50	90,898	0 76%	144,150	1 21%	235,048	**1.97%**
	Lewis Creek Common	3,695,662	SQ	17	-1%	3,747,159	1,796,019	1,951,140	16 50	115,130	3 12%	3,121	0 08%	118,251	**3.20%**
	Lewis Creek Unit 1	5,933,249	SQ	17	-1%	6,015,926	2,653,918	3,362,008	16 50	198,747	3 35%	5,011	0 08%	203,758	**3.43%**
	Lewis Creek Unit 2	4,703,340	SQ	17	-1%	4,768,879	1,777,190	2,991,689	16 50	177,342	3 77%	3,972	0 08%	181,315	**3 86%**
	Nelson Common	261,813	SQ	25	-7%	278,967	139,024	139,942	24 50	5,012	1 91%	700	0 27%	5,712	**2 18%**
	Nelson Unit 6	20,938,501	SQ	25	-7%	22,310,354	12,141,221	10,169,133	24 50	359,073	1 71%	55,994	0 27%	415,067	**1 98%**
	Sabine Common	3,648,107	SQ	22	-1%	3,701,296	1,793,848	1,907,448	21 50	86,245	2 36%	2,474	0 07%	88,718	**2.43%**
	Sabine Unit 1	7,479,276	SQ	5	-1%	7,588,321	5,183,541	2,404,780	4 50	510,163	6 82%	24,232	0 32%	534,395	**7.15%**

Depreciation Rate Development

Account No	Description	[1] Original Cost	[2] Iowa Curve Type	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
	Sabine Unit 3	8,954,420	SQ	9	-1%	9,084,972	4,814,886	4,270,086	8 50	487,004	5 44%	15,359	0 17%	502,363	5.61%
	Sabine Unit 4	8,044,461	SQ	9	-1%	8,161,747	5,531,585	2,630,162	8 50	295,633	3 67%	13,798	0 17%	309,431	3.85%
	Sabine Unit 5	23,995,701	SQ	22	-1%	24,345,551	12,263,770	12,081,780	21 50	545,671	2 27%	16,272	0 07%	561,943	2.34%
	Spindletop	5,177,875	SQ	22	-11%	5,746,361	1,260,269	4,486,092	21 50	182,214	3 52%	26,441	0 51%	208,655	4.03%
	System Repair Shop	95,188	SQ	22	-1%	96,576	54,107	42,469	21 50	1,911	2 01%	65	0 07%	1,975	2.08%
	TOTAL ACCESSORY ELECTRIC EQUIPMENT	105,720,989			-6%	112,401,084	59,297,223	53,103,861	15 65	3,078,088	2 91%	314,952	0 30%	3,393,040	3 21%
316 00	MISCELLANEOUS POWER PLANT EQUIPMENT														
	Big Cajun 2 Common	508,680	SQ	26	10%	560,808	134,464	426,344	25 50	14,675	2 88%	2,044	0 40%	16,719	3 29%
	Big Cajun 2 Unit 3	828,894	SQ	26	-31%	1,083,722	474,493	609,228	25 50	13,898	1 68%	9,993	1 21%	23,891	2.88%
	Lewis Creek Common	2,681,778	SQ	17	-1%	2,719,147	727,521	1,991,626	16 50	118,440	4 42%	2,265	0 08%	120,705	4.50%
	Lewis Creek Unit 1	37,257	SQ	17	-1%	37,776	1,091	36,685	16 50	2,192	5 88%	31	0 08%	2,223	5.97%
	Nelson Common	217,405	SQ	25	-7%	231,649	62,877	168,772	24 50	6,307	2 90%	581	0 27%	6,889	3.17%
	Nelson Unit 6	1,351,621	SQ	25	-7%	1,440,177	745,910	694,267	24 50	24,723	1 83%	3,615	0 27%	28,337	2.10%
	Sabine Common	5,064,678	SQ	22	-1%	5,138,519	1,898,100	3,240,419	21 50	147,283	2 91%	3,434	0 07%	150,717	2.98%
	Sabine Unit 1	78,771	SQ	5	-1%	79,919	46,441	33,478	4 50	7,184	9 12%	255	0 32%	7,440	9 44%
	Sabine Unit 4	22,473	SQ	9	-1%	22,800	12,928	9,872	8 50	1,123	5 00%	39	0 17%	1,161	5 17%
	Spindletop	387,507	SQ	22	-11%	430,052	104,698	325,355	21 50	13,154	3 39%	1,979	0 51%	15,133	3.91%
	System Production Laboratory	201,820	SQ	22	-1%	204,762	106,317	98,445	21 50	4,442	2 20%	137	0 07%	4,579	2.27%
	System Production Maintenance	2,082,313	SQ	22	-1%	2,112,672	1,112,829	999,843	21 50	45,092	2 17%	1,412	0 07%	46,504	2.23%
	System Production Training	775,378	SQ	22	-1%	786,682	417,315	369,368	21 50	16,654	2 15%	526	0 07%	17,180	2.22%
	System Repair	56,275	SQ	22	-1%	57,095	29,724	27,371	21 50	1,235	2 19%	38	0 07%	1,273	2.26%
	TOTAL MISCELLANEOUS POWER PLANT EQUIPMENT	14,294,849			-4%	14,905,783	5,874,708	9,031,075	20 40	416,402	2 91%	26,350	0 18%	442,752	3 10%
	TOTAL STEAM PRODUCTION PLANT	1,120,362,756			-5%	1,179,473,719	604,195,674	575,278,045	15 16	35,202,944	3 14%	2,744,233	0 24%	37,947,178	3.39%
	Hydraulic Production Plant														
334 00	Accessory Electric Equipment - Toledo Bend Common	218,538			0%	218,538	218,772								
335 10	Misc Power Plant Equipment - Toledo Bend Common	32,669			0%	32,669	32,669								
	TOTAL HYDRAULIC PRODUCTION PLANT	251,207			0%	251,207	251,442	0	0 00	0	0 00%	0	0 00%	0	0 00%
	Transmission Plant														
350 00	Land Rights	44,351,293	R3	85	0%	44,351,293	13,753,085	30,598,207	61 41	498,225	1 12%	0	0 00%	498,225	1.12%
352 00	Structures & Improv	37,130,902	R2 5	82	-20%	44,557,083	8,185,152	36,371,931	70 15	412,627	1 11%	105,861	0 29%	518,488	1.40%
353 00	Station Equipment	668,610,518	R1	64	-25%	835,763,148	172,735,884	663,027,264	54 29	9,133,812	1 37%	3,078,884	0 46%	12,212,696	1.83%
354 00	Towers & Fixtures	33,997,316	R4	75	-5%	35,697,182	16,333,563	19,363,619	47 52	371,677	1 09%	35,768	0 11%	407,445	1.20%
355 00	Poles & Fixtures	285,514,523	R1 5	65	-30%	371,168,880	68,850,913	302,317,967	54 64	3,965,443	1 39%	1,567,672	0 55%	5,533,115	1.94%
356 00	OH Conductors & Devices	266,631,005	R1 5	70	-30%	346,620,307	68,321,424	278,298,883	58 57	3,386,130	1 27%	1,365,815	0 51%	4,751,945	1.78%
358 00	UG Conductors & Devices	321,717	R2	50	0%	321,717	71,293	250,424	39 09	6,406	1 99%	0	0 00%	6,406	1.99%
359 00	Roads & Trails	202,785	R5	65	0%	202,785	112,237	90,548	30 61	2,958	1 46%	0	0 00%	2,958	1.46%
	TOTAL TRANSMISSION PLANT	1,336,760,060			-26%	1,678,682,394	348,363,552	1,330,318,842	55 59	17,777,276	1 33%	6,154,001	0 46%	23,931,276	1.79%
	Distribution Plant														
360 20	Land Rights	11,800,472	R3	70	0%	11,800,472	4,931,244	6,869,228	38 93	176,457	1 50%	0	0 00%	176,457	1 50%
361 00	Structures & Improv	18,557,848	R2 5	83	-10%	20,413,633	3,821,068	16,592,565	70 11	210,195	1 13%	26,470	0 14%	236,665	1 28%
362 00	Station Equipment	225,925,641	R1	65	-20%	271,110,769	53,687,306	217,423,463	52 89	3,256,398	1 44%	854,286	0 38%	4,110,684	1.82%
364 00	Poles, Towers & Fixtures	264,181,249	R1	43	-30%	343,435,624	93,323,583	250,112,041	30 84	5,540,911	2 10%	2,570,218	0 97%	8,111,128	3 07%
365 00	OH Conductors & Devices	309,498,054	R0 5	42	-20%	371,397,665	55,748,379	315,649,286	33 43	7,590,269	2 45%	1,851,568	0 60%	9,441,836	3 05%
366 00	UG Conduit	50,196,843	L0 5	60	-10%	55,216,528	11,915,582	43,300,946	48 66	786,709	1 57%	103,158	0 21%	889,867	1 77%
367 00	UG Conductors & Devices	135,549,244	R1	42	-1%	136,904,736	46,698,441	90,206,295	30 17	2,945,005	2 17%	44,928	0 03%	2,989,934	2 21%
368 00	Line Transformers	473,161,091	L0	34	-20%	567,793,309	99,817,322	467,975,987	28 14	13,268,156	2 80%	3,363,107	0 71%	16,631,263	3 51%
369 10	Services - Overhead	91,258,666	S4	27	-15%	104,947,466	64,966,638	39,980,828	17 03	1,543,975	1 69%	803,862	0 88%	2,347,836	2.57%
369 20	Services - Underground	72,901,102	R5	36	-10%	80,191,212	-604,188	80,795,400	22 57	3,256,923	4 47%	323,015	0 44%	3,579,938	4.91%
370 00	Meters (Customer)	46,715,009	R1 5	26	-5%	49,050,760	16,872,631	32,178,129	15 15	1,969,603	4 22%	154,160	0 33%	2,123,762	4 55%
370 10	Meters (Substation	5,029,930	R1 5	26	-5%	5,281,426	1,057,762	4,223,665	9 36	424,292	8 44%	26,864	0 53%	451,156	8 97%
370 10	Smart Meters	492,364	SQ	7	0%	492,364	84,360								14.29%
371 00	I O C P	33,240,655	R4	56	-10%	36,564,720	12,706,974	23,857,746	33 94	604,999	1 82%	97,939	0 29%	702,939	2 11%

Depreciation Rate Development

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Account		Original	Iowa Curve		Net	Depreciable	Book	Future	Remaining	Service Life		Net Salvage		Total	
No	Description	Cost	Type	AL	Salvage	Base	Reserve	Accruals	Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
373 00	Street Lighting & Signal Systems	18,103,167	R2 -	45	-20%	21,723,801	1,563,618	20,160,182	34 24	483,059	2 67%	105,745	0 58%	588,805	3 25%
	TOTAL DISTRIBUTION PLANT	1,756,611,334			-18%	2,076,324,484	466,590,720	1,609,325,760	30 72	42,056,951	2 39%	10,325,321	0 59%	52,382,272	2 98%
	General Plant														
390 00	Structures & Improvements	55,362,670	R1	50	-10%	60,898,937	21,434,372	39,464,564	36 93	918,622	1 66%	149,897	0 27%	1,068,519	1 93%
397 20	Microwave & Fiber Optic	13,245,854	S5 -	23	0%	13,245,854	3,792,645	9,453,209	15 48	610,860	4 61%	0	0 00%	610,860	4.61%
	TOTAL GENERAL PLANT	68,608,524			-8%	74,144,791	25,227,018	48,917,773	29 13	1,529,483	2 23%	149,897	0 22%	1,679,380	2 45%
	TOTAL DEPRECIABLE PLANT STUDIED	**4,282,593,881**			**-17%**	**5,008,876,595**	**1,444,628,405**	**3,563,840,420**	**30 74**	**96,566,655**	**2.25%**	**19,373,451**	**0.45%**	**115,940,106**	**2.71%**

[1] Company depreciation study
[2] Average life and Iowa curve shape developed through actuarial analysis and professional judgment
[3] Weighted net salvage for life span accounts from weighted net salvage exhibit net salvage for mass accounts developed through statistical analysis and professional judgment
[4] = [1]*(1-[3])
[5] Production theoretical reserve balances calculated without including blances for the Neches Station and Sabine Unit 2 (see ETI response to Staff 1-69), transmission, distribution and general book reserve balances at 12 31-17
[6] = [4] - [5]
[7] Composite remaining life based on Iowa cuve 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]

001

Production Net Salvage

Units	[1] Original Cost	[2] Proposed Removal Cost	[3] Contingency Factor	[4] Adjusted Removal Cost	[5] ETI Ownership %	[6] ETI Net Removal Cost	[7] Net Salvage
Big Cajun 2 Common	3,352,470	88,315,737	8,338,276	79,977,461	14%	343,551	-10%
Big Cajun 2 Unit 3	111,204,774	5,271,288	1,395,218	3,876,070	42%	34,187,829	-31%
Lewis Creek	263,987,058	5,622,951	1,944,432	3,678,519	100%	3,678,519	-1%
Nelson	202,938,174	22,373,367	3,378,870	18,994,497	70%	13,296,148	-7%
Sabine	463,743,984	11,585,413	4,824,180	6,761,233	100%	6,761,233	-1%
Spindletop	7,182,548	954,380	165,798	788,582	100%	788,582	-11%
System Production	3,059,511	76,434	31,827	44,607	100%	44,607	-1%
System Repair	719,789	17,982	7,488	10,494	100%	10,494	-1%
Total	1,056,188,306	134,217,552	20,086,089	114,131,463		59,110,963	

[1] Total original cost per unit as of depreciation study date

[2] Company proposed net removal cost from Exhibit SCM-2; costs for system production and repair allocated based on plant balances as proposed in DAW-2, App. D

[3] Contingency factor of 15% proposed by Mr. McHone in Exhibit SCM-2

[4] = [2] - [3]

[5] ETI unit ownership percentage

[6] = [4] * [5]

[7] = [6] / [1] * -1 ; net salvage percentages applied depreciable base for production units in Exhibit DJG-4

Account 352 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R3-75	[5] Cities R2.5-82	[6] ETI SSD	[7] Cities SSD
0.0	38,750,827	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	31,522,043	100.00%	99.99%	99.97%	0.0000	0.0000
1.5	27,331,128	99.51%	99.97%	99.90%	0.0000	0.0000
2.5	24,572,108	99.49%	99 94%	99.82%	0.0000	0.0000
3.5	22,109,539	99.41%	99.92%	99.75%	0.0000	0.0000
4.5	21,341,263	99.23%	99.88%	99.67%	0.0000	0.0000
5.5	21,266,186	99.18%	99.85%	99.58%	0.0000	0.0000
6.5	20,833,487	99.17%	99.81%	99.49%	0.0000	0.0000
7.5	21,668,298	99.04%	99.77%	99.40%	0.0001	0.0000
8.5	21,203,636	99.02%	99.73%	99.30%	0.0000	0.0000
9.5	21,188,210	98.98%	99.67%	99.20%	0.0000	0.0000
10.5	21,214,674	98.88%	99.62%	99.09%	0.0001	0.0000
11.5	19,844,563	98.87%	99.56%	98.98%	0.0000	0.0000
12.5	17,535,826	98.87%	99.49%	98.86%	0.0000	0.0000
13.5	16,079,970	98.84%	99.42%	98.73%	0.0000	0.0000
14.5	12,518,348	98.80%	99.34%	98.60%	0.0000	0.0000
15.5	8,839,891	98.72%	99.25%	98.47%	0.0000	0.0000
16.5	8,291,931	98.50%	99.16%	98.32%	0.0000	0.0000
17.5	8,106,965	98.18%	99.06%	98.17%	0.0001	0.0000
18.5	8,450,622	98.04%	98.95%	98.01%	0.0001	0.0000
19.5	9,944,358	97.91%	98.83%	97.85%	0.0001	0.0000
20.5	9,904,793	97.68%	98.70%	97.67%	0.0001	0.0000
21.5	9,706,579	97.46%	98.56%	97.49%	0.0001	0.0000
22.5	9,615,374	97.37%	98.41%	97.30%	0.0001	0.0000
23.5	9,400,062	97.06%	98.25%	97.10%	0.0001	0.0000
24.5	9,001,374	97.05%	98.08%	96.89%	0.0001	0.0000
25.5	6,206,068	96.86%	97.90%	96.67%	0.0001	0.0000
26.5	6,082,030	96.80%	97.70%	96.45%	0.0001	0.0000
27.5	5,857,045	96.65%	97.49%	96.21%	0.0001	0.0000
28.5	5,757,757	96.04%	97.26%	95.96%	0.0001	0.0000
29.5	5,828,888	95.73%	97.02%	95.70%	0.0002	0.0000
30.5	5,797,397	95.47%	96.76%	95.43%	0.0002	0.0000
31.5	5,691,642	95.29%	96.49%	95.15%	0.0001	0.0000
32.5	5,595,120	95.25%	96.20%	94.85%	0.0001	0.0000
33.5	5,347,375	94.86%	95.89%	94.55%	0.0001	0.0000
34.5	5,114,880	94.38%	95.57%	94.23%	0.0001	0.0000
35.5	4,376,217	94.27%	95.22%	93.89%	0.0001	0.0000
36.5	2,261,585	94.25%	94.85%	93.54%	0.0000	0.0000
37.5	2,073,709	93.05%	94.47%	93.18%	0.0002	0.0000
38.5	2,028,602	92.90%	94.05%	92.81%	0.0001	0.0000
39.5	2,023,026	92.67%	93.62%	92.41%	0.0001	0.0000
40.5	2,024,572	92.53%	93.17%	92.00%	0.0000	0.0000
41.5	1,948,621	92.27%	92.69%	91.58%	0.0000	0.0000
42.5	1,945,493	92.19%	92.18%	91.14%	0.0000	0.0001
43.5	1,907,638	92.17%	91.65%	90.68%	0.0000	0.0002
44.5	1,869,335	91.38%	91.09%	90.21%	0.0000	0.0001
45.5	1,640,317	90.91%	90.50%	89.71%	0.0000	0.0001
46.5	1,457,248	90.71%	89.88%	89.20%	0.0001	0.0002
47.5	1,441,820	90.51%	89.23%	88.67%	0.0002	0.0003
48.5	1,342,701	90.44%	88.55%	88.12%	0.0004	0.0005
49.5	1,250,154	88.96%	87.84%	87.55%	0.0001	0.0002
50.5	1,189,187	88.91%	87.09%	86.96%	0.0003	0.0004

Account 352 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R3-75	[5] Cities R2.5-82	[6] ETI SSD	[7] Cities SSD
51.5	1,120,894	88.86%	86.31%	86.34%	0.0007	0.0006
52.5	1,072,861	88.27%	85.49%	85.71%	0.0008	0.0007
53.5	1,016,743	87.45%	84.63%	85.05%	0.0008	0.0006
54.5	1,001,459	86.22%	83.73%	84.36%	0.0006	0.0003
55.5	808,008	86.22%	82.80%	83.66%	0.0012	0.0007
56.5	767,045	84.38%	81.81%	82.93%	0.0007	0.0002
57.5	672,031	84.36%	80.79%	82.17%	0.0013	0.0005
58.5	614,522	82.63%	79.72%	81.39%	0.0008	0.0002
59.5	565,141	82.23%	78.60%	80.58%	0.0013	0.0003
60.5	523,296	82.23%	77.43%	79.75%	0.0023	0.0006
61.5	318,686	81.99%	76.22%	78.89%	0.0033	0.0010
62.5	299,135	81.70%	74.95%	77.99%	0.0046	0.0014
63.5	225,896	79.24%	73.64%	77.07%	0.0031	0.0005
64.5	196,418	79.06%	72.27%	76.12%	0.0046	0.0009
65.5	124,016	79.06%	70.84%	75.14%	0.0067	0.0015
66.5	119,653	79.06%	69.37%	74.13%	0.0094	0.0024
67.5	98,496	79.06%	67.84%	73.08%	0.0126	0.0036
68.5	90,474	77.99%	66.26%	72.01%	0.0138	0.0036
69.5	88,152	77.99%	64.62%	70.90%	0.0179	0.0050
70.5	87,475	77.99%	62.93%	69.76%	0.0227	0.0068
71.5	78,943	77.82%	61.19%	68.59%	0.0276	0.0085
72.5	78,943	77.82%	59.40%	67.38%	0.0339	0.0109
73.5	39,947	77.82%	57.57%	66.15%	0.0410	0.0136
74.5	7,719	77.82%	55.69%	64.88%	0.0490	0.0168
75.5	7,719	77.82%	53.77%	63.58%	0.0578	0.0203
76.5	7,719	77.82%	51.82%	62.24%	0.0676	0.0243
77.5	7,719	77.82%	49.83%	60.88%	0.0783	0.0287
78.5	6,925	77.82%	47.82%	59.48%	0.0900	0.0336
79.5			45.79%	58.06%		
Sum of Squared Differences				[8]	0.5587	0.1905
Up to 1% of Beginning Exposures				[9]	0.0148	0.0072

[1] Age in years using half-year convention
[2] Dollars exposed to retirement at the beginning of each age interval
[3] Observed life table based on the Company's property records. These numbers form the original survivor curve
[4] The Company's selected Iowa curve to be fitted to the OLT.
[5] My selected Iowa curve to be fitted to the OLT
[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.
[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.
[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 353 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R2-55	[5] Cities R1-64	[6] ETI SSD	[7] Cities SSD
0.0	684,193,184	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	680,180,878	99.90%	99.91%	99.80%	0.0000	0.0000
1.5	551,092,920	99.81%	99.73%	99 39%	0.0000	0.0000
2.5	447,542,981	99.63%	99.54%	98 97%	0.0000	0.0000
3.5	425,772,801	99.21%	99.34%	98.54%	0.0000	0.0000
4.5	391,879,883	99.04%	99.12%	98.11%	0.0000	0.0001
5.5	372,479,979	98.75%	98.89%	97.66%	0.0000	0.0001
6 5	343,108,100	98.50%	98.65%	97.21%	0.0000	0.0002
7.5	327,217,507	97.64%	98.39%	96.75%	0.0001	0.0001
8.5	327,554,078	97.31%	98.12%	96.28%	0.0001	0.0001
9.5	314,699,082	97.02%	97.83%	95.80%	0.0001	0.0002
10.5	308,686,871	96.75%	97.53%	95.31%	0.0001	0.0002
11.5	286,802,478	96.41%	97.21%	94.81%	0.0001	0 0003
12.5	261,644,051	95.95%	96.87%	94.30%	0.0001	0.0003
13.5	252,533,226	95.19%	96.52%	93.79%	0.0002	0.0002
14.5	215,180,215	94.84%	96.14%	93.26%	0.0002	0.0002
15.5	183,878,962	94.16%	95.75%	92.73%	0.0003	0.0002
16.5	164,146,331	93.88%	95.33%	92.19%	0.0002	0.0003
17.5	159,391,398	93.33%	94.89%	91.64%	0.0002	0.0003
18.5	156,501,125	93.03%	94.43%	91.09%	0.0002	0.0004
19.5	156,282,854	92.08%	93.95%	90.52%	0.0003	0.0002
20.5	154,058,053	91.67%	93.44%	89.95%	0.0003	0.0003
21.5	146,544,410	91.05%	92.91%	89.37%	0.0003	0.0003
22.5	143,426,577	90.79%	92.35%	88.78%	0.0002	0.0004
23.5	141,542,526	90.11%	91.76%	88.18%	0.0003	0.0004
24.5	137,552,799	89.40%	91.15%	87.57%	0.0003	0.0003
25.5	134,045,864	88.98%	90.50%	86.95%	0.0002	0.0004
26.5	132,265,930	88.64%	89.83%	86.32%	0.0001	0.0005
27.5	132,160,702	88.29%	89.13%	85.68%	0.0001	0.0007
28.5	130,893,323	87.89%	88.39%	85.03%	0.0000	0.0008
29.5	134,655,746	87.23%	87.62%	84.37%	0.0000	0.0008
30.5	134,097,568	86.69%	86.81%	83.70%	0.0000	0.0009
31.5	113,878,374	85.75%	85.97%	83.01%	0.0000	0.0007
32.5	106,139,857	84.31%	85.10%	82.31%	0.0001	0.0004
33.5	95,097,374	83.76%	84.18%	81.61%	0.0000	0.0005
34.5	88,259,132	83.30%	83.23%	80.88%	0.0000	0.0006
35.5	76,297,788	82.85%	82.24%	80.15%	0.0000	0.0007
36.5	61,534,309	81.67%	81.20%	79.40%	0.0000	0.0005
37.5	58,340,191	81.15%	80.13%	78 64%	0.0001	0.0006
38.5	52,059,463	80.63%	79.01%	77.86%	0.0003	0.0008
39.5	50,178,014	80.02%	77.85%	77.07%	0.0005	0.0009
40.5	48,960,464	79.58%	76.64%	76.26%	0.0009	0.0011
41.5	45,504,484	78.24%	75.39%	75.44%	0.0008	0.0008
42.5	44,598,317	78.12%	74.09%	74.60%	0.0016	0 0012
43.5	43,529,521	77.70%	72.75%	73.75%	0.0025	0.0016
44.5	43,066,500	77.34%	71.36%	72.88%	0.0036	0.0020
45.5	37,590,190	76.86%	69.92%	71.99%	0.0048	0.0024
46.5	29,170,924	76.45%	68.43%	71.09%	0.0064	0.0029
47.5	27,449,928	75.96%	66.90%	70.18%	0.0082	0.0033
48.5	26,589,450	75.53%	65.32%	69.25%	0.0104	0.0039
49.5	24,112,471	74.87%	63.70%	68.30%	0 0125	0.0043
50.5	22,107,643	73.28%	62.03%	67.34%	0.0127	0.0035
51.5	20,774,759	72.72%	60 32%	66.36%	0.0154	0.0040
52.5	20,205,058	72.58%	58.57%	65.36%	0.0196	0.0052
53.5	19,393,329	72.25%	56.78%	64.35%	0.0239	0.0062
54.5	18,935,195	71.48%	54.95%	63.33%	0.0273	0.0066

Account 353 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R2-55	[5] Cities R1-64	[6] ETI SSD	[7] Cities SSD
55.5	16,706,054	69.27%	53.09%	62.29%	0.0262	0.0049
56.5	16,502,467	68.73%	51.20%	61.23%	0.0307	0.0056
57.5	15,116,169	68.43%	49.28%	60.16%	0.0367	0.0068
58.5	13,445,541	68.29%	47.33%	59.08%	0.0439	0.0085
59.5	12,505,983	68.04%	45.37%	57.98%	0.0514	0.0101
60.5	10,497,767	67.74%	43.40%	56.87%	0.0593	0.0118
61.5	8,375,823	67.62%	41.41%	55.75%	0.0687	0.0141
62.5	7,687,012	67.33%	39.42%	54.62%	0.0779	0.0162
63.5	5,751,848	67.33%	37.43%	53.47%	0.0894	0.0192
64.5	5,750,334	67.31%	35.45%	52.31%	0.1015	0.0225
65.5	4,354,613	67.17%	33.49%	51.15%	0.1134	0.0257
66.5	4,269,604	66.63%	31.54%	49.97%	0.1231	0.0278
67.5	4,063,361	66.50%	29.62%	48.79%	0.1360	0.0314
68.5	4,060,217	66.50%	27.73%	47.59%	0.1503	0.0357
69.5	4,006,752	66.48%	25.88%	46.39%	0.1648	0.0403
70.5	3,757,896	66.48%	24.08%	45.19%	0.1798	0.0453
71.5	3,757,896	66.48%	22.32%	43.98%	0.1950	0.0506
72.5	3,692,418	66.48%	20.62%	42.76%	0.2103	0.0563
73.5	3,167,938	66.28%	18.98%	41.54%	0.2238	0.0612
74.5	1,084,840	66.28%	17.40%	40.32%	0.2390	0.0674
75.5	1,064,840	66.28%	15.88%	39.09%	0.2540	0.0739
76.5	1,016,301	66.28%	14.44%	37.87%	0.2687	0.0807
77.5	1,016,301	66.28%	13.07%	36.64%	0.2832	0.0878
78.5	1,016,301	66.28%	11.77%	35.42%	0.2971	0.0952
79.5	1,051	66.28%	10.55%	34.20%	0.3106	0.1029
80.5	1,051	66.28%	9.40%	32.99%	0.3235	0.1109
81.5	1,051	66.28%	8.33%	31.77%	0.3358	0.1191
82.5	6,992	66.28%	7.33%	30.57%	0.3475	0.1275
83.5	6,992	66.28%	6.41%	29.37%	0.3585	0.1362
84.5	6,992	66.28%	5.56%	28.18%	0.3687	0.1451
85.5	6,992	66.28%	4.78%	27.01%	0.3783	0.1542
86.5			4.06%	25.84%		
Sum of Squared Differences				[8]	6.0026	**1.8592**
Up to 1% of Beginning Exposures				[9]	0.5503	**0.1422**

[1] Age in years using half-year convention
[2] Dollars exposed to retirement at the beginning of each age interval
[3] Observed life table based on the Company's property records. These numbers form the original survivor curve
[4] The Company's selected Iowa curve to be fitted to the OLT
[5] My selected Iowa curve to be fitted to the OLT
[6] = ([4] - [3])^2 This is the squared difference between each point on the Company's curve and the observed survivor curve.
[7] = ([5] - [3])^2 This is the squared difference between each point on my curve and the observed survivor curve.
[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit

Account 361 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R3-75	[5] Cities R2.5-83	[6] ETI SSD	[7] Cities SSD
0.0	12,296,822	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	12,556,062	99.88%	99.99%	99.97%	0.0000	0.0000
1.5	7,006,924	99.88%	99.97%	99.90%	0.0000	0.0000
2.5	4,971,977	99.86%	99.94%	99.83%	0.0000	0.0000
3.5	5,591,731	99.86%	99.92%	99.75%	0.0000	0.0000
4.5	5,637,057	99.86%	99.88%	99.67%	0.0000	0.0000
5.5	5,703,870	99.77%	99.85%	99.59%	0.0000	0.0000
6.5	5,184,937	99.75%	99.81%	99.50%	0.0000	0.0000
7.5	5,018,756	99.63%	99.77%	99.41%	0.0000	0.0000
8.5	4,757,259	99.63%	99.73%	99.31%	0.0000	0.0000
9.5	4,745,361	99.56%	99.67%	99.21%	0 0000	0.0000
10.5	4,930,992	99.54%	99.62%	99.11%	0.0000	0.0000
11.5	5,149,382	99.40%	99.56%	98.99%	0.0000	0.0000
12.5	4,633,698	99.39%	99.49%	98.88%	0.0000	0.0000
13.5	5,800,447	99.26%	99.42%	98.75%	0.0000	0.0000
14.5	5,104,299	99.16%	99.34%	98.63%	0.0000	0.0000
15.5	4,330,683	98.90%	99.25%	98.49%	0.0000	0.0000
16.5	3,718,378	98.65%	99.16%	98.35%	0.0000	0.0000
17.5	2,601,749	98.52%	99.06%	98.20%	0.0000	0.0000
18.5	2,044,155	95.24%	98.95%	98.05%	0.0014	0.0008
19.5	1,926,740	95.10%	98.83%	97.89%	0.0014	0.0008
20.5	2,159,217	95.10%	98.70%	97.72%	0.0013	0.0007
21.5	2,164,257	95.10%	98.56%	97.54%	0.0012	0.0006
22.5	2,164,724	95.10%	98.41%	97.35%	0.0011	0.0005
23.5	2,140,182	94.93%	98.25%	97.16%	0.0011	0.0005
24.5	2,069,290	94.61%	98.08%	96.95%	0.0012	0.0005
25.5	1,860,852	94.01%	97.90%	96.74%	0.0015	0.0007
26.5	2,029,055	93.93%	97.70%	96.52%	0.0014	0.0007
27.5	2,016,494	93.93%	97.49%	96.29%	0.0013	0.0006
28.5	2,103,461	93.91%	97.26%	96.05%	0.0011	0.0005
29.5	2,195,433	93.82%	97.02%	95.79%	0.0010	0.0004
30.5	2,420,113	93.58%	96.76%	95.53%	0.0010	0.0004
31.5	2,493,703	93.14%	96.49%	95.26%	0.0011	0.0004
32.5	2,312,025	92.89%	96.20%	94.97%	0.0011	0.0004
33.5	2,448,945	92.80%	95.89%	94.67%	0.0010	0.0003
34.5	2,327,976	92.63%	95.57%	94.36%	0.0009	0.0003
35.5	2,012,350	92.29%	95.22%	94.04%	0.0009	0.0003
36.5	1,784,608	91.70%	94.85%	93.70%	0.0010	0.0004
37.5	1,382,771	91.40%	94.47%	93.35%	0.0009	0.0004
38.5	1,345,319	91.40%	94.05%	92.98%	0.0007	0.0002
39.5	1,302,364	91.40%	93.62%	92.60%	0.0005	0.0001
40.5	1,313,465	91.40%	93.17%	92.21%	0.0003	0.0001
41.5	1,245,310	91.40%	92.69%	91.80%	0.0002	0.0000
42.5	1,215,293	91.32%	92.18%	91.37%	0.0001	0.0000
43.5	1,023,420	91.31%	91.65%	90.92%	0.0000	0.0000
44.5	919,082	91.19%	91.09%	90.46%	0.0000	0.0001
45.5	717,964	91.17%	90.50%	89.99%	0.0000	0.0001
46.5	590,133	90.71%	89.88%	89.49%	0.0001	0.0001
47.5	559,244	90.68%	89.23%	88.98%	0.0002	0.0003
48.5	533,260	88.35%	88.55%	88.44%	0.0000	0.0000
49.5	496,175	88.33%	87.84%	87.89%	0.0000	0.0000

Account 361 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**ETI R3-75**	**Cities R2.5-83**	**ETI SSD**	**Cities SSD**
50.5	469,199	87.94%	87.09%	87.32%	0.0001	0.0000
51.5	462,820	87.94%	86.31%	86.73%	0.0003	0.0001
52.5	446,096	87.11%	85.49%	86.11%	0.0003	0.0001
53.5	402,534	82.27%	84.63%	85.47%	0.0006	0.0010
54.5	399,788	82.27%	83.73%	84.82%	0.0002	0.0006
55.5	380,991	81.45%	82.80%	84.13%	0.0002	0.0007
56.5	366,593	81.45%	81.81%	83.43%	0.0000	0.0004
57.5	358,648	81.25%	80.79%	82.70%	0.0000	0.0002
58.5	149,683	81.25%	79.72%	81.94%	0.0002	0.0000
59.5	140,777	79.66%	78.60%	81.16%	0.0001	0.0002
60.5	123,610	79.38%	77.43%	80.36%	0.0004	0.0001
61.5	129,134	79.38%	76.22%	79.53%	0.0010	0.0000
62.5	129,134	79.38%	74.95%	78.67%	0.0020	0.0001
63.5	124,834	79.38%	73.64%	77.78%	0.0033	0.0003
64.5	121,767	78.43%	72.27%	76.86%	0.0038	0.0002
65.5	55,682	78.43%	70.84%	75.92%	0.0058	0.0006
66.5	42,049	78.43%	69.37%	74.94%	0.0082	0.0012
67.5	41,889	78.13%	67.84%	73.93%	0.0106	0.0018
68.5	41,889	78.13%	66.26%	72.90%	0.0141	0.0027
69.5	39,784	78.13%	64.62%	71.83%	0.0183	0.0040
70.5	39,383	78.13%	62.93%	70.73%	0.0231	0.0055
71.5	39,383	78.13%	61.19%	69.60%	0.0287	0.0073
72.5	31,412	78.13%	59.40%	68.44%	0.0351	0.0094
73.5	27,545	78.13%	57.57%	67.24%	0.0423	0.0119
74.5	7,228	78.13%	55.69%	66.02%	0.0503	0.0147
75.5	7,228	78.13%	53.77%	64.76%	0.0593	0.0179
76.5			51.82%	63.47%		
Sum of Squared Differences				[8]	0.3331	**0.0926**
Up to 1% of Beginning Exposures				[9]	0.0336	**0.0155**

[1] Age in years using half-year convention
[2] Dollars exposed to retirement at the beginning of each age interval
[3] Observed life table based on the Company's property records. These numbers form the original survivor curve
[4] The Company's selected Iowa curve to be fitted to the OLT.
[5] My selected Iowa curve to be fitted to the OLT
[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve
[7] = ([5] - [3])^2 This is the squared difference between each point on my curve and the observed survivor curve
[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 366 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R3-50	[5] Cities L0.5-60	[6] ETI SSD	[7] Cities SSD
0.0	32,190,852	100.00%	100 00%	100.00%	0.0000	0.0000
0.5	30,647,785	99.74%	99.98%	99.92%	0.0000	0 0000
1.5	27,945,043	99.22%	99.95%	99.70%	0.0001	0.0000
2.5	6,124,849	99.04%	99.91%	99.42%	0.0001	0.0000
3.5	6,780,910	98 21%	99.86%	99.09%	0.0003	0.0001
4.5	17,721,947	96.98%	99.80%	98.72%	0.0008	0.0003
5.5	17,526,828	96.46%	99.74%	98.30%	0.0011	0.0003
6.5	17,880,455	95.57%	99.66%	97.85%	0.0017	0.0005
7.5	22,355,531	94.63%	99 57%	97.36%	0 0024	0.0007
8.5	20,847,963	94.02%	99.47%	96.83%	0.0030	0.0008
9 5	19,076,107	93.54%	99.36%	96.27%	0 0034	0.0007
10.5	18,020,521	92.93%	99.23%	95.68%	0.0040	0.0008
11.5	18,114,039	92.39%	99.09%	95.05%	0.0045	0.0007
12.5	17,431,166	92.08%	98.92%	94.39%	0.0047	0.0005
13.5	17,204,960	91.64%	98.73%	93.69%	0 0050	0.0004
14.5	16,676,535	91.14%	98.53%	92.97%	0.0055	0.0003
15 5	16,854,102	90 37%	98.29%	92.21%	0.0063	0.0003
16.5	16,819,407	89.28%	98.04%	91.42%	0.0077	0.0005
17.5	15,114,398	88.40%	97.75%	90.61%	0.0087	0.0005
18.5	14,845,907	87.57%	97.43%	89.76%	0.0097	0.0005
19.5	14,768,087	86.96%	97.08%	88.88%	0.0102	0.0004
20.5	14,737,192	86.54%	96.70%	87 97%	0.0103	0.0002
21.5	15,172,657	86.22%	96.28%	87.04%	0.0101	0.0001
22 5	14,298,929	85 32%	95.81%	86.08%	0.0110	0.0001
23.5	13,395,809	85.03%	95.31%	85.10%	0.0106	0.0000
24.5	11,959,346	84.45%	94 76%	84.10%	0.0106	0 0000
25.5	11,410,309	83.80%	94.16%	83.07%	0.0107	0.0001
26.5	10,234,243	83.28%	93.51%	82.02%	0.0105	0.0002
27 5	8,957,997	82.59%	92.81%	80.96%	0.0104	0.0003
28.5	8,559,280	82.30%	92.05%	79.88%	0.0095	0.0006
29.5	8,128,667	82.06%	91 23%	78.78%	0.0084	0 0011
30.5	8,277,459	81.85%	90.35%	77.67%	0.0072	0.0017
31.5	7,578,879	81.61%	89.40%	76.56%	0.0061	0 0026
32.5	5,801,178	81.03%	88.38%	75.43%	0.0054	0.0031
33.5	4,260,649	80.76%	87.28%	74 30%	0.0043	0.0042
34.5	3,128,317	80.44%	86.11%	73.16%	0.0032	0.0053
35.5	2,217,751	80.03%	84.85%	72.03%	0.0023	0.0064
36.5	1,862,759	79.53%	83.51%	70.89%	0.0016	0.0075
37.5	1,716,137	78.98%	82.07%	69 75%	0.0010	0.0085
38.5	1,682,943	78.43%	80.53%	68.61%	0.0004	0.0096
39 5	1,587,473	77 87%	78 89%	67 48%	0.0001	0.0108
40.5	1,500,434	77.33%	77.14%	66.35%	0.0000	0.0121
41.5	1,025,384	76.55%	75.28%	65.22%	0.0002	0.0128
42.5	968,559	73.54%	73.30%	64.09%	0.0000	0.0089
43.5	864,987	70.83%	71.21%	62.97%	0 0000	0.0062
44 5	814,384	66.37%	68.99%	61 85%	0.0007	0.0020
45.5	678,297	59.21%	66 66%	60.74%	0.0056	0.0002
46.5	539,163	46.77%	64.20%	59.63%	0.0304	0.0165
47.5	448,634	39.33%	61.63%	58.52%	0.0498	0.0368
48.5	363,734	32.26%	58.95%	57.42%	0.0713	0.0633
49.5	285,812	25.14%	56.17%	56.32%	0.0963	0.0972
50.5	216,251	19.34%	53.29%	55.23%	0.1153	0.1288
51.5	167,240	14.81%	50.34%	54.15%	0.1262	0.1548
52 5	148,843	13.05%	47.32%	53.07%	0.1174	0.1602
53.5	141,973	10 71%	44 25%	52 00%	0.1125	0.1705
54.5	142,871	9.36%	41.16%	50.94%	0.1012	0.1729
55.5	150,945	8.69%	38.07%	49.88%	0.0863	0.1697
56.5	160,149	8.23%	35 00%	48.84%	0.0717	0.1649

Account 366 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**ETI R3-50**	**Cities L0.5-60**	**ETI SSD**	**Cities SSD**
57.5	168,712	7.83%	31.98%	47.80%	0.0583	0.1597
58.5	176,722	7.50%	29.03%	46.76%	0.0464	0.1542
59.5	183,964	7.23%	26.17%	45.74%	0.0359	0.1483
60.5	190,235	7.01%	23.42%	44.73%	0.0269	0.1423
61.5	186,050	6.81%	20.81%	43.72%	0.0196	0.1363
62.5	182,032	6.63%	18.35%	42.73%	0.0137	0.1303
63.5	177,817	6.45%	16.05%	41.74%	0.0092	0.1245
64.5	154,558	5.58%	13.92%	40.77%	0.0070	0.1238
65.5	131,999	4.75%	11.97%	39.80%	0.0052	0.1228
66.5	109,659	3.94%	10.20%	38.84%	0.0039	0.1218
67.5	87,638	3.14%	8.60%	37.90%	0.0030	0.1208
68.5	65,283	2.33%	7.17%	36.97%	0.0023	0.1200
69.5	42,485	1.51%	5.91%	36.04%	0.0019	0.1193
70.5	19,523	0.69%	4.80%	35.13%	0.0017	0.1186
71.5	5,142	0.18%	3.84%	34 23%	0.0013	0.1160
72.5	4,056	0.14%	3.01%	33.35%	0.0008	0.1103
73.5	3,148	0.10%	2.31%	32.47%	0.0005	0.1048
74.5	2,426	0.08%	1.72%	31.60%	0.0003	0.0994
75.5	1,883	0.06%	1.24%	30.75%	0.0001	0 0942
76 5	1,497	0.05%	0.86%	29.91%	0.0001	0.0892
77.5	1,235	0.04%	0.56%	29.09%	0.0000	0.0844
78.5	1,039	0.03%	0.34%	28.27%	0.0000	0.0798
79.5	872	0.02%	0.19%	27.47%	0.0000	0.0754
80.5	720	0.02%	0.09%	26.68%	0.0000	0.0711
81.5	589	0.02%	0 04%	25.91%	0.0000	0.0670
82 5	477	0.01%	0.01%	25 14%	0.0000	0.0632
83.5	385	0.01%	0.00%	24.39%	0 0000	0.0595
84.5	309	0.01%	0.00%	23.66%	0.0000	0.0559
85.5	240	0.01%	0.00%	22.93%	0.0000	0.0526
86.5	176	0.01%	0.00%	22.22%	0.0000	0.0493
87.5	114	0.00%	0.00%	21.53%	0.0000	0 0463
88.5	63	0.00%	0.00%	20.84%	0.0000	0.0435
89.5	24	0.00%	0.00%	20.18%	0.0000	0.0407
90.5			0.00%	19.52%		
Sum of Squared Differences				[8]	1.4358	4.6936
Up to 1% of Beginning Exposures				[9]	0.3706	0.2296

[1] Age in years using half-year convention
[2] Dollars exposed to retirement at the beginning of each age interval
[3] Observed life table based on the Company's property records These numbers form the original survivor curve
[4] The Company's selected Iowa curve to be fitted to the OLT
[5] My selected Iowa curve to be fitted to the OLT
[6] = ([4] - [3])^2 This is the squared difference between each point on the Company's curve and the observed survivor curve.
[7] = ([5] - [3])^2 This is the squared difference between each point on my curve and the observed survivor curve
[8] = Sum of squared differences The smallest SSD represents the best mathematical fit

Account 367 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R2-36	[5] Cities R1-42	[6] ETI SSD	[7] Cities SSD
0.0	136,075,295	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	136,875,495	99.93%	99.87%	99.69%	0.0000	0.0000
1.5	133,731,542	99.57%	99.58%	99.06%	0.0000	0.0000
2.5	123,368,733	98.74%	99.27%	98.41%	0.0000	0.0000
3.5	120,264,797	97 74%	98.93%	97.74%	0.0001	0.0000
4.5	126,277,489	97.00%	98.56%	97.05%	0.0002	0.0000
5.5	121,851,007	95.97%	98.15%	96.33%	0.0005	0.0000
6.5	117,845,241	94.76%	97.71%	95.60%	0.0009	0.0001
7.5	127,842,364	94.33%	97.22%	94.85%	0.0008	0.0000
8.5	120,072,268	93.70%	96.70%	94.07%	0.0009	0.0000
9.5	114,192,891	93.12%	96.14%	93.28%	0.0009	0.0000
10.5	107,790,493	92.59%	95.52%	92.46%	0.0009	0.0000
11.5	105,041,870	92.15%	94.86%	91.63%	0.0007	0.0000
12.5	102,026,197	91.69%	94.14%	90.78%	0.0006	0.0001
13.5	98,029,017	91.08%	93.37%	89.91%	0.0005	0.0001
14.5	94,507,000	90.52%	92.54%	89.02%	0.0004	0.0002
15.5	91,094,116	89.76%	91.65%	88.10%	0.0004	0.0003
16.5	84,082,765	88.90%	90.69%	87.17%	0.0003	0.0003
17.5	80,109,863	87.99%	89.67%	86.21%	0.0003	0.0003
18.5	73,344,726	86.89%	88.57%	85.23%	0.0003	0.0003
19.5	70,718,961	86.10%	87.39%	84.23%	0.0002	0.0004
20.5	66,911,444	85.31%	86.13%	83.19%	0.0001	0.0004
21.5	61,243,278	84.52%	84.78%	82.13%	0.0000	0.0006
22.5	54,307,614	83.58%	83.35%	81.04%	0.0000	0.0006
23.5	48,300,596	82.53%	81.83%	79.92%	0.0000	0.0007
24.5	43,233,678	81.13%	80.21%	78.76%	0.0001	0.0006
25.5	39,650,615	79.67%	78.48%	77.58%	0.0001	0.0004
26.5	35,133,461	78.35%	76.66%	76.36%	0.0003	0.0004
27.5	31,455,528	76.94%	74.73%	75.10%	0.0005	0.0003
28.5	29,243,469	75.99%	72.69%	73.81%	0.0011	0.0005
29.5	27,644,721	75.21%	70.54%	72.48%	0.0022	0.0007
30.5	26,580,967	74.34%	68.28%	71.12%	0.0037	0.0010
31.5	24,556,228	73.56%	65.92%	69.72%	0.0058	0.0015
32.5	20,868,992	72.79%	63.45%	68.28%	0.0087	0.0020
33.5	16,349,065	71.52%	60.87%	66.80%	0.0113	0.0022
34.5	13,203,043	69.30%	58.20%	65.29%	0.0123	0.0016
35.5	9,358,288	65.83%	55.44%	63.74%	0.0108	0.0004
36.5	8,213,877	65.10%	52.59%	62.16%	0.0156	0.0009
37.5	7,452,537	64.47%	49.68%	60.55%	0.0219	0.0015
38.5	6,847,943	63.96%	46.71%	58.90%	0.0298	0.0026
39.5	5,953,783	63.34%	43.70%	57.22%	0.0386	0.0037
40.5	5,078,997	62.76%	40.66%	55.51%	0.0488	0.0053
41.5	3,770,970	53.90%	37.63%	53.77%	0.0265	0.0000
42.5	3,357,349	48.05%	34.60%	52.01%	0.0181	0.0016
43.5	2,423,196	36.17%	31.62%	50.22%	0.0021	0.0198
44.5	1,929,702	32.33%	28.70%	48.42%	0.0013	0.0259
45.5	1,491,621	25.81%	25.86%	46.59%	0.0000	0.0432
46.5	1,041,643	18.91%	23.12%	44.76%	0.0018	0.0668
47.5	918,184	16.68%	20.50%	42.90%	0.0015	0.0688
48.5	768,212	13.97%	18.02%	41.04%	0.0016	0.0733
49.5	638,423	11.62%	15.70%	39.18%	0.0017	0.0760
50.5	519,221	9.45%	13.54%	37.31%	0.0017	0.0776
51.5	405,965	7.39%	11.54%	35.45%	0.0017	0.0787
52.5	317,339	5.78%	9.73%	33.59%	0.0016	0.0774

Account 367 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R2-36	[5] Cities R1-42	[6] ETI SSD	[7] Cities SSD
53.5	264,945	4.82%	8.09%	31.75%	0.0011	0.0725
54.5	225,272	4.10%	6.62%	29.91%	0.0006	0.0666
55.5	201,812	3.67%	5 32%	28.10%	0.0003	0.0597
56.5	183,815	3.35%	4.18%	26.31%	0.0001	0.0527
57.5	169,413	3.08%	3.21%	24.55%	0.0000	0.0461
58.5	151,060	2.75%	2.38%	22 82%	0.0000	0.0403
59.5	140,914	2.57%	1.69%	21.13%	0.0001	0.0344
60.5	120,865	2.20%	1.13%	19.47%	0.0001	0.0298
61.5	72,267	1.32%	0.71%	17.87%	0.0000	0.0274
62.5	57,865	1.05%	0.40%	16.31%	0.0000	0.0233
63.5	45,129	0.82%	0.19%	14.81%	0.0000	0.0196
64.5	33,392	0.61%	0.07%	13.37%	0.0000	0.0163
65.5	26,137	0.48%	0.01%	11.99%	0.0000	0.0132
66.5	19,623	0.36%	0.00%	10.68%	0.0000	0.0106
67.5	14,604	0.27%	0.00%	9.44%	0.0000	0.0084
68.5	9,818	0.18%	0.00%	8.27%	0.0000	0.0065
69.5	5,512	0.10%	0.00%	7.17%	0.0000	0.0050
70.5	2,187	0.04%	0.00%	6.16%	0.0000	0.0037
71.5	1	0.00%	0.00%	5.23%	0.0000	0.0027
72.5	1	0.00%	0.00%	4.38%	0.0000	0.0019
73.5	1	0.00%	0.00%	3.61%	0.0000	0.0013
74.5	1	0.00%	0.00%	2.93%	0.0000	0.0009
75.5	1	0.00%	0.00%	2.33%	0.0000	0.0005
76.5	1	0.00%	0.00%	1.81%	0.0000	0.0003
77.5	1	0.00%	0.00%	1.37%	0.0000	0.0002
78.5	1	0.00%	0.00%	1.00%	0.0000	0.0001
79.5	1	0.00%	0.00%	0.69%	0.0000	0.0000
80.5	1	0.00%	0.00%	0.44%	0.0000	0.0000
81.5	1	0.00%	0.00%	0.24%	0.0000	0.0000
82.5	1	0.00%	0.00%	0.10%	0.0000	0.0000
83.5			0.00%	0.02%		
Sum of Squared Differences				[8]	0.2826	1.1836
Up to 1% of Beginning Exposures				[9]	0.2704	**0.1875**

[1] Age in years using half-year convention
[2] Dollars exposed to retirement at the beginning of each age interval
[3] Observed life table based on the Company's property records These numbers form the original survivor curve
[4] The Company's selected Iowa curve to be fitted to the OLT
[5] My selected Iowa curve to be fitted to the OLT.
[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.
[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve
[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit

Account 371 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R1.5-40	[5] Cities R4-56	[6] ETI SSD	[7] Cities SSD
0.0	21,523,826	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	21,305,135	100.00%	99.78%	100.00%	0.0000	0.0000
1.5	20,145,202	99.98%	99.32%	100.00%	0.0000	0.0000
2.5	19,393,696	99.94%	98.84%	100.00%	0.0001	0.0000
3.5	18,591,894	99.90%	98.33%	99.99%	0.0002	0.0000
4.5	28,860,367	99.88%	97.81%	99.99%	0.0004	0.0000
5.5	30,140,199	99.82%	97.25%	99.98%	0.0007	0.0000
6.5	28,785,539	99.76%	96.68%	99.98%	0.0010	0.0000
7.5	27,453,080	99.71%	96.07%	99.97%	0.0013	0.0000
8.5	27,920,159	99.66%	95.44%	99.96%	0.0018	0.0000
9.5	28,838,359	99.62%	94.78%	99.95%	0.0023	0.0000
10.5	28,337,746	99.59%	94.10%	99.93%	0.0030	0.0000
11.5	28,030,569	99.42%	93.38%	99.91%	0.0036	0.0000
12.5	27,708,219	99.32%	92.63%	99.89%	0.0045	0.0000
13.5	27,063,200	99.07%	91.85%	99.87%	0.0052	0.0001
14.5	25,970,876	98.90%	91.04%	99.83%	0.0062	0.0001
15.5	25,096,390	98.72%	90.19%	99.79%	0.0073	0.0001
16.5	24,391,426	98.54%	89.31%	99.75%	0.0085	0.0001
17.5	23,788,275	98.37%	88.39%	99.69%	0.0100	0.0002
18.5	22,936,523	98.17%	87.42%	99.62%	0.0115	0.0002
19.5	21,732,274	98.00%	86.42%	99.54%	0.0134	0.0002
20.5	20,120,227	97.86%	85.36%	99.45%	0.0156	0.0003
21.5	18,491,370	97.71%	84.26%	99.34%	0.0181	0.0003
22.5	16,831,142	97.55%	83.11%	99.21%	0.0208	0.0003
23.5	15,680,117	97.35%	81.91%	99.06%	0.0238	0.0003
24.5	14,505,590	97.11%	80.66%	98.88%	0.0271	0.0003
25.5	13,731,036	96.89%	79.35%	98.68%	0.0308	0.0003
26.5	12,906,150	96.65%	77.98%	98.45%	0.0349	0.0003
27.5	12,170,009	96.32%	76.55%	98.19%	0.0391	0.0003
28 5	11,426,380	95.92%	75.06%	97.88%	0.0435	0.0004
29.5	10,729,172	95.51%	73.51%	97.54%	0.0484	0.0004
30.5	10,133,524	94.21%	71.89%	97.15%	0.0498	0.0009
31.5	8,578,557	91.97%	70.22%	96.71%	0.0473	0.0022
32.5	7,817,066	91.44%	68.47%	96.21%	0.0527	0.0023
33.5	7,352,022	90.79%	66.67%	95.65%	0.0582	0.0024
34.5	6,827,109	90.18%	64.80%	95.03%	0.0644	0.0024
35.5	6,387,799	89.56%	62.87%	94.34%	0.0713	0.0023
36.5	5,471,634	88.90%	60.87%	93.57%	0.0786	0.0022
37.5	5,086,899	88.23%	58.82%	92.72%	0.0865	0.0020
38.5	4,522,723	87.47%	56.71%	91.78%	0.0946	0.0019
39.5	4,095,510	86.55%	54.56%	90.75%	0.1024	0.0018
40.5	3,522,762	85.81%	52.35%	89.63%	0.1120	0.0015
41.5	3,088,398	85.27%	50.10%	88.41%	0.1237	0.0010
42.5	2,800,301	84.54%	47.82%	87.08%	0.1348	0.0006
43.5	2,487,042	83.80%	45.51%	85.64%	0.1466	0.0003
44.5	2,171,885	83.46%	43.19%	84.09%	0.1622	0.0000
45.5	1,943,630	83.08%	40.84%	82.42%	0.1784	0.0000
46.5	1,617,721	82.94%	38.50%	80.65%	0.1975	0.0005
47.5	1,400,389	82.92%	36.17%	78.75%	0.2186	0.0017
48.5	1,154,222	82 91%	33.85%	76.71%	0.2407	0.0038
49.5	1,115,988	82.90%	31.56%	74.53%	0.2636	0.0070
50.5	1,020,657	82.90%	29.31%	72.17%	0.2872	0.0115
51.5	956,346	82.90%	27.11%	69.61%	0.3113	0.0177
52.5	873,392	82.90%	24.96%	66.82%	0.3357	0.0259
53.5	794,145	82.08%	22.88%	63.81%	0.3504	0.0334

Account 371 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] ETI R1.5-40	[5] Cities R4-56	[6] ETI SSD	[7] Cities SSD
54.5	685,032	80.77%	20.88%	60.59%	0.3587	0.0407
55.5	562,109	76.86%	18.96%	57.16%	0.3353	0.0388
56.5	451,207	61.41%	17.12%	53.55%	0.1962	0.0062
57.5	344,898	46.74%	15.38%	49.80%	0.0984	0.0009
58.5	255,280	34.53%	13.73%	45.95%	0.0433	0.0130
59.5	231,159	31.16%	12.18%	42.06%	0.0360	0.0119
60.5	193,871	25.93%	10.73%	38.18%	0.0231	0.0150
61.5	193,118	25.90%	9.38%	34.35%	0.0273	0.0071
62.5	168,533	22.20%	8.14%	30.64%	0.0198	0.0071
63.5	148,218	19.06%	6.99%	27.07%	0.0146	0.0064
64.5	119,420	15.16%	5.95%	23.68%	0.0085	0.0073
65.5	91,059	11.55%	5.00%	20.51%	0.0043	0.0080
66.5	72,456	9.10%	4.16%	17.58%	0.0024	0.0072
67.5	46,467	5.90%	3.41%	14.89%	0.0006	0.0081
68.5	26,958	3.36%	2.76%	12.46%	0.0000	0.0083
69.5	17,953	2.25%	2.19%	10.27%	0.0000	0.0064
70.5	13,745	1.71%	1.72%	8.34%	0.0000	0.0044
71.5	11,914	1.46%	1.33%	6.66%	0.0000	0.0027
72.5	10,846	1.31%	1.01%	5.21%	0.0000	0.0015
73.5	9,344	1.14%	0.75%	3.97%	0.0000	0.0008
74.5	9,150	1.12%	0.55%	2.94%	0.0000	0.0003
75.5	7,233	0.88%	0.38%	2.11%	0.0000	0.0002
76.5	4,293	0.53%	0.24%	1.45%	0.0000	0.0001
77.5	2,282	0.28%	0.13%	0.94%	0.0000	0.0000
78.5	1,466	0.18%	0.06%	0.57%	0.0000	0.0000
79.5	694	0.09%	0.01%	0.32%	0.0000	0.0000
80.5	694	0.09%	0.00%	0.16%	0.0000	0.0000
81.5	403	0.05%	0.00%	0.07%	0.0000	0.0000
82.5	345	0.04%	0.00%	0.02%	0.0000	0.0000
83.5	258	0.03%	0.00%	0.00%	0.0000	0.0000
84.5	136	0.02%	0.00%	0.00%	0.0000	0.0000
85.5			0.00%	0.00%		
Sum of Squared Differences				[8]	5.3199	**0.3321**
Up to 1% of Beginning Exposures				[9]	5.2193	**0.2411**

[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

ETI

Electric Division

352.00 Structures and Improvements

Observed Life Table

Retirement Expr. 1967 TO 2017
Placement Years 1938 TO 2017

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
0.0 - 0.5	$35,044,581.32	$608.06	0.00002	100.00
0.5 - 1.5	$27,662,104.25	$150,566.00	0.00544	100.00
1.5 - 2.5	$21,099,305.78	$6,528.07	0.00031	99.45
2.5 - 3.5	$20,107,971.76	$20,229.72	0.00101	99.42
3.5 - 4.5	$18,173,598.96	$39,332.00	0.00216	99.32
4.5 - 5.5	$17,610,080.15	$8,894.25	0.00051	99.11
5.5 - 6.5	$20,389,533.98	$339.00	0.00002	99.06
6.5 - 7.5	$19,981,812.44	$26,614.69	0.00133	99.06
7.5 - 8.5	$18,125,352.68	$1,443.34	0.00008	98.92
8.5 - 9.5	$17,792,042.50	$7,831.16	0.00044	98.92
9.5 - 10.5	$17,319,292.48	$21,067.94	0.00122	98.87
10.5 - 11.5	$17,106,508.59	$1,106.16	0.00006	98.75
11.5 - 12.5	$14,935,566.04	$205.77	0.00001	98.75
12.5 - 13.5	$13,084,223.88	$5,807.59	0.00044	98.75
13.5 - 14.5	$12,787,476.13	$6,254.06	0.00049	98.70
14.5 - 15.5	$9,327,997.70	$10,636.64	0.00114	98.65
15.5 - 16.5	$5,707,993.47	$19,520.10	0.00342	98.54
16.5 - 17.5	$5,523,013.45	$27,039.84	0.00490	98.20
17.5 - 18.5	$6,916,408.33	$10,989.09	0.00159	97.72
18.5 - 19.5	$6,864,233.42	$11,475.77	0.00167	97.57
19.5 - 20.5	$6,814,606.09	$23,619.91	0.00347	97.40
20.5 - 21.5	$6,784,571.36	$21,994.07	0.00324	97.07
21.5 - 22.5	$6,475,162.42	$8,904.78	0.00138	96.75
22.5 - 23.5	$6,456,532.26	$30,893.07	0.00478	96.62
23.5 - 24.5	$6,312,519.32	$948.29	0.00015	96.16
24.5 - 25.5	$5,844,663.24	$16,963.84	0.00290	96.14
25.5 - 26.5	$5,830,887.61	$4,220.86	0.00072	95.86
26.5 - 27.5	$5,719,855.87	$9,564.31	0.00167	95.79
27.5 - 28.5	$5,594,389.60	$36,965.69	0.00661	95.63
28.5 - 29.5	$5,559,217.16	$18,072.22	0.00325	95.00
29.5 - 30.5	$5,489,843.60	$16,031.56	0.00292	94.69
30.5 - 31.5	$5,526,246.78	$10,975.14	0.00199	94.42
31.5 - 32.5	$5,351,237.65	$2,304.00	0.00043	94.23
32.5 - 33.5	$5,160,592.34	$22,824.12	0.00442	94.19
33.5 - 34.5	$5,069,221.39	$27,413.89	0.00541	93.77
34 5 - 35.5	$4,872,787.04	$6,104.38	0.00125	93.26
35.5 - 36.5	$4,158,959.87	$691.16	0.00017	93.15

ETI
Electric Division
352.00 Structures and Improvements
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1938 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$2,043,255.67	$28,844.85	0.01412	93.13
37.5 - 38.5	$1,878,212.38	$3,396.32	0.00181	91.82
38.5 - 39.5	$1,876,169.02	$5,034.56	0.00268	91.65
39.5 - 40.5	$1,835,664.71	$2,997.14	0.00163	91.41
40.5 - 41.5	$1,806,827.57	$5,724.79	0.00317	91.26
41.5 - 42.5	$1,742,670.34	$1,630.56	0.00094	90.97
42.5 - 43.5	$1,873,883.29	$355.59	0.00019	90.88
43.5 - 44.5	$1,832,367.05	$16,297.56	0.00889	90.86
44.5 - 45.5	$1,720,896.96	$9,656.59	0.00561	90.06
45.5 - 46.5	$1,535,797.49	$3,582.90	0.00233	89.55
46.5 - 47.5	$1,376,974.44	$3,227.40	0.00234	89.34
47.5 - 48.5	$1,367,003.99	$1,191.84	0.00087	89.13
48.5 - 49.5	$1,235,848.45	$21,979.54	0.01778	89.06
49.5 - 50.5	$1,148,467.90	$633.05	0.00055	87.47
50.5 - 51.5	$1,110,632.48	$730.57	0.00066	87.42
51.5 - 52.5	$1,047,060.45	$7,492.94	0.00716	87.37
52.5 - 53.5	$990,013.99	$9,920.11	0.01002	86.74
53.5 - 54.5	$935,012.25	$14,251.13	0.01524	85.87
54.5 - 55.5	$936,317.75	$0.00	0.00000	84.56
55.5 - 56.5	$744,148.01	$17,285.08	0.02323	84.56
56.5 - 57.5	$683,340.23	$210.00	0.00031	82.60
57.5 - 58.5	$590,269.41	$13,738.74	0.02328	82.57
58.5 - 59.5	$536,787.71	$3,000.00	0.00559	80.65
59.5 - 60.5	$488,980.15	$0.00	0.00000	80.20
60.5 - 61.5	$447,178.55	$1,550.00	0.00347	80.20
61.5 - 62.5	$295,588.43	$1,113.30	0.00377	79.92
62.5 - 63.5	$286,628.05	$9,029.07	0.03150	79.62
63.5 - 64.5	$222,418.14	$500.19	0.00225	77.11
64.5 - 65.5	$192,940.40	$0.00	0.00000	76.94
65.5 - 66.5	$120,538.67	$0.00	0.00000	76.94
66.5 - 67.5	$119,653.40	$0.00	0.00000	76.94
67.5 - 68.5	$98,495.56	$1,335.00	0.01355	76.94
68.5 - 69.5	$90,474.07	$0.00	0.00000	75.90
69.5 - 70.5	$88,151.90	$0.00	0.00000	75.90
70.5 - 71.5	$87,474.55	$187.70	0.00215	75.90
71.5 - 72.5	$78,943.31	$0.00	0.00000	75.73
72.5 - 73.5	$78,943.31	$0.00	0.00000	75.73

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Electric Division

352.00 Structures and Improvements

Observed Life Table

Retirement Expr. 1967 TO 2017
Placement Years 1938 TO 2017

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
73.5 - 74.5	$39,947.18	$0.00	0.00000	75.73
74.5 - 75.5	$7,719.41	$0.00	0.00000	75.73
75.5 - 76.5	$7,719.41	$0.00	0.00000	75.73
76.5 - 77.5	$7,719.41	$0.00	0.00000	75.73
77.5 - 78.5	$7,719.41	$0 00	0.00000	75.73
78.5 - 79.5	$6,924.56	$0.00	0.00000	75.73

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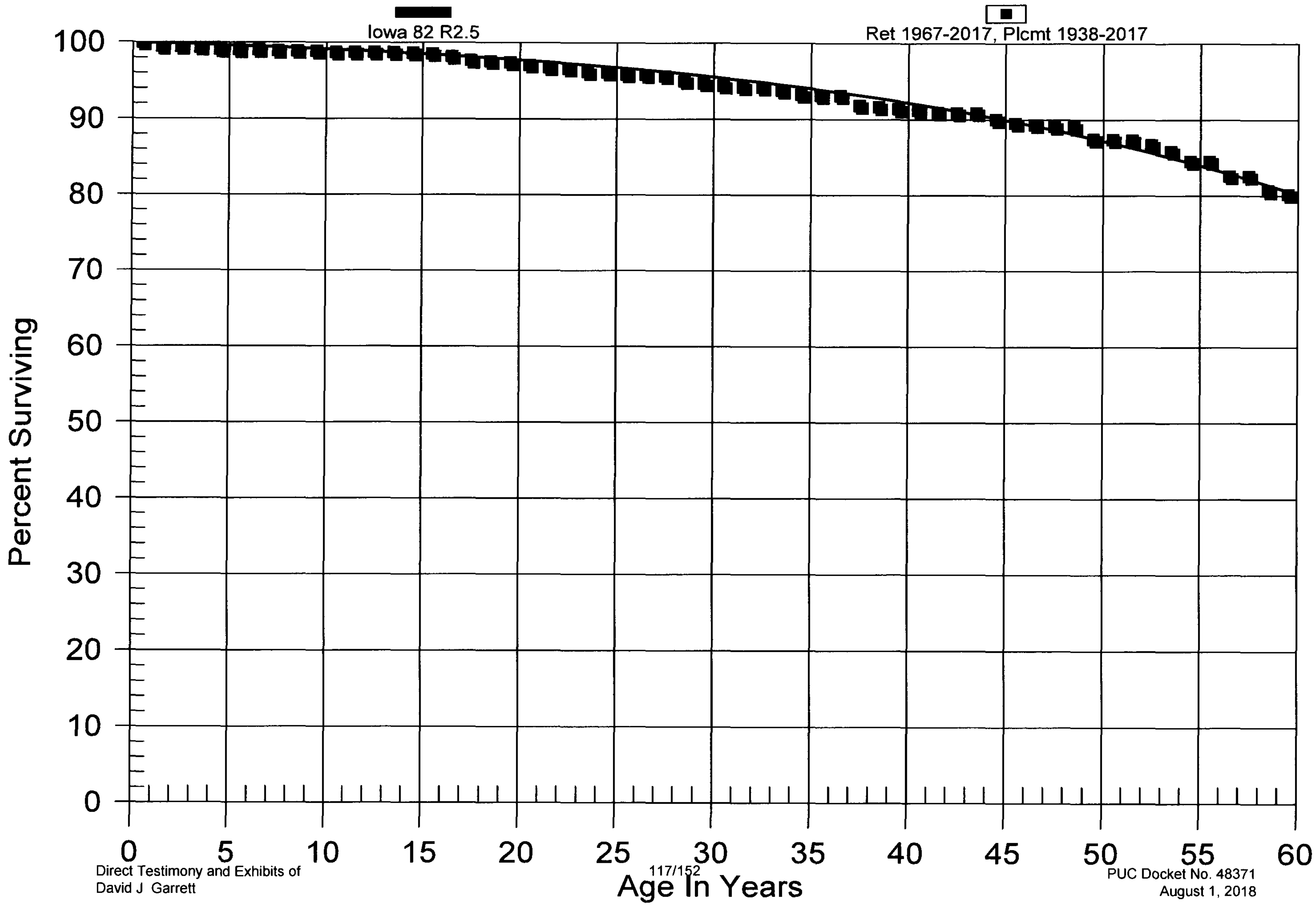
Electric Division
352.00 Structures and Improvements
Original And Smooth Survivor Curves



ETI
Electric Division
353.00 Station Equipment
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1931 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$659,561,125.10	$226,961.05	0.00034	100.00
0.5 - 1.5	$597,108,666.77	$542,216.04	0.00091	99.97
1.5 - 2.5	$381,330,823.52	$866,423.05	0.00227	99.87
2.5 - 3.5	$359,552,402.45	$1,800,785.90	0.00501	99.65
3.5 - 4.5	$339,031,154.69	$671,032.09	0.00198	99.15
4.5 - 5.5	$308,356,704.15	$1,053,345.38	0.00342	98.95
5.5 - 6.5	$292,857,600.92	$856,701.96	0.00293	98.61
6.5 - 7.5	$271,051,183.69	$2,915,294.51	0.01076	98.33
7.5 - 8.5	$254,114,541.48	$1,016,875.05	0.00400	97.27
8.5 - 9.5	$248,591,960.77	$896,490.03	0.00361	96.88
9.5 - 10.5	$238,765,798.00	$779,277.92	0.00326	96.53
10.5 - 11.5	$234,727,868.47	$1,064,608.54	0.00454	96.21
11.5 - 12.5	$208,893,706.98	$1,325,737.17	0.00635	95.78
12.5 - 13.5	$188,841,551.44	$2,093,406.45	0.01109	95.17
13.5 - 14.5	$181,695,871.10	$905,982.74	0.00499	94.12
14.5 - 15.5	$147,028,697.43	$1,557,378.65	0.01059	93.65
15.5 - 16.5	$115,091,552.20	$538,061.80	0.00468	92.65
16.5 - 17.5	$96,475,667.63	$969,173.32	0.01005	92.22
17.5 - 18.5	$98,774,911.78	$509,693.07	0.00516	91.29
18.5 - 19.5	$93,226,192.96	$1,596,516.50	0.01713	90.82
19.5 - 20.5	$90,122,228.33	$693,763.83	0.00770	89.27
20.5 - 21.5	$88,236,051.93	$1,045,931.55	0.01185	88.58
21.5 - 22.5	$80,490,455.15	$407,935.84	0.00507	87.53
22.5 - 23.5	$77,707,390.37	$1,074,909.48	0.01383	87.09
23.5 - 24.5	$78,074,490.78	$1,119,944.92	0.01434	85.88
24.5 - 25.5	$75,399,713.61	$642,404.42	0.00852	84.65
25.5 - 26 5	$73,730,515.83	$524,511.61	0.00711	83.93
26.5 - 27.5	$71,696,800.71	$521,149.46	0.00727	83.33
27.5 - 28.5	$75,619,610.82	$593,451.96	0.00785	82.73
28.5 - 29.5	$75,702,537.06	$984,165.31	0.01300	82.08
29.5 - 30.5	$74,932,483.18	$837,592.25	0.01118	81.01
30.5 - 31.5	$74,737,024.04	$1,447,608.14	0.01937	80.11
31.5 - 32.5	$54,809,572.91	$1,915,262.69	0.03494	78.55
32.5 - 33.5	$49,445,544.76	$686,951.64	0.01389	75.81
33.5 - 34.5	$39,090,678.10	$529,314.47	0.01354	74.76
34.5 - 35.5	$34,712,167.99	$470,255.94	0.01355	73.74
35.5 - 36.5	$35,352,230.04	$1,085,702.36	0.03071	72.74

ETI

Electric Division

353.00 Station Equipment

Observed Life Table

Retirement Expr. 1967 TO 2017
Placement Years 1931 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$24,928,264.92	$398,407.70	0.01598	70.51
37.5 - 38.5	$26,159,841.24	$373,766.34	0.01429	69.38
38.5 - 39.5	$21,406,243.23	$388,650.87	0.01816	68.39
39.5 - 40.5	$20,587,561.59	$280,962.46	0.01365	67.15
40.5 - 41.5	$21,327,477.30	$824,234.71	0.03865	66.23
41.5 - 42.5	$18,505,481.25	$68,131.53	0.00368	63.67
42.5 - 43.5	$18,795,876.23	$240,792.01	0.01281	63.44
43.5 - 44.5	$21,950,815.46	$199,162.68	0.00907	62.63
44.5 - 45.5	$26,782,562.14	$268,005.58	0.01001	62.06
45.5 - 46.5	$21,528,572.50	$202,475.27	0.00940	61.44
46.5 - 47.5	$13,993,557.25	$185,606.13	0.01326	60.86
47.5 - 48.5	$13,599,884.50	$154,554.19	0.01136	60.05
48.5 - 49.5	$13,966,077.29	$233,600.71	0.01673	59.37
49.5 - 50.5	$12,218,556.75	$510,835.66	0.04181	58.38
50.5 - 51.5	$11,572,079.43	$169,498.08	0.01465	55.94
51.5 - 52.5	$11,032,299.21	$38,619.00	0.00350	55.12
52.5 - 53.5	$11,535,495.12	$93,340.20	0.00809	54.92
53.5 - 54.5	$11,234,519.73	$207,263.27	0.01845	54.48
54.5 - 55.5	$11,250,569.61	$585,716.62	0.05206	53.47
55.5 - 56.5	$9,519,086.40	$130,534.95	0.01371	50.69
56.5 - 57.5	$9,936,029.85	$71,750.76	0.00722	50.00
57.5 - 58.5	$9,029,936.71	$30,086.00	0.00333	49.63
58.5 - 59.5	$8,381,571.18	$50,324.81	0.00600	49.47
59.5 - 60.5	$7,586,430.16	$54,510.55	0.00719	49.17
60.5 - 61.5	$7,946,461.74	$18,376.00	0.00231	48.82
61.5 - 62.5	$6,884,168.12	$36,065.46	0.00524	48.71
62.5 - 63.5	$7,421,097.71	$0.00	0.00000	48.45
63.5 - 64.5	$5,784,161.13	$1,513.68	0.00026	48.45
64.5 - 65.5	$5,782,647.45	$11,842.88	0.00205	48.44
65.5 - 66.5	$4,334,612.90	$35,370.65	0.00816	48.34
66.5 - 67.5	$4,249,603.52	$8,438.88	0.00199	47.94
67.5 - 68.5	$4,043,360.95	$0.00	0.00000	47.85
68.5 - 69.5	$4,022,154.77	$1,152.00	0.00029	47.85
69.5 - 70.5	$3,968,689.50	$0.00	0.00000	47.84
70.5 - 71.5	$3,737,896.22	$0.00	0.00000	47.84
71.5 - 72.5	$3,737,896.22	$0.00	0.00000	47.84
72.5 - 73.5	$3,672,417.87	$10,912.35	0.00297	47.84

ETI
Electric Division
353.00 Station Equipment
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1931 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
73.5 - 74.5	$3,147,937.82	$0.00	0.00000	47.69
74.5 - 75.5	$1,064,839.63	$0.00	0.00000	47.69
75.5 - 76.5	$1,064,839.63	$0.00	0.00000	47.69
76.5 - 77.5	$1,016,301.40	$0.00	0.00000	47.69
77.5 - 78.5	$1,016,301.40	$0.00	0.00000	47.69
78.5 - 79.5	$1,016,301.40	$0.00	0.00000	47.69
79.5 - 80.5	$1,051.00	$0.00	0.00000	47.69
80.5 - 81.5	$8,043.00	$0.00	0.00000	47.69
81.5 - 82.5	$8,043.00	$0.00	0.00000	47.69
82.5 - 83.5	$6,992.00	$0.00	0.00000	47.69
83.5 - 84.5	$6,992.00	$0.00	0.00000	47.69
84.5 - 85.5	$6,992.00	$0.00	0.00000	47.69
85.5 - 86.5	$6,992.00	$0.00	0.00000	47.69

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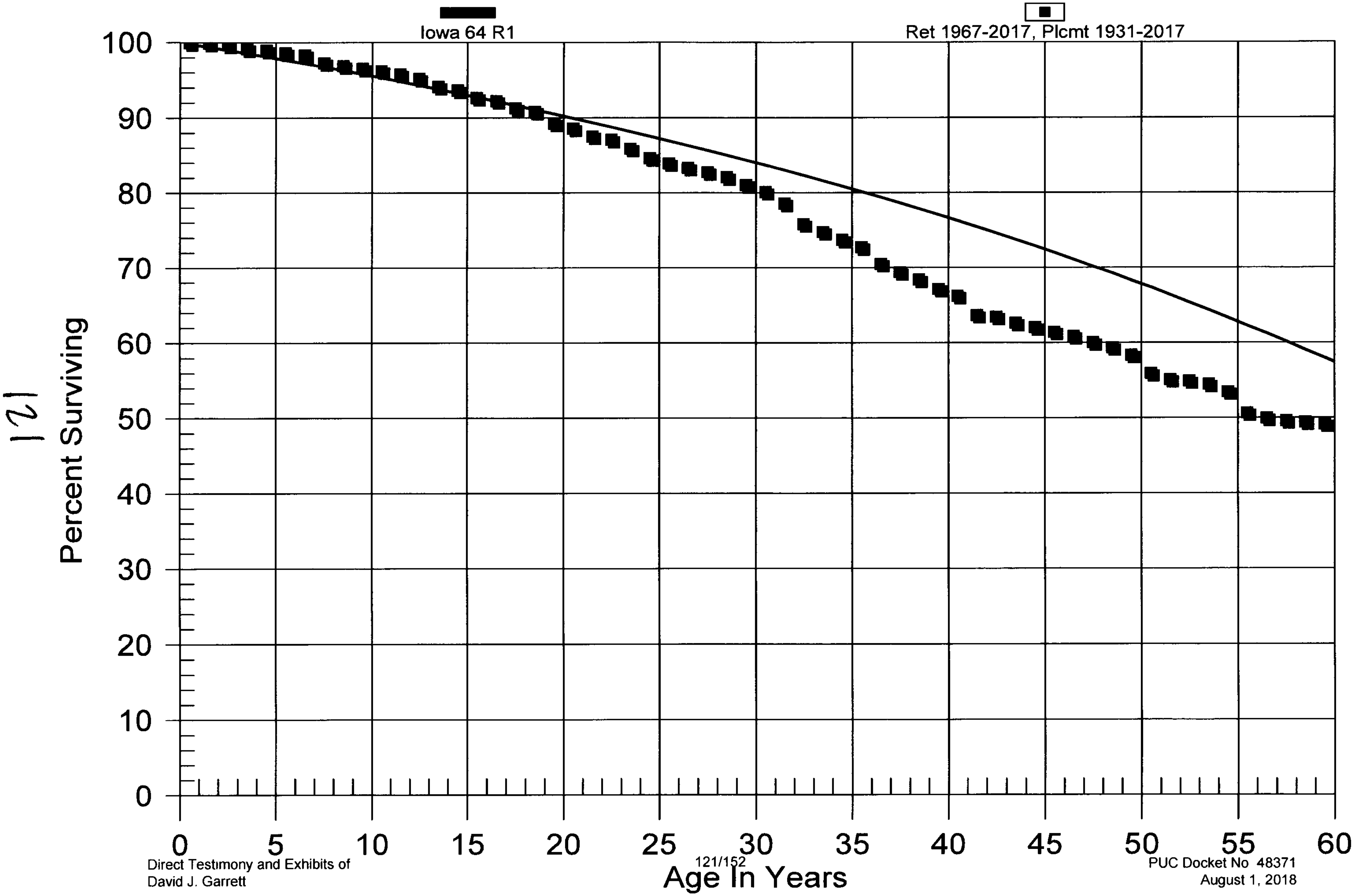
Electric Division
353.00 Station Equipment
Original And Smooth Survivor Curves



ETI
Electric Division
361.00 Structures and Improvements
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1941 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$12,077,907.27	$3,050.00	0.00025	100.00
0.5 - 1.5	$11,859,358.90	$6.00	0.00000	99.97
1.5 - 2.5	$5,628,092.60	$651.77	0 00012	99.97
2.5 - 3.5	$5,057,178.06	$1.00	0.00000	99.96
3.5 - 4.5	$4,969,641.32	$17.00	0.00000	99.96
4.5 - 5.5	$5,223,071.14	$5,138.71	0.00098	99.96
5.5 - 6.5	$5,748,737.63	$0.00	0.00000	99.86
6.5 - 7.5	$5,101,718.35	$6,167.67	0.00121	99.86
7.5 - 8.5	$4,713,234.27	$72.31	0.00002	99.74
8.5 - 9.5	$4,511,756.81	$3,091.82	0.00069	99.74
9.5 - 10.5	$4,950,523.31	$1,337.43	0.00027	99.67
10.5 - 11.5	$5,297,786.66	$6,987.64	0.00132	99.65
11.5 - 12.5	$6,088,047.72	$61.54	0.00001	99.52
12.5 - 13.5	$5,228,905.89	$6,506.72	0.00124	99.51
13.5 - 14.5	$5,237,335.37	$5,679.96	0.00108	99.39
14.5 - 15.5	$4,653,991.48	$13,282.00	0.00285	99.28
15.5 - 16.5	$3,948,491.93	$11,133.26	0.00282	99.00
16.5 - 17.5	$3,253,081.68	$4,826.31	0.00148	98.72
17.5 - 18.5	$2,074,260.62	$86,603.86	0.04175	98.57
18.5 - 19.5	$1,816,286.59	$2,889.58	0.00159	94.46
19.5 - 20.5	$1,934,481.59	$0.00	0.00000	94.31
20.5 - 21.5	$2,117,897.69	$0.00	0.00000	94.31
21.5 - 22.5	$1,868,340.58	$0.00	0.00000	94.31
22.5 - 23.5	$1,661,770.19	$3,876.77	0.00233	94.31
23.5 - 24.5	$1,598,251.43	$7,374.52	0.00461	94.09
24.5 - 25.5	$1,636,615.23	$13,147.60	0.00803	93.65
25.5 - 26.5	$1,472,160.70	$1,502.18	0.00102	92.90
26.5 - 27.5	$1,609,946.64	$0.00	0.00000	92.81
27.5 - 28.5	$1,680,579.72	$521.16	0.00031	92.81
28.5 - 29.5	$1,848,037.53	$1,969.95	0.00107	92.78
29.5 - 30.5	$1,986,360.85	$5,589.31	0.00281	92.68
30.5 - 31.5	$1,926,784.70	$11,282.53	0.00586	92.42
31.5 - 32.5	$1,978,654.93	$6,705.43	0.00339	91.88
32.5 - 33.5	$1,855,932.98	$2,385.84	0.00129	91.57
33.5 - 34.5	$1,893,462.28	$4,364.99	0.00231	91.45
34.5 - 35.5	$1,855,853.15	$8,570.67	0.00462	91.24
35.5 - 36.5	$1,478,118.16	$12,916.51	0.00874	90.82

ETI

Electric Division

361.00 Structures and Improvements

Observed Life Table

Retirement Expr. 1967 TO 2017
Placement Years 1941 TO 2017

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
36.5 - 37.5	$1,244,667.67	$5,734.28	0.00461	90.02
37.5 - 38.5	$857,323.85	$0.00	0.00000	89.61
38.5 - 39.5	$815,710.13	$2.41	0.00000	89.61
39.5 - 40.5	$792,950.87	$43.69	0.00006	89.61
40.5 - 41.5	$799,835.62	$24.61	0.00003	89.60
41.5 - 42.5	$726,449.44	$1,094.32	0.00151	89.60
42.5 - 43.5	$727,348.22	$98.44	0.00014	89.46
43.5 - 44.5	$551,943.07	$1,358.16	0.00246	89.45
44.5 - 45.5	$464,000.03	$225.66	0.00049	89.23
45.5 - 46.5	$218,515.67	$3,615.01	0.01654	89.19
46.5 - 47.5	$98,371.93	$180.91	0.00184	87.71
47.5 - 48.5	$81,698.33	$14,358.29	0.17575	87.55
48.5 - 49.5	$493,410.56	$162.34	0.00033	72.17
49.5 - 50.5	$468,379.90	$2,188.72	0.00467	72.14
50.5 - 51.5	$389,254.05	$0.00	0.00000	71.80
51.5 - 52.5	$370,128.02	$4,320.51	0.01167	71.80
52.5 - 53.5	$362,920.87	$24,826.14	0.06841	70.97
53.5 - 54.5	$318,874.30	$0.00	0.00000	66.11
54.5 - 55.5	$315,336.72	$3,945.69	0.01251	66.11
55.5 - 56.5	$304,108.99	$0.00	0.00000	65.28
56.5 - 57.5	$293,738.24	$912.80	0.00311	65.28
57.5 - 58.5	$298,139.45	$0.00	0.00000	65.08
58.5 - 59.5	$85,147.28	$2,940.00	0.03453	65.08
59.5 - 60.5	$63,152.39	$490.00	0.00776	62.83
60.5 - 61.5	$45,984.62	$0.00	0.00000	62.35
61.5 - 62.5	$44,281.22	$0.00	0.00000	62.35
62.5 - 63.5	$129,134.22	$0.00	0.00000	62.35
63.5 - 64.5	$124,834.46	$1,490.30	0.01194	62.35
64.5 - 65.5	$121,766.79	$0.00	0.00000	61.60
65.5 - 66.5	$55,681.58	$0.00	0.00000	61.60
66.5 - 67.5	$42,048.98	$160.24	0.00381	61.60
67.5 - 68.5	$41,888.74	$0.00	0.00000	61.37
68.5 - 69.5	$41,888.74	$0.00	0.00000	61.37
69.5 - 70.5	$39,784.32	$0.00	0.00000	61.37
70.5 - 71.5	$39,382.92	$0.00	0.00000	61.37
71.5 - 72.5	$39,382.92	$0.00	0.00000	61.37
72.5 - 73.5	$31,412.13	$0.00	0.00000	61.37

ETI

Electric Division

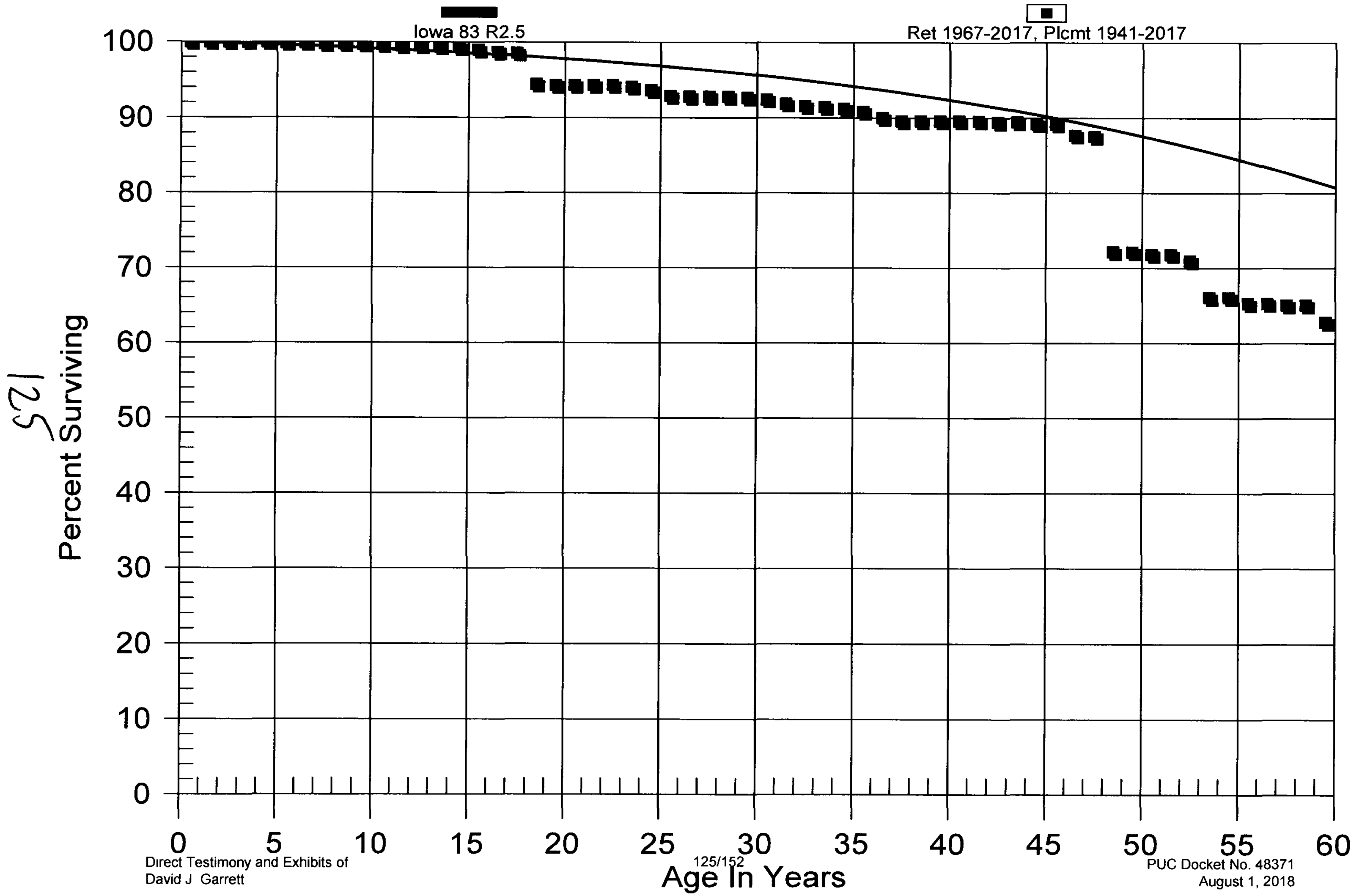
361.00 Structures and Improvements

Observed Life Table

Retirement Expr. 1967 TO 2017
Placement Years 1941 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
73.5 - 74.5	$27,545.09	$0.00	0.00000	61.37
74.5 - 75.5	$7,228.00	$0.00	0.00000	61.37
75.5 - 76.5	$7,228.00	$0.00	0.00000	61.37

ETI
Electric Division
361.00 Structures and Improvements
Original And Smooth Survivor Curves



ETI
Electric Division
366.00 Underground Conduit
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1927 TO 2017

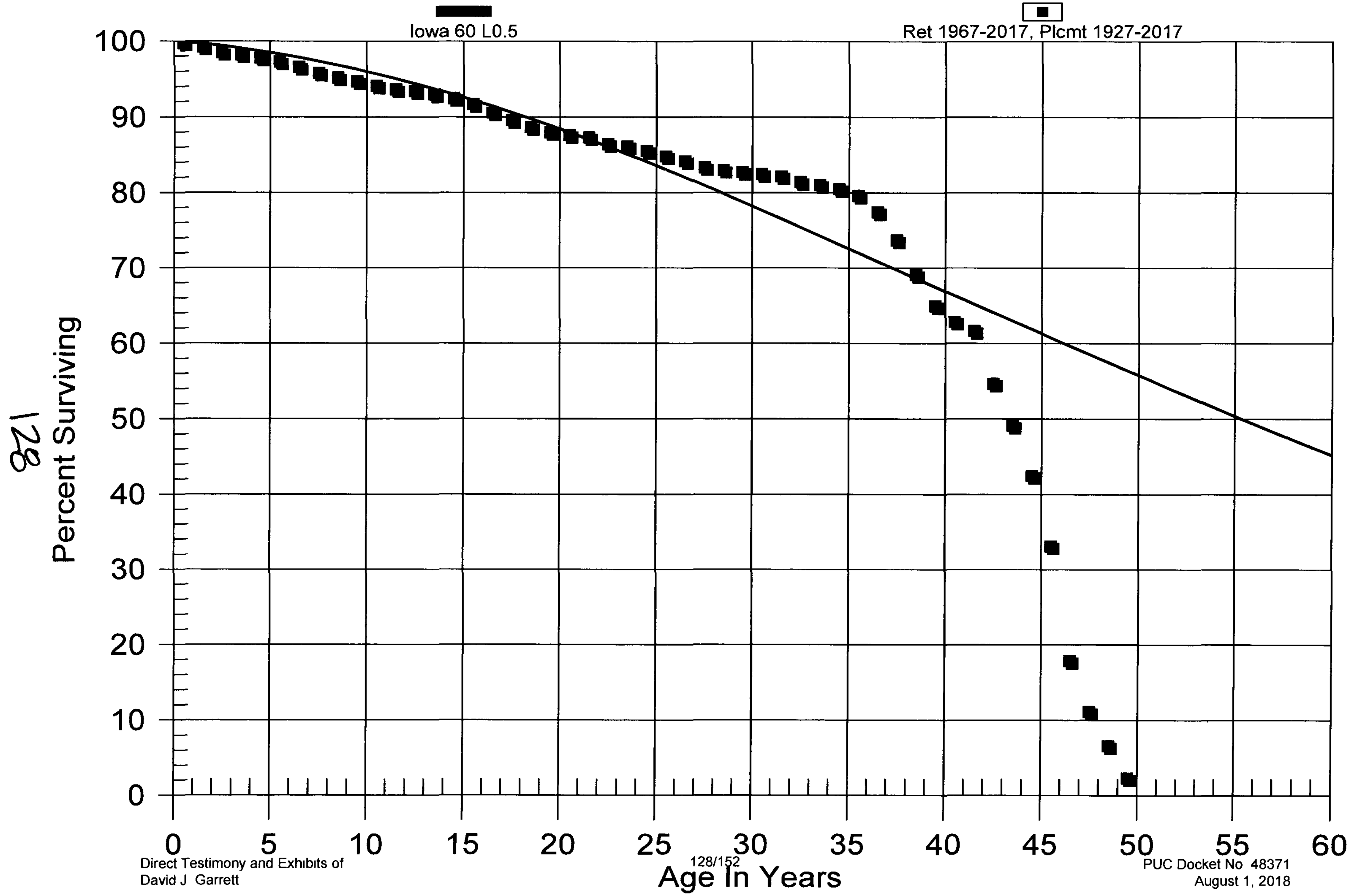
Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$31,216,965.18	$72,339.16	0.00232	100.00
0.5 - 1.5	$29,910,648.72	$161,912.58	0.00541	99.77
1.5 - 2.5	$7,060,262.38	$49,756.80	0.00705	99.23
2.5 - 3.5	$18,329,595.45	$50,883.92	0.00278	98.53
3.5 - 4.5	$18,182,932.77	$84,993.20	0.00467	98.26
4.5 - 5.5	$17,913,940.15	$94,366.05	0.00527	97.80
5.5 - 6.5	$22,683,103.73	$162,305.39	0.00716	97.28
6.5 - 7.5	$21,883,815.16	$176,152.10	0.00805	96.58
7.5 - 8.5	$21,293,302.22	$142,922.57	0.00671	95.81
8.5 - 9.5	$21,037,518.28	$105,721.96	0.00503	95.16
9.5 - 10 5	$21,169,105 79	$125,113.11	0.00591	94.69
10.5 - 11.5	$20,940,640.09	$104,001.60	0.00497	94.13
11.5 - 12.5	$20,982,349.20	$60,631.08	0.00289	93.66
12.5 - 13.5	$19,139,244.15	$83,536.44	0.00436	93.39
13.5 - 14.5	$17,976,428.35	$94,576.69	0.00526	92.98
14.5 - 15.5	$16,700,194.71	$140,448.20	0.00841	92.49
15.5 - 16.5	$16,193,428.90	$202,746.08	0.01252	91.71
16.5 - 17.5	$15,525,278.30	$165,662.40	0.01067	90.57
17.5 - 18.5	$13,825,392.80	$143,003.14	0.01034	89.60
18.5 - 19.5	$13,841,647.61	$103,797.32	0.00750	88.67
19.5 - 20.5	$15,385,246.38	$70,644.84	0.00459	88.01
20.5 - 21.5	$16,250,918.35	$54,549.26	0.00336	87.60
21.5 - 22.5	$16,027,213.35	$157,491.88	0.00983	87.31
22.5 - 23.5	$14,546,618.35	$50,021.03	0.00344	86.45
23.5 - 24.5	$12,834,996.31	$91,184.31	0.00710	86.15
24.5 - 25.5	$10,602,680.55	$90,942.06	0.00858	85.54
25.5 - 26.5	$9,741,506.91	$71,607.56	0.00735	84.81
26.5 - 27.5	$8,522,931.84	$84,532.80	0.00992	84.18
27.5 - 28.5	$7,309,253.43	$31,012.11	0.00424	83.35
28.5 - 29.5	$7,297,101.77	$24,988.20	0.00342	83.00
29.5 - 30.5	$6,842,174.35	$21,408.29	0.00313	82.71
30.5 - 31.5	$6,625,636.63	$23,937.14	0.00361	82.45
31.5 - 32.5	$5,937,923.02	$54,105.43	0.00911	82.16
32.5 - 33.5	$4,124,740.92	$19,035.26	0.00461	81.41
33.5 - 34.5	$2,601,655.01	$16,830.69	0.00647	81.03
34.5 - 35.5	$1,449,040 42	$16,032.46	0.01106	80.51
35.5 - 36.5	$509,916.65	$13,942.66	0.02734	79.62

ETI
Electric Division
366.00 Underground Conduit

Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1927 TO 2017

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
36.5 - 37.5	$267,540.14	$12,739.71	0.04762	77.44
37.5 - 38.5	$193,829.09	$12,155.62	0.06271	73.75
38.5 - 39.5	$195,989.57	$11,815.46	0.06029	69.13
39.5 - 40.5	$346,184.15	$11,071.74	0.03198	64.96
40.5 - 41.5	$793,863.90	$15,221.90	0.01917	62.88
41.5 - 42.5	$355,089.75	$40,310.59	0.11352	61.68
42.5 - 43.5	$351,629.81	$35,688.97	0.10150	54.67
43.5 - 44.5	$403,833.49	$54,496.79	0.13495	49.13
44.5 - 45.5	$397,006.19	$87,870.57	0.22133	42.50
45.5 - 46.5	$310,497.69	$142,509.82	0.45897	33.09
46.5 - 47.5	$225,822.34	$85,688.49	0.37945	17.90
47.5 - 48.5	$198,495.22	$80,735.87	0.40674	11.11
48.5 - 49.5	$124,311.53	$80,244.94	0.64551	6.59

ETI
Electric Division
366.00 Underground Conduit
Original And Smooth Survivor Curves



ETI

Electric Division

367.00 Underground Conductors and Devices

Observed Life Table

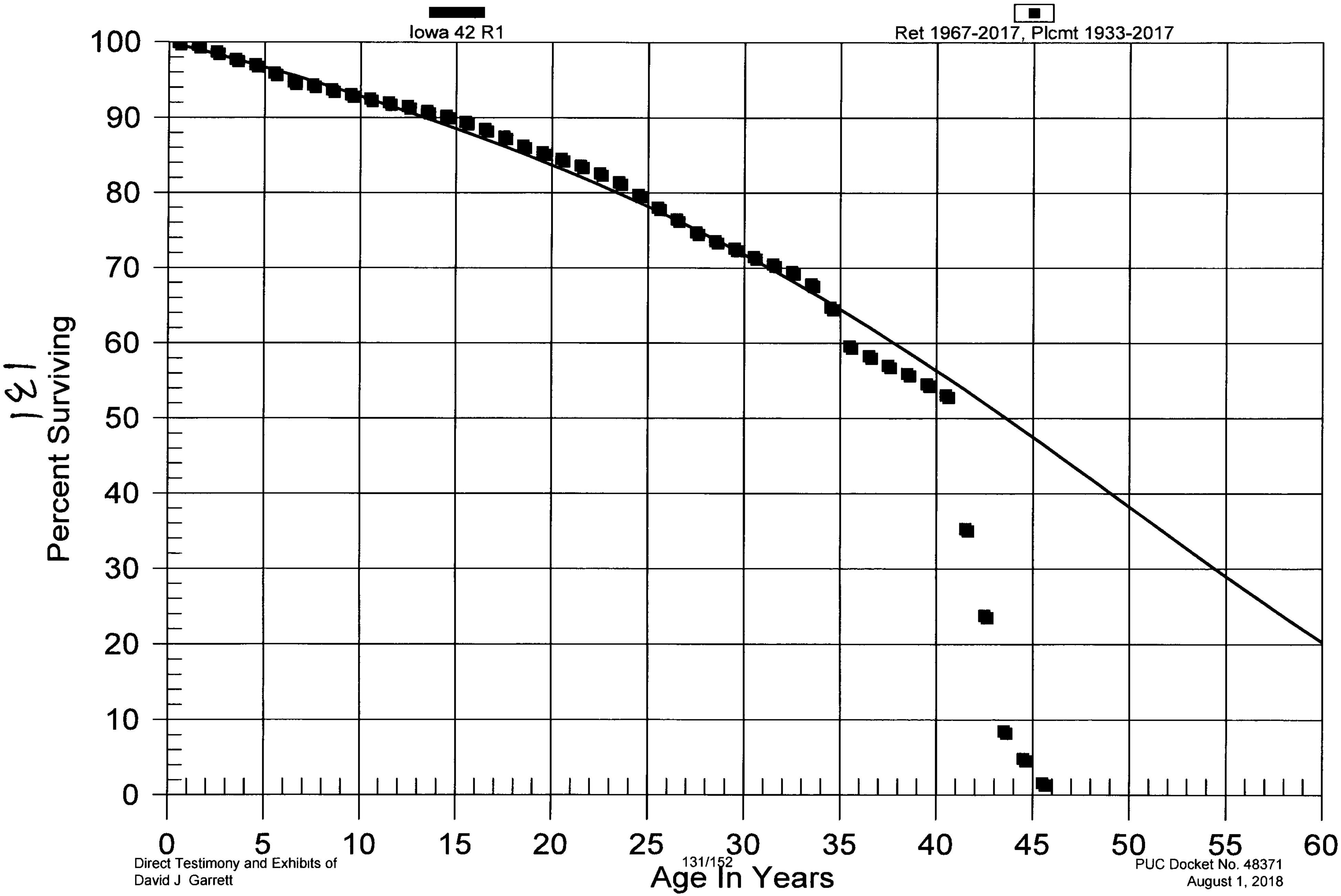
Retirement Expr. 1967 TO 2017
Placement Years 1933 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$135,024,712.34	$29,501.69	0.00022	100.00
0.5 - 1.5	$130,536,756.57	$454,663.83	0.00348	99.98
1.5 - 2.5	$123,510,326.70	$1,089,433.91	0.00882	99.63
2.5 - 3.5	$125,767,681.23	$1,249,489.11	0.00993	98.75
3.5 - 4.5	$121,442,742.77	$905,774.41	0.00746	97.77
4.5 - 5.5	$117,646,242.52	$1,331,141.56	0.01131	97.04
5.5 - 6.5	$127,470,563.16	$1,529,880.49	0.01200	95.94
6.5 - 7.5	$123,546,111.51	$522,293.01	0.00423	94.79
7.5 - 8.5	$119,014,348.33	$847,537.65	0.00712	94.39
8.5 - 9.5	$111,274,042.41	$737,665.02	0.00663	93.72
9.5 - 10.5	$105,545,501.00	$647,779.94	0.00614	93.10
10.5 - 11.5	$99,354,733.82	$509,930.64	0.00513	92.53
11.5 - 12.5	$96,651,072.84	$528,634.97	0.00547	92.05
12.5 - 13.5	$93,840,112.92	$673,967.59	0.00718	91.55
13.5 - 14.5	$90,028,282.47	$602,851.64	0.00670	90.89
14.5 - 15.5	$86,453,659.92	$793,470.80	0.00918	90.28
15.5 - 16.5	$83,222,812.99	$870,046.90	0.01045	89.45
16.5 - 17.5	$76,383,223.60	$867,117.25	0.01135	88.52
17.5 - 18.5	$72,650,653.85	$996,807.84	0.01372	87.51
18.5 - 19.5	$65,500,795.36	$670,877.44	0.01024	86.31
19.5 - 20.5	$62,992,042.61	$650,764.63	0.01033	85.43
20.5 - 21.5	$59,300,375.45	$619,772.68	0.01045	84.55
21.5 - 22.5	$53,734,093.24	$680,787.20	0.01267	83.66
22.5 - 23.5	$46,930,680.08	$676,298.82	0.01441	82.60
23.5 - 24.5	$41,049,916.35	$821,313.39	0.02001	81.41
24.5 - 25.5	$36,111,545.15	$776,880.30	0.02151	79.78
25.5 - 26.5	$32,634,647.13	$657,221.12	0.02014	78.07
26.5 - 27.5	$28,178,464.54	$632,042.40	0.02243	76.49
27.5 - 28.5	$24,561,332.92	$387,907.32	0.01579	74.78
28.5 - 29.5	$22,393,257.90	$301,040.98	0.01344	73.60
29.5 - 30.5	$20,834,946.18	$320,654.99	0.01539	72.61
30.5 - 31.5	$19,930,879.98	$277,255.21	0.01391	71.49
31.5 - 32.5	$18,373,857.37	$259,961.09	0.01415	70.50
32.5 - 33.5	$15,175,702.48	$362,338.43	0.02388	69.50
33.5 - 34.5	$11,124,696.73	$507,878.17	0.04565	67.84
34.5 - 35.5	$8,375,351.45	$661,013.85	0.07892	64.74
35.5 - 36.5	$4,730,886.04	$104,121.34	0.02201	59.63

ETI
Electric Division
367.00 Underground Conductors and Devices
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1933 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$3,653,322.44	$79,015.21	0.02163	58.32
37.5 - 38.5	$3,111,765.83	$59,545.05	0.01914	57.06
38.5 - 39 5	$2,660,888.51	$65,968.40	0.02479	55.97
39.5 - 40.5	$2,019,847.19	$54,738.57	0.02710	54.58
40.5 - 41.5	$2,138,397.58	$716,662.67	0.33514	53.10
41.5 - 42.5	$1,255,133.19	$409,486.41	0.32625	35.30
42.5 - 43.5	$1,293,888.42	$829,881.77	0.64139	23.79
43.5 - 44.5	$600,819.69	$257,624.33	0.42879	8.53
44.5 - 45.5	$581,850.48	$388,985.32	0.66853	4.87

ETI
Electric Division
367.00 Underground Conductors and Devices
Original And Smooth Survivor Curves



ETI
Electric Division
371.00 Installation on Customer Premises
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1932 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$21,271,562.19	$134.05	0.00001	100.00
0.5 - 1.5	$20,043,002.30	$4,546.64	0.00023	100.00
1.5 - 2.5	$19,003,303.10	$8,727.02	0.00046	99.98
2.5 - 3.5	$29,250,443.35	$7,767.70	0.00027	99.93
3.5 - 4.5	$30,898,137.01	$3,339.38	0.00011	99.90
4.5 - 5.5	$29,348,250.89	$15,762.56	0.00054	99.89
5.5 - 6.5	$28,055,622.90	$17,448.25	0.00062	99.84
6.5 - 7.5	$28,735,952.35	$15,594.23	0.00054	99.78
7.5 - 8.5	$28,865,732.01	$13,836.77	0.00048	99.72
8.5 - 9.5	$27,979,371.58	$11,508.45	0.00041	99.68
9.5 - 10.5	$27,637,520.59	$9,533.97	0.00034	99.63
10.5 - 11.5	$27,132,981.78	$48,769.50	0.00180	99.60
11.5 - 12.5	$26,934,390.90	$27,746.33	0.00103	99.42
12.5 - 13.5	$27,242,623.56	$68,363.26	0.00251	99.32
13.5 - 14.5	$26,641,278.61	$47,552.36	0.00178	99.07
14.5 - 15.5	$25,586,987.35	$47,300.86	0.00185	98.89
15.5 - 16.5	$24,725,697.02	$45,071.44	0.00182	98.71
16.5 - 17.5	$25,058,132.60	$42,769.31	0.00171	98.53
17.5 - 18.5	$24,403,222.03	$46,769.17	0.00192	98.36
18.5 - 19.5	$22,512,859.11	$40,996.39	0.00182	98.17
19.5 - 20.5	$21,422,848.82	$30,526.83	0.00142	97.99
20.5 - 21.5	$19,913,517.98	$31,803.25	0.00160	97.86
21.5 - 22.5	$18,179,188.40	$30,556.28	0.00168	97.70
22.5 - 23.5	$16,353,474.55	$34,287.46	0.00210	97.53
23.5 - 24.5	$15,272,735.22	$37,474.92	0.00245	97.33
24.5 - 25.5	$14,163,974.02	$32,976.19	0.00233	97.09
25.5 - 26.5	$13,391,193.83	$34,916.14	0.00261	96.87
26.5 - 27.5	$12,567,234.14	$43,810.41	0.00349	96.61
27.5 - 28.5	$11,810,186.73	$50,366.14	0.00426	96.28
28.5 - 29.5	$11,128,734.82	$49,173.49	0.00442	95.87
29.5 - 30.5	$10,484,703.71	$145,813.55	0.01391	95.44
30.5 - 31.5	$9,881,102.36	$241,529.25	0.02444	94.11
31.5 - 32.5	$8,352,912.30	$48,927.23	0.00586	91.81
32.5 - 33.5	$8,004,381.12	$55,400.30	0.00692	91.28
33.5 - 34.5	$7,980,218.87	$49,926.85	0.00626	90.64
34.5 - 35.5	$7,160,890.83	$46,936.62	0.00655	90.08
35.5 - 36.5	$6,502,378.32	$46,613.44	0.00717	89.49

ETI

Electric Division

371.00 Installation on Customer Premises

Observed Life Table

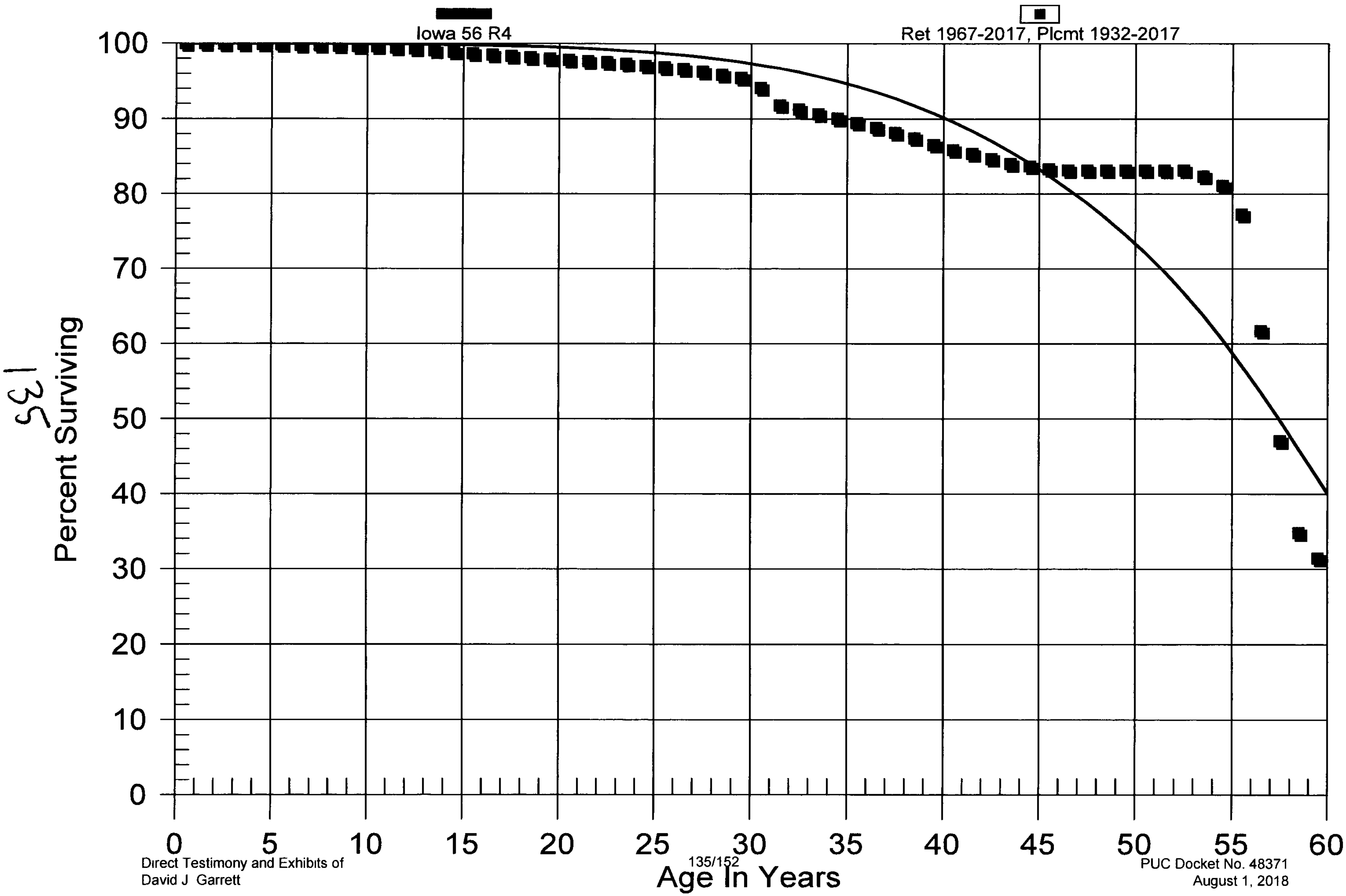
Retirement Expr. 1967 TO 2017
Placement Years 1932 TO 2017

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$5,681,387.15	$41,504.71	0.00731	88.85
37.5 - 38.5	$5,279,112.44	$43,995.43	0.00833	88.20
38.5 - 39.5	$4,713,211.11	$47,566.69	0.01009	87.46
39.5 - 40.5	$4,337,264.03	$34,760.78	0.00801	86.58
40.5 - 41.5	$3,822,562.36	$22,071.08	0.00577	85.88
41.5 - 42.5	$3,318,212.81	$26,561.53	0.00800	85.39
42.5 - 43.5	$2,995,300.81	$24,503.93	0.00818	84.71
43.5 - 44.5	$2,663,973.46	$9,958.07	0.00374	84.01
44.5 - 45.5	$2,228,453.17	$10,090.69	0.00453	83.70
45.5 - 46.5	$1,969,543.85	$3,267.99	0.00166	83.32
46.5 - 47.5	$1,635,870.61	$346.70	0.00021	83.18
47.5 - 48.5	$1,415,623.15	$140.36	0.00010	83.16
48.5 - 49.5	$1,215,040.47	$140.42	0.00012	83.16
49.5 - 50.5	$1,167,209.96	$0.00	0.00000	83.15
50.5 - 51.5	$1,077,890.25	$76.53	0.00007	83.15
51.5 - 52.5	$993,133.01	$0.00	0.00000	83.14
52.5 - 53.5	$912,457.14	$8,615.07	0.00944	83.14
53.5 - 54.5	$836,387.77	$12,625.97	0.01510	82.35
54.5 - 55.5	$700,463.30	$33,199.19	0.04740	81.11
55.5 - 56.5	$563,055.02	$113,023.14	0.20073	77.27
56.5 - 57.5	$453,169.22	$107,744.77	0.23776	61.76
57.5 - 58.5	$346,222.48	$90,144.18	0.26036	47.07
58.5 - 59.5	$257,600.57	$24,919.61	0.09674	34.82
59.5 - 60.5	$232,117.23	$38,810.43	0.16720	31.45
60.5 - 61.5	$196,290.90	$189.00	0.00096	26.19
61.5 - 62.5	$199,676.23	$27,569.35	0.13807	26.17
62.5 - 63.5	$173,598.49	$23,888.45	0.13761	22.55
63.5 - 64.5	$149,764.62	$30,289.63	0.20225	19.45
64.5 - 65.5	$120,218.77	$28,416.20	0.23637	15.52
65.5 - 66.5	$91,324.42	$19,347.06	0.21185	11.85
66.5 - 67.5	$72,449.04	$25,510.71	0.35212	9.34
67.5 - 68.5	$46,852.06	$19,980.44	0.42646	6.05
68.5 - 69.5	$26,976.28	$8,919.05	0.33063	3.47
69.5 - 70.5	$18,201.24	$4,312.19	0.23692	2.32
70.5 - 71.5	$14,033.68	$1,974.80	0.14072	1.77
71.5 - 72.5	$11,974.59	$1,212.70	0.10127	1.52
72.5 - 73.5	$10,761.89	$1,417.43	0.13171	1.37

ETI
Electric Division
371.00 Installation on Customer Premises
Observed Life Table
Retirement Expr. 1967 TO 2017
Placement Years 1932 TO 2017

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
73.5 - 74.5	$9,344.46	$194.26	0.02079	1.19
74.5 - 75.5	$9,150.20	$1,916.72	0.20947	1.16
75.5 - 76.5	$7,233.48	$2,940.12	0.40646	0.92
76.5 - 77.5	$4,293.36	$2,010.95	0.46839	0.55
77.5 - 78.5	$2,282.41	$816.42	0.35770	0.29
78.5 - 79.5	$1,465.99	$771.57	0.52631	0.19
79.5 - 80.5	$694.42	$0.00	0.00000	0.09
80.5 - 81.5	$694.42	$291.22	0.41937	0.09
81.5 - 82.5	$403.20	$58.15	0.14422	0.05
82.5 - 83.5	$345.05	$86.87	0.25176	0.04
83.5 - 84.5	$258.18	$122.15	0.47312	0.03

ETI
Electric Division
371.00 Installation on Customer Premises
Original And Smooth Survivor Curves



ETI

Electric Division

352.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 82 *Survivor Curve: R2.5*

Year (1)	*Original Cost* (2)	*Avg. Service Life* (3)	*Avg. Annual Accrual* (4)	*Avg. Remaining Life* (5)	*Future Annual Accruals* (6)
1938	6,924.56	82.00	84.45	20 77	1,754.33
1939	794.85	82.00	9.69	21.26	206.12
1943	32,227.77	82.00	393.02	23.33	9,170.20
1944	38,996.13	82.00	475.56	23.87	11,353.41
1946	8,343.54	82.00	101.75	24.99	2,542.80
1947	677.35	82.00	8.26	25.56	211.15
1948	2,322.17	82.00	28.32	26.14	740.30
1949	6,686.49	82.00	81.54	26.73	2,179.65
1950	21,157.84	82.00	258.02	27.33	7,052.58
1951	885.27	82.00	10.80	27.94	301.65
1952	72,401.73	82.00	882.95	28.56	25,214.35
1953	28,977.55	82.00	353.38	29.18	10,312.22
1954	55,180.84	82.00	672.94	29.82	20,065.57
1955	18,438.08	82.00	224.85	30.46	6,848.98
1956	203,060.12	82.00	2,476.34	31.11	77,036.39
1957	41,844.60	82.00	510.30	31.77	16,210.08
1958	44,891.56	82.00	547.46	32.43	17,754.06
1959	39,742.96	82.00	484.67	33.11	16,045.59
1960	94,803.52	82.00	1,156.14	33.79	39,061.51
1961	39,664.42	82.00	483.71	34.47	16,674.99
1962	193,450.74	82.00	2,359.15	35.17	82,963.28
1963	730.93	82.00	8.91	35.87	319.74
1964	45,312.63	82.00	552.59	36.58	20,213.07
1965	49,264.46	82.00	600.79	37.29	22,405.19
1966	66,342.10	82.00	809.05	38.01	30,755.18
1967	56,376.43	82.00	687.52	38.74	26,635.09
1968	78,863.01	82.00	961.74	39.48	37,967.85

ETI

Electric Division

352.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 82 Survivor Curve: R2.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1969	126,513.47	82.00	1,542.85	40.22	62,051.05
1970	50,041.63	82.00	610.26	40.96	24,999.35
1971	184,022.12	82.00	2,244.17	41.72	93,620.01
1972	214,731.46	82.00	2,618.67	42.48	111,235.76
1973	139,338.16	82.00	1,699.24	43.24	73,479.79
1974	36,530.58	82.00	445.49	44.01	19,607.51
1975	6,693.18	82.00	81.62	44.79	3,655.84
1976	67,010.83	82.00	817.20	45.57	37,239.96
1977	38,665.13	82.00	471.53	46.36	21,859.87
1978	32,368.90	82.00	394.74	47.15	18,613.24
1979	41,855.51	82.00	510.43	47.95	24,475.80
1980	173,520.82	82.00	2,116.11	48.75	103,169.51
1981	2,115,179.04	82.00	25,794.84	49.56	1,278,465.96
1982	767,775.57	82.00	9,363.11	50.38	471,712.10
1983	210,855.43	82.00	2,571.40	51.20	131,653.98
1984	117,074.18	82.00	1,427.73	52.02	74,275.60
1985	194,213.17	82.00	2,368.45	52.85	125,178.53
1986	56,187.33	82.00	685.21	53.69	36,788.23
1987	49,807.37	82.00	607.41	54.53	33,120.80
1988	12,709.35	82.00	154.99	55.37	8,582.23
1989	40,127.01	82.00	489.35	56.22	27,511.64
1990	218,608.55	82.00	2,665.96	57.07	152,154.45
1991	84,615.59	82.00	1,031.90	57.93	59,780.92
1993	431,706.34	82.00	5,264.71	59.66	314,100.10
1994	151,784.58	82.00	1,851.03	60.53	112,046.18
1995	87,339.06	82.00	1,065.11	61.41	65,406.54
1996	242,822.23	82.00	2,961.24	62.29	184,447.86

ETI

Electric Division

352.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: *82* *Survivor Curve:* *R2.5*

Year (1)	*Original Cost* (2)	*Avg. Service Life* (3)	*Avg. Annual Accrual* (4)	*Avg. Remaining Life* (5)	*Future Annual Accruals* (6)
1997	20,139.72	82.00	245.61	63.17	15,514.96
1998	105,431.03	82.00	1,285.74	64.06	82,360.38
1999	47,912.96	82.00	584.30	64.95	37,948.68
2000	196,898.94	82.00	2,401.20	65.84	158,101.92
2001	589,196.91	82.00	7,185.32	66.74	479,552.97
2002	3,654,537.40	82.00	44,567.48	67.64	3,014,629.69
2003	3,585,506.49	82.00	43,725.64	68.55	2,997,238.97
2004	287,117.22	82.00	3,501.43	69.46	243,194.41
2005	1,987,397.24	82.00	24,236.53	70.37	1,705,459.15
2006	1,034,333.50	82.00	12,613.81	71.28	899,135.35
2007	19,254.41	82.00	234.81	72.20	16,953.09
2008	53,509.95	82.00	652.56	73.12	47,714.92
2009	464,945.35	82.00	5,670.06	74.04	419,835.84
2010	1,945,639.49	82.00	23,727.29	74.97	1,778,850.51
2011	512,003.56	82.00	6,243.94	75.90	473,912.66
2012	25,712.20	82.00	313.56	76.83	24,091.40
2013	800,589.52	82.00	9,763.28	77.77	759,252.83
2014	1,854,759.53	82.00	22,618.99	78.70	1,780,182.08
2015	1,107,763.09	82.00	13,509.29	79.64	1,075,907.77
2016	4,167,496.37	82.00	50,823.07	80.58	4,095,494.78
2017	7,530,298.97	82.00	91,832.82	81.53	7,486,841.45
Total	37,130,902.09	82.00	452,815.39	70.15	31,763,401.95

Composite Average Remaining Life ... *70.15 Years*

ETI

Electric Division

353.00 Station Equipment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 64 *Survivor Curve: R1*

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1931	6,992.00	64.00	109.25	13.82	1,509.56
1935	1,051.00	64.00	16.42	15.37	252.38
1938	1,015,250.40	64.00	15,862.99	16.58	262,968.42
1941	48,538.23	64.00	758.40	17.83	13,520.12
1943	2,083,098.19	64.00	32,547.80	18.68	608,113.13
1944	513,567.70	64.00	8,024.34	19.12	153,417.61
1945	65,478.35	64.00	1,023.08	19.56	20,010.81
1947	230,793.28	64.00	3,606.08	20.45	73,761.02
1948	52,313.27	64.00	817.38	20.91	17,090.89
1949	3,143.76	64.00	49.12	21.37	1,049.70
1950	197,803.69	64.00	3,090.62	21.84	67,484.66
1951	49,638.73	64.00	775.59	22.31	17,299.87
1952	1,436,191.67	64.00	22,440.07	22.78	511,213.20
1954	1,689,249.85	64.00	26,394.03	23.75	626,808.40
1955	630,578.95	64.00	9,852.61	24.24	238,815.99
1956	2,019,221.62	64.00	31,549.74	24.74	780,418.30
1957	1,882,714.30	64.00	29,416.86	25.24	742,403.36
1958	855,232.21	64.00	13,362.75	25.75	344,031.43
1959	1,640,541.53	64.00	25,632.98	26.26	673,090.11
1960	1,536,180.80	64.00	24,002.37	26.78	642,700.35
1961	130,841.60	64.00	2,044.36	27.30	55,812.68
1962	1,643,424.58	64.00	25,678.03	27.83	714,600.64
1963	223,706.85	64.00	3,495.35	28.36	99,144.39
1964	607,123.19	64.00	9,486.12	28.90	274,185.03
1965	531,655.93	64.00	8,306.97	29.45	244,642.57
1966	1,074,434.11	64.00	16,787.72	30.00	503,659.52
1967	1,485,021.90	64.00	23,203.03	30.56	709,030.63

ETI

Electric Division

353.00 Station Equipment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 64 *Survivor Curve: R1*

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1968	2,214,118.83	64.00	34,594.96	31.12	1,076,598.01
1969	722,594.17	64.00	11,290.32	31.69	357,752.82
1970	1,570,847.62	64.00	24,544.03	32.26	791,791.01
1971	8,499,840.08	64.00	132,807.50	32.84	4,361,011.20
1972	5,217,210.47	64.00	81,517.38	33.42	2,724,406.84
1973	1,380,359.45	64.00	21,567.71	34.01	733,485.74
1974	826,641.07	64.00	12,916.02	34.60	446,935.04
1975	949,225.92	64.00	14,831.38	35.20	522,098.18
1976	3,055,422.81	64.00	47,740.08	35.81	1,709,351.46
1977	976,336 72	64.00	15,254.97	36.41	555,503.60
1978	1,529,710.65	64.00	23,901.28	37.03	884,998.57
1979	6,398,591.65	64.00	99,976.11	37.65	3,763,719.50
1980	2,956,687.08	64.00	46,197.37	38.27	1,767,882.12
1981	14,196,814.70	64.00	221,821.05	38.90	8,628,009.92
1982	11,929,362.20	64.00	186,392.78	39.53	7,367,792.07
1983	7,097,536.24	64.00	110,896.92	40.16	4,454,047.91
1984	10,703,373.78	64.00	167,237.07	40.80	6,824,018.67
1985	6,868,267.74	64.00	107,314.66	41.45	4,447,976.45
1986	19,384,266.33	64.00	302,873.46	42.10	12,749,938.16
1987	532,021.26	64.00	8,312.68	42.75	355,346.45
1988	470,109.96	64.00	7,345.33	43.40	318,813.48
1989	1,167,786.24	64.00	18,246.32	44.06	803,958.00
1990	817,045.15	64.00	12,766.09	44.72	570,953.26
1991	2,106,220.45	64.00	32,909.08	45.39	1,493,731.81
1992	3,534,458.68	64.00	55,224.88	46.06	2,543,510.23
1993	3,487,352.10	64.00	54,488.85	46.73	2,546,194.82
1994	1,403,097.76	64.00	21,922.99	47.40	1,039,190.11

ETI

Electric Division

353.00 Station Equipment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 64 *Survivor Curve:* R1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1995	3,298,415.61	64.00	51,536.77	48.08	2,477,818.69
1996	7,363,163.39	64.00	115,047.26	48.76	5,609,331.79
1997	1,812,519.46	64.00	28,320.08	49.44	1,400,104.06
1998	2,657,088.70	64.00	41,516.23	50.12	2,080,889.27
1999	5,384,849.19	64.00	84,136.69	50.81	4,274,802.32
2000	4,738,385.64	64.00	74,035.88	51.50	3,812,575.78
2001	21,347,799.93	64.00	333,553.10	52.19	17,406,939.06
2002	31,359,659.92	64.00	489,985.46	52.88	25,910,373.43
2003	37,399,075.47	64.00	584,349.56	53.57	31,306,450.01
2004	6,779,980.02	64.00	105,935.19	54.27	5,749,493.31
2005	24,563,922.36	64.00	383,804.06	54.97	21,099,206.81
2006	24,361,172.62	64.00	380,636.16	55.68	21,193,223.20
2007	6,702,552.60	64.00	104,725.41	56.39	5,904,991.34
2008	12,088,618.51	64.00	188,881.11	57.09	10,784,123.11
2009	6,538,508.14	64.00	102,162.27	57.81	5,905,795.10
2010	16,770,784.21	64.00	262,038.57	58.52	15,335,374.42
2011	29,588,547.14	64.00	462,312.35	59.24	27,388,805.67
2012	18,388,743.11	64.00	287,318.70	59.96	17,229,003.73
2013	32,652,183.33	64.00	510,180.76	60.69	30,963,540.66
2014	18,834,652.57	64.00	294,285.91	61.42	18,075,294.67
2015	22,277,040.92	64.00	348,072.21	62.15	21,633,827.57
2016	130,602,582.20	64.00	2,040,626.94	62.89	128,335,099.85
2017	61,451,186.57	64.00	960,156.72	63.63	61,094,286.75
Total	668,610,518.41	64.00	10,446,842.73	54.29	567,207,400.79

Composite Average Remaining Life ... 54.29 Years

ETI
Electric Division
361.00 Structures and Improvements
Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2017
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 83 *Survivor Curve:* R2.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1941	7,228.00	83.00	87.08	23.04	2,006.22
1943	20,317.09	83.00	244.78	24.11	5,901.45
1944	3,867.04	83.00	46.59	24.66	1,148.87
1945	7,970.79	83.00	96.03	25.22	2,422.26
1947	401.40	83.00	4.84	26.37	127.54
1948	2,104.42	83.00	25.35	26.96	683.55
1951	13,632.60	83.00	164.25	28.78	4,727.29
1952	66,085.21	83.00	796.21	29.40	23,411.98
1953	1,577.37	83.00	19.00	30.04	570.81
1954	4,299.76	83.00	51.80	30.67	1,589.05
1956	1,703.40	83.00	20.52	31.98	656.35
1957	16,677.77	83.00	200.94	32.64	6,559.40
1958	26,282.89	83.00	316.66	33.31	10,549.25
1959	212,992.17	83.00	2,566.17	33.99	87,236.16
1960	15,003.08	83.00	180.76	34.68	6,268.74
1961	14,398.03	83.00	173.47	35.37	6,135.96
1962	15,252.83	83.00	183.77	36.07	6,628.63
1963	3,537.58	83.00	42.62	36.78	1,567.43
1964	19,621.83	83.00	236.41	37.49	8,863.09
1965	3,678.70	83.00	44.32	38.21	1,693.52
1966	20,011.39	83.00	241.10	38.94	9,387.28
1967	68,213.07	83.00	821.84	39.67	32,599.55
1968	38,500.92	83.00	463.87	40.40	18,741.90
1969	15,638.27	83.00	188.41	41.15	7,753.27
1970	18,070.06	83.00	217.71	41.90	9,122.26
1971	120,541.99	83.00	1,452.31	42.66	61,950.72
1972	234,514.57	83.00	2,825.47	43.42	122,677.04

ETI

Electric Division

361.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 83 *Survivor Curve: R2.5*

Year *(1)*	*Original Cost* *(2)*	*Avg. Service Life* *(3)*	*Avg. Annual Accrual* *(4)*	*Avg. Remaining Life* *(5)*	*Future Annual Accruals* *(6)*
1973	122,995.81	83.00	1,481.87	44.19	65,477.24
1974	209,131.92	83.00	2,519.66	44.96	113,287.59
1975	40,214.12	83.00	484.51	45.74	22,161.67
1976	90,718.80	83.00	1,093.00	46.53	50,851.89
1977	4,363.17	83.00	52.57	47.32	2,487.27
1978	45,344.85	83.00	546.32	48.11	26,283.63
1979	57,121.57	83.00	688.21	48.91	33,662.83
1980	384,003.42	83.00	4,626.54	49.72	230,030.78
1981	245,833.19	83.00	2,961.84	50.53	149,665.05
1982	357,065.37	83.00	4,301.99	51.35	220,895.28
1983	126,408.03	83.00	1,522.99	52.17	79,451.64
1984	10,095.27	83.00	121.63	53.00	6,446.04
1985	126,069.37	83.00	1,518.91	53.83	81,760.89
1986	86,249.08	83.00	1,039.14	54.66	56,804.75
1987	5,205.17	83.00	62.71	55.51	3,480.91
1988	30,828.21	83.00	371.42	56.35	20,930.04
1989	67,495.98	83.00	813.20	57.20	46,517.98
1990	54,136.43	83.00	652.25	58.06	37,868.16
1991	15,696.34	83.00	189.11	58.92	11,141.96
1992	200,110.00	83.00	2,410.96	59.78	144,128.17
1993	132,435.10	83.00	1,595.60	60.65	96,769.58
1994	86,269.56	83.00	1,039.39	61.52	63,945.15
1995	259,197.88	83.00	3,122.86	62.40	194,859.55
1996	319,104.65	83.00	3,844.63	63.28	243,278.89
1997	68,278.53	83.00	822.63	64.16	52,781.05
1998	203,461.63	83.00	2,451.34	65.05	159,460.45
1999	476,568.66	83.00	5,741.78	65.94	378,623.68

ETI

Electric Division

361.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 83 *Survivor Curve: R2.5*

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2000	1,262,440.45	83.00	15,210.10	66.84	1,016,595.81
2001	689,856.11	83.00	8,311.51	67.74	562,982.79
2002	856,487.39	83.00	10,319.11	68.64	708,274.33
2003	718,800.97	83.00	8,660.24	69.54	602,266.39
2004	39,368.96	83.00	474.32	70.45	33,417.39
2005	896,193.46	83.00	10,797.50	71.36	770,558.29
2006	326,507.56	83.00	3,933.82	72.28	284,334.24
2007	35,581.84	83.00	428.70	73.20	31,379.37
2008	129,316.40	83.00	1,558.03	74.12	115,479.87
2009	434,940.49	83.00	5,240.24	75.04	393,244.32
2010	720,260.98	83.00	8,677.83	75.97	659,252.51
2011	822,462.16	83.00	9,909.17	76.90	762,004.05
2012	25,540.25	83.00	307.71	77.83	23,949.50
2013	53,327.92	83.00	642.50	78.77	50,607.44
2014	172,986.24	83.00	2,084.17	79.70	166,114.09
2015	685,064.75	83.00	8,253.78	80.64	665,601.09
2016	5,549,871.35	83.00	66,865.82	81.58	5,455,137.66
2017	342,316.49	83.00	4,124.29	82.53	340,364.69
Total	18,557,848.11	83.00	223,588.19	70.11	15,675,595.48

Composite Average Remaining Life ... 70.11 Years

ETI

Electric Division

366.00 Underground Conduit

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 60 *Survivor Curve:* L0.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1967	5,576.81	60.00	92.95	34.22	3,180.82
1969	6,831.90	60.00	113.86	34.88	3,971.81
1970	7,857.44	60.00	130.96	35.22	4,611.79
1972	51,849.36	60.00	864.14	35.89	31,018.34
1974	72,149.64	60.00	1,202.47	36.59	43,993.85
1975	21,158.20	60.00	352.63	36.94	13,024.84
1976	464,680.66	60.00	7,744.55	37.29	288,791.91
1977	81,156.14	60.00	1,352.58	37.65	50,920.05
1978	89,231.77	60.00	1,487.17	38.01	56,522.94
1979	26,994.68	60.00	449.90	38.37	17,263.08
1980	140,713.75	60.00	2,345.19	38.74	90,847.62
1981	348,898.19	60.00	5,814.87	39.11	227,409.85
1982	947,589.18	60.00	15,792.89	39.48	623,540.40
1983	1,167,119.72	60.00	19,451.67	39.86	775,353.03
1984	1,566,391.93	60.00	26,106.10	40.24	1,050,596.86
1985	1,822,419.00	60.00	30,373.14	40.63	1,234,129.20
1986	726,291.16	60.00	12,104.65	41.03	496,617.39
1987	298,526.69	60.00	4,975.36	41.43	206,129.43
1988	485,651.90	60.00	8,094.06	41.84	338,664.71
1989	455,465.76	60.00	7,590.97	42.26	320,800.34
1990	1,214,152.13	60.00	20,235.53	42.69	863,837.75
1991	1,240,605.77	60.00	20,676.42	43.13	891,751.25
1992	801,511.89	60.00	13,358.31	43.58	582,120.90
1993	2,287,426.34	60.00	38,123.14	44.04	1,678,943.82
1994	2,018,253.24	60.00	33,636.99	44.51	1,497,328.46
1995	2,283,843.58	60.00	38,063.42	45.00	1,712,883.00
1996	1,350,455.55	60.00	22,507.22	45.50	1,024,052.05

ETI

Electric Division

366.00 Underground Conduit

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: ***60*** *Survivor Curve:* ***L0.5***

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1997	681,686.97	60.00	11,361.26	46.01	522,755.65
1998	267,947.95	60.00	4,465.72	46.54	207,817.02
1999	606,555.48	60.00	10,109.09	47.08	475,912.28
2000	1,991,254.37	60.00	33,187.02	47.63	1,580,799.40
2001	1,038,070.51	60.00	17,300.89	48.20	833,894.99
2002	913,541.81	60.00	15,225.44	48.78	742,772.01
2003	1,223,524.81	60.00	20,391.74	49.38	1,007,038.63
2004	2,423,871.32	60.00	40,397.18	50.00	2,019,688.56
2005	2,606,108.08	60.00	43,434.41	50.63	2,198,939.95
2006	2,054,433.19	60.00	34,239.98	51.27	1,755,566.66
2007	2,192,198.41	60.00	36,536.03	51.93	1,897,433.06
2008	2,042,145.34	60.00	34,035.19	52.61	1,790,528.37
2009	1,415,937.82	60.00	23,598.57	53.30	1,257,851.28
2010	867,496.80	60.00	14,458.04	54.01	780,855.72
2011	758,652.40	60.00	12,644.00	54.74	692,096.08
2012	715,412.10	60.00	11,923.34	55.48	661,545.15
2013	1,530,631.07	60.00	25,510.09	56.25	1,434,884.82
2014	722,800.94	60.00	12,046.48	57.03	687,018.04
2015	1,274,761.68	60.00	21,245.67	57.84	1,228,851.40
2016	2,854,683.34	60.00	47,577.26	58.67	2,791,361.12
2017	2,032,326.65	60.00	33,871.54	59.54	2,016,825.98
Total	50,196,843.42	60.00	836,600.08	48.66	40,712,741.65

Composite Average Remaining Life ... 48.66 Years

ETI
Electric Division
367.00 Underground Conductors and Devices
Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2017
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 42 *Survivor Curve:* R1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1967	141.15	42.00	3.36	11.58	38.90
1968	145.32	42.00	3.46	12.00	41.52
1969	455.31	42.00	10.84	12.43	134.78
1970	302.38	42.00	7.20	12.87	92.67
1971	51,057.54	42.00	1,215.62	13.32	16,191.28
1972	48,262.86	42.00	1,149.09	13.77	15,827.56
1973	234,789.88	42.00	5,590.09	14.24	79,581.55
1974	102,544.96	42.00	2,441.48	14.71	35,904.38
1975	2,132.36	42.00	50.77	15.18	770.90
1976	598,906.72	42.00	14,259.31	15.67	223,445.29
1977	817,283.04	42.00	19,458.61	16.16	314,539.50
1978	825,296.83	42.00	19,649.41	16.67	327,489.90
1979	539,267.27	42.00	12,839.36	17.18	220,538.73
1980	676,490.40	42.00	16,106.49	17.70	285,021.45
1981	1,029,038.26	42.00	24,500.27	18.22	446,465.35
1982	3,164,799.56	42.00	75,350.40	18.76	1,413,405.33
1983	2,621,127.11	42.00	62,406.16	19.30	1,204,580.62
1984	4,122,290.64	42.00	98,147.21	19.85	1,948,609.27
1985	3,396,580.20	42.00	80,868.84	20.41	1,650,920.47
1986	1,707,506.40	42.00	40,653.85	20.98	853,044.35
1987	695,850.21	42.00	16,567.43	21.56	357,182.20
1988	1,257,270.74	42.00	29,934.24	22.14	662,885.36
1989	1,780,168.70	42.00	42,383.86	22.74	963,681.62
1990	2,985,916.22	42.00	71,091.39	23.34	1,659,113.57
1991	3,798,961.47	42.00	90,449.10	23.95	2,165,849.08
1992	2,700,017.72	42.00	64,284.46	24.56	1,578,847.81
1993	4,117,057.81	42.00	98,022.63	25.18	2,468,529.76

ETI

Electric Division

367.00 Underground Conductors and Devices

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 42 *Survivor Curve:* R1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1994	5,204,464.91	42.00	123,912.59	25.81	3,198,460.19
1995	6,122,625.96	42.00	145,773.00	26.45	3,855,336.11
1996	4,946,509.53	42.00	117,770.96	27.09	3,190,448.08
1997	3,080,383.03	42.00	73,340.54	27.74	2,034,316.40
1998	1,885,793.14	42.00	44,898.66	28.39	1,274,760.78
1999	5,694,958.01	42.00	135,590.70	29.05	3,939,000.05
2000	3,031,906.88	42.00	72,186.37	29.71	2,144,953.38
2001	6,039,351.44	42.00	143,790.33	30.38	4,368,777.30
2002	2,510,721.92	42.00	59,777.53	31.06	1,856,415.90
2003	2,806,581.51	42.00	66,821.62	31.73	2,120,361.78
2004	3,213,831.99	42.00	76,517.81	32.41	2,480,141.62
2005	2,403,538.32	42.00	57,225.61	33.10	1,893,957.06
2006	2,156,375.62	42.00	51,340.94	33.78	1,734,509.94
2007	5,757,427.65	42.00	137,078.03	34.48	4,725,783.98
2008	5,087,151.07	42.00	121,119.48	35.17	4,259,745.51
2009	6,870,039.94	42.00	163,568.11	35.87	5,867,070.25
2010	4,063,759 26	42.00	96,753.65	36.57	3,538,506.78
2011	2,394,195.48	42.00	57,003.17	37.28	2,125,098.11
2012	2,973,372.92	42.00	70,792.74	37.99	2,689,600.29
2013	2,922,225.67	42.00	69,574.98	38.71	2,693,209.51
2014	3,180,649.53	42.00	75,727.77	39.43	2,986,100.63
2015	6,580,368.40	42.00	156,671.35	40.16	6,291,789.45
2016	4,277,508.15	42.00	101,842.77	40.89	4,164,490.98
2017	5,071,842.45	42.00	120,755.00	41.63	5,027,037.83

ETI

Electric Division

367.00 Underground Conductors and Devices

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 42 *Survivor Curve: R1*

Year	*Original Cost*	*Avg. Service Life*	*Avg. Annual Accrual*	*Avg. Remaining Life*	*Future Annual Accruals*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Total	135,549,243.84	42.00	3,227,278.65	30.17	97,352,605.11

Composite Average Remaining Life ... 30.17 Years

ETI

Electric Division

371.00 Installation on Customer Premises

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 56 *Survivor Curve: R4*

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1962	106,233.63	56.00	1,897.02	8.44	16,002.56
1963	125,909.68	56.00	2,248.37	8.93	20,077.96
1964	84,372.49	56.00	1,506.64	9.45	14,236.02
1965	110,279.22	56.00	1,969.26	10.00	19,698.96
1966	98,604.01	56.00	1,760.78	10.59	18,638.14
1967	117,018.02	56.00	2,089.60	11.19	23,387.78
1968	82,447.48	56.00	1,472.27	11.82	17,405.54
1969	222,163.54	56.00	3,967 18	12.47	49,463.73
1970	264,255.20	56.00	4,718.82	13.14	61,983.10
1971	306,542.12	56.00	5,473.94	13.82	75,623.30
1972	296,145.45	56.00	5,288.28	14.51	76,715.39
1973	409,524.10	56.00	7,312.89	15.21	111,228.95
1974	384,867.55	56.00	6,872.60	15.92	109,436.18
1975	400,805.33	56.00	7,157.20	16.65	119,191.43
1976	578,390.73	56.00	10,328.35	17.40	179,673.02
1977	619,450.59	56.00	11,061.56	18.15	200,788.92
1978	494,834.12	56.00	8,836.28	18.92	167,166.05
1979	604,024.81	56.00	10,786.10	19.70	212,507.78
1980	478,381.16	56.00	8,542.47	20.50	175,111.27
1981	861,289.83	56.00	15,380.09	21.31	327,729.55
1982	749,552.48	56.00	13,384.79	22.13	296,221.19
1983	765,421.60	56.00	13,668.17	22.96	313,875.98
1984	328,983.29	56.00	5,874.67	23.81	139,889.60
1985	593,392.14	56 00	10,596.23	24.67	261,432.75
1986	1,210,115.46	56.00	21,609.09	25.54	551,967.69
1987	343,525.72	56.00	6,134.35	26.43	162,101.04
1988	495,959.17	56.00	8,856.37	27.32	241,919.39

ETI

Electric Division

371.00 Installation on Customer Premises

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 56 *Survivor Curve:* R4

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1989	530,215.96	56.00	9,468.09	28.22	267,176.66
1990	564,202.19	56.00	10,074.98	29.13	293,489.06
1991	631,773.61	56.00	11,281.61	30.05	339,022.06
1992	617,518.71	56.00	11,027.06	30.98	341,594.76
1993	914,854.48	56.00	16,336.60	31.91	521,374.62
1994	922,938.27	56.00	16,480.95	32.86	541,530.83
1995	1,576,592.67	56.00	28,153.29	33.81	951,799.35
1996	1,511,685.26	56.00	26,994.23	34.76	938,408.92
1997	1,429,685.32	56.00	25,529.96	35.72	912,018.14
1998	968,440.35	56.00	17,293.48	36.69	634,491.29
1999	1,698,355.22	56.00	30,327.61	37.66	1,142,139.76
2000	430,958.84	56.00	7,695.65	38.63	297,316.78
2001	524,290.38	56.00	9,362.28	39.61	370,860.15
2002	681,764.39	56.00	12,174.30	40.59	494,187.97
2003	883,402.06	56.00	15,774.95	41.58	655,869.04
2004	392,972.39	56.00	7,017.33	42.56	298,677.50
2005	54,488.97	56.00	973.01	43.55	42,375.84
2006	1,759.36	56.00	31.42	44.54	1,399.35
2007	230,857.93	56.00	4,122.44	45.53	187,707.06
2008	114,026.41	56.00	2,036.17	46.53	94,735.54
2009	694,378.75	56.00	12,399.55	47.52	589,234.23
2010	1,062,115.22	56.00	18,966.24	48.52	920,165.43
2011	497,234.55	56.00	8,879.14	49.51	439,624.48
2012	1,003,782.58	56.00	17,924.59	50.51	905,353.52
2013	735,611.38	56.00	13,135.85	51.51	676,582.18
2014	643,413.47	56.00	11,489.46	52.50	603,249.34
2015	706,618.31	56.00	12,618.12	53.50	675,106.78

ETI

Electric Division

371.00 Installation on Customer Premises

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2017

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: *56* *Survivor Curve:* *R4*

Year	*Original Cost*	*Avg. Service Life*	*Avg. Annual Accrual*	*Avg. Remaining Life*	*Future Annual Accruals*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
2016	1,085,030.58	56.00	19,375.44	54.50	1,055,994.07
2017	999,198.07	56.00	17,842.73	55.50	990,283.91
Total	33,240,654.60	56.00	593,579.87	33.94	20,145,241.90

Composite Average Remaining Life ... 33.94 Years