STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF INDIANA GAS COMPANY, INC. D/B/A VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN NORTH") FOR (1) AUTHORITY TO MODIFY ITS RATES AND CHARGES FOR GAS UTILITY SERVICE THROUGH A PHASE-IN OF RATES, (2) APPROVAL OF NEW SCHEDULES OF RATES AND CHARGES, AND NEW AND REVISED RIDERS, (3) APPROVAL OF A NEW TAX SAVINGS CREDIT RIDER, (4) APPROVAL OF VECTREN NORTH'S ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS AND AUTHORITY TO EXTEND PETITIONER'S ENERGY EFFICIENCY RIDER ("EER"), INCLUDING THE DECOUPLING MECHANISM EFFECTUATED THROUGH THE EER, (5) APPROVAL OF REVISED DEPRECIATION RATES APPLICABLE TO GAS PLANT IN SERVICE, (6) APPROVAL OF NECESSARY AND APPROPRIATE ACCOUNTING RELIEF, AND (7) APPROVAL OF AN ALTERNATIVE REGULATORY PLAN PURSUANT TO WHICH VECTREN NORTH WOULD CONTINUE ITS CUSTOMER BILL ASSISTANCE PROGRAMS.	)	**CAUSE NO. 45468**

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR'S

PUBLIC'S EXHIBIT NO. 6 – TESTIMONY OF OUCC WITNESS DAVID J. GARRETT

With the current requirement that all staff work from home, signatures for affirmations are not available at this time.

March 31, 2021

Respectfully submitted,

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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 in 2011, where 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. In 2016 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]

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[1] Attachment DJG-1.

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

A. I am testifying on behalf of the Indiana Office of Utility Consumer Counselor ("OUCC").

Q. Describe the scope and organization of your testimony.

A. My testimony addresses the depreciation rates proposed by John Spanos, who conducted the depreciation study on behalf of Indiana Gas Company, Inc. d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren North" or the "Company").

II. EXECUTIVE SUMMARY

Q. Summarize the key points of your testimony.

A. In the context of utility ratemaking, "depreciation" refers to a cost allocation system designed to measure the rate by which a utility may recover its capital investments in a systematic and rational manner over the average service life of the capital investment. I employed a depreciation system using actuarial plant analysis to statistically analyze the Company's depreciable assets and develop reasonable depreciation rates and annual accruals. In this case, Mr. Spanos conducted a depreciation study on the Company's natural gas plant as of December 31, 2019. Mr. Spanos calculated his proposed depreciation rates under the Equal Life Group ("ELG") procedure. As further discussed below, one cannot conclude that use of the ELG procedure will result in fair and reasonable depreciation rates under the present circumstances. Thus, my primary recommendation to the Indiana Utility Regulatory Commission ("Commission") is the calculation of depreciation rates under the Average Life Group ("ALG") procedure, along with reasonable adjustments to the

Company's proposed mass property service lives for several accounts. The following table summarizes my primary recommendation to the Commission.[2]

Figure 1:
Primary Recommendation – ALG Procedure

Plant Function	Plant Balance 12/31/2019	Company Proposed Accrual	OUCC Proposed Accrual	**OUCC Accrual Adjustment**
Manufactured Gas Production	$ 10,592,377	$ 14,691	$ 12,809	$ (1,882)
Underground Storage	45,077,607	281,463	226,412	(55,051)
Transmission	362,418,164	8,335,010	6,661,912	(1,673,098)
Distribution	2,166,237,970	68,207,710	57,932,531	(10,275,179)
General	108,457,476	3,040,717	2,560,090	(480,627)
Total Plant Studied	$ 2,692,783,593	$ 79,879,591	$ 67,393,755	**$ (12,485,836)**

As shown in the table, the OUCC's proposed depreciation rates would result in an adjustment reducing the Company's proposed depreciation accrual by $12.5 million, when applied to plant as of December 31, 2019.

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

A. 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 lives of the utility's assets. If depreciation rates are overestimated (i.e., service lives are underestimated), it may unintentionally incent economic inefficiency. When an asset is fully depreciated and no longer in rate base, but still used by a utility, a utility may be incented to retire and replace the asset to increase rate base, even though the retired asset

[2] Attachments DJG-2 and DJG-3; *see also* Attachment DJG-12 for remaining life calculations.

may not have reached the end of its economic useful life. If, on the other hand, an asset must be retired before it is fully depreciated, there are regulatory mechanisms that can ensure the utility fully recovers its prudent investment in the retired asset. Thus, in my opinion, it is preferable for regulators to ensure that assets are not fully depreciated before the end of their economic useful lives.

III. LEGAL STANDARDS

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

A. In *Lindheimer v. Illinois Bell Telephone Co.*, the U.S. Supreme Court stated that "depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy, and obsolescence."[3] The *Lindheimer* Court also recognized that the original cost of plant assets, rather than present value or some other measure, is the proper basis for calculating depreciation expense. Moreover, the *Lindheimer* Court found:

> [T]he company has the burden of making a convincing showing that the amounts it has charged to operating expenses for depreciation have not been excessive. That burden is not sustained by proof that its general accounting system has been correct. The calculations are mathematical, but the predictions underlying them are essentially matters of opinion.[4]

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

[4] *Id*. at 169.

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

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

A. Yes. While the *Lindheimer* case and other early literature recognized depreciation as a necessary expense, the language indicated that depreciation was primarily a mechanism to determine loss of value.[5] Adoption of this "value concept" requires 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.[6] The definition of "depreciation accounting" published by the American Institute of Certified Public Accountants ("AICPA") properly reflects the cost allocation concept:

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

[6] 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.[7]

Thus, the concept of depreciation as "the allocation of cost has proven to be the most useful and most widely used concept."[8]

IV. <u>ANALYTIC METHODS</u>

A. <u>Depreciation System</u>

Q. Discuss the definition and general purpose of a depreciation system, as well as the specific 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 <u>method</u> of allocation; 2) a <u>procedure</u> for applying the method of allocation; 3) a <u>technique</u> of applying the depreciation rate; and 4) a <u>model</u> for analyzing the characteristics of vintage property groups.[9] In this case, I used the straight-line method, the average life procedure, the

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

[8] Wolf *supra* n. 5, at 73.

[9] *See* Wolf *supra* n. 5, at 70, 140.

remaining life technique, and the broad group model; this system would be denoted as an "SL-AL-RL-BG" system. This depreciation system conforms to the legal standards set forth above and is commonly used by depreciation analysts in regulatory proceedings. I provide a more detailed discussion of depreciation system parameters, theories, and equations in Appendix A.

B. Average Life vs. Equal Life Procedure

Q. Explain the primary difference between the ALG and ELG procedures.

A. In the ALG procedure, a constant accrual rate based on the average life of all property in the group is applied to the surviving property.[10] In the ELG procedure, property is divided into subgroups that each have a common life. Pertinently, the ELG procedure results in higher depreciation rates in the early years of a vintage's life. This fact is confirmed by authoritative depreciation literature. According to Wolf:

> When contrasted with the average life procedure, the equal life group procedure results in annual accruals that are <u>higher</u> during the early years and lower in the later years.[11]

The NARUC Public Utility Depreciation Practices also makes the same conclusion about the equal life procedure:

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[10] *Id*. at 74-75.

[11] *Id*. at 93 (emphasis added).

> [T]he ELG procedure results in annual accruals that are higher during the early years of a vintage's life, thereby causing an increase in depreciation expense and revenue requirements during these years.[12]

In contrast, use of the average life results in the same depreciation rate applied to each age interval.

Q. Did the Commission recently reject the ELG method in favor of the ALG method?

A. Yes. In Duke Energy Indiana's ("DEI") 2019 rate case, DEI proposed depreciation rates under the ELG procedure.[13] Both the OUCC and the Industrial Group recommended that the ELG procedure be rejected in favor of the ALG procedure. In its decision, the Commission found:

> First, with respect to the question of whether the ELG or ALG method should be used, we find the evidence presented by OUCC witness Mr. Garrett and Industrial Group witness Mr. Andrews persuasive, as both witnesses showed that the ELG method results in unreasonably high depreciation rates. ALG depreciation rates result in systematical and rational cost recovery with near term customer rate relief and full cost recovery of utility investments. While we have determined in the past that the ELG methodology was appropriate and acknowledge the weight given to precedent in many prior decisions, we always evaluate each case as it comes before us and do not need to approve the same methodology based on prior decisions, especially in light of a changed landscape.[14]

In my opinion, the Commission should continue to adopt the ALG procedure and apply it to the Company's depreciation rates in this case.

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[12] NARUC *supra* n. 6, at 176.

[13] *In re Duke Energy Indiana, LLC*, Cause No. 45253, Final Order p. 90 (Ind. Util. Regul. Comm'n Jun. 29, 2020).

[14] *Id*.

Q. Are you aware of another recent case in which the Commission approved depreciation rates under the ALG method?

A. Yes. In Indiana Michigan Power Company's ("I&M") 2019 rate case, I&M proposed depreciation rates calculated under the ALG method, as did the OUCC and Industrial Group.[15] Thus, no party proposed depreciation rates under the ELG method.

Q. In discussing the legal and technical standards above, you stated that a depreciation system should result in systematical and rational cost recovery. Do you think the ELG procedure would likely violate that fundamental standard?

A. Yes. In theory, the ELG could be part of a systematic and rational cost recovery system. In practice, however, it would be difficult to come to the same conclusion. In order for the ELG procedure to be properly applied, a utility would need to revise depreciation rates each year. However, given the logistical realities involved with prosecuting rate cases, this would be impractical and inefficient. When a utility has made substantial, recent capital investments, depreciation expense calculated under the ELG method will always be higher than the expense calculated under the ALG method. The larger the amount of the investments, the larger the discrepancy will be between the two procedures.

Q. Which grouping procedure is more commonly used in utility regulatory proceedings?

A. In my experience, the ALG procedure is the most commonly used procedure by analysts in depreciation proceedings. Thus, the majority of depreciation rates approved by regulators around the country are calculated under the ALG procedure.

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[15] *In re Indiana Michigan Power Co*., Cause No. 45235, Final Order p. 29, et seq. (Ind. Util. Regul. Comm'n Mar. 11, 2019).

Q. What is the isolated impact to the depreciation accrual in this case resulting from the Company's use of the ELG procedure?

A. If all of the Company's proposed depreciation parameters were left unadjusted (service life, net salvage, etc.), using the ALG method alone would result in an adjustment decreasing the Company's proposed depreciation accrual by $10.3 million, as shown in the figure below.[16]

Figure 2:
Vectren North's Depreciation Parameters Under ALG Method

Plant Function	Plant Balance 12/31/2019	Company Proposed Accrual	OUCC Proposed Accrual	**OUCC Accrual Adjustment**
Manufactured Gas Production	$ 10,592,377	$ 14,691	$ 12,809	$ (1,882)
Underground Storage	45,077,607	281,463	226,412	(55,051)
Transmission	362,418,164	8,335,010	6,661,912	(1,673,098)
Distribution	2,166,237,970	68,207,710	60,126,689	(8,081,021)
General	108,457,476	3,040,717	2,572,912	(467,805)
Total Plant Studied	$ 2,692,783,593	$ 79,879,591	$ 69,600,734	**$ (10,278,857)**

Q. Do you think it would be reasonable for the Commission to adopt all of the depreciation parameters proposed by the Company, but calculated under the ALG procedure, as presented in the figure above?

A. Yes. I disagree with several of the Company's proposed depreciation parameters, as further discussed in my testimony. However, under the circumstances, if the Commission accepted all of the Company's substantive depreciation positions, but calculated depreciation under the ALG procedure, it would result in depreciation rates that are more reasonable than those

[16] *See also* Attachments DJG-5, DJG-6, and DJG-7.

proposed by the Company. To be clear, this is not the OUCC's primary recommendation, which was presented in Figure 1 above.[17]

Q. Please provide an example of how the ELG procedure results in higher depreciation rates in earlier years relative to the ALG procedure.

A. For the following illustration, assume a group of property containing two units, one with an original cost of $4,000 and a 4-year life and the second with an original cost of $6,000 and an 8-year life.[18] Thus, the average life of this group is 6.4 years.[19] Under the ALG procedure, the depreciation rate is 15.625% per year (1/6.4 = 15.625%). The following table illustrates this example.

Figure 3:
ALG Procedure

Year	Balance	Retired	Rate	Annual Accrual	Accum. Deprec.
1974	10000		15.625%	1563	0
1975	10000		15.625%	1563	1563
1976	10000		15.625%	1563	3125
1977	10000	4000	15.625%	1563	4688
1978	6000		15.625%	938	2250
1979	6000		15.625%	938	3188
1980	6000		15.625%	938	4125
1981	6000	6000	15.625%	938	5063
1982	0				0

[17] *See also* Attachments DJG-2, DJG-3, and DJG-4.

[18] *See* Wolf *supra* n. 5, at 82.

[19] AL = [($4,000 x 4) + ($6,000 x 8)] / $10,000 = 6.4 years.

As shown in the annual accrual column, the full $10,000 is depreciated after eight years. Now, considering the same assumptions presented above, the following table illustrates the same scenario except that the rate is calculated under the ELG procedure.

Figure 4:
ELG Procedure

Year	Balance	Retired	Rate	Annual Accrual	Accum. Deprec.
1974	10000		17.50%	1750	0
1975	10000		17.50%	1750	1750
1976	10000		17.50%	1750	3500
1977	10000	4000	17.50%	1750	5250
1978	6000		12.50%	750	3000
1979	6000		12.50%	750	3750
1980	6000		12.50%	750	4500
1981	6000	6000	12.50%	750	5250
1982	0				0

As with the ALG example presented above, the full $10,000 investment is still fully depreciated after eight years. However, there are higher rate and accrual amounts during the earlier years. The reason there is a 17.5% depreciation rate instead of a 15.625% depreciation rate in the early years is because the two units in this group are treated separately under the ELG procedure. The following table shows how the rates in this example are calculated.

Figure 5:
ELG Rate Development

				Annual Accrual	
	Group	Group	Group		
Group	Amount	Life	Rate	1974-77	1978-81
A	4000	4	25.00%	1000	
B	6000	8	12.50%	750	750
Annual accruals				1750	750
Balance during interval				10000	6000
Annual accrual rate %				17.50%	12.50%

This example is simplified in an attempt to explain the complexities of the ELG procedure. In this example, the higher rate of 17.5% stayed the same for four years because there are only two units in this simple example, and the rate drops to 12.5% after the first unit retires. In reality, when the ELG method is applied to large groups of property such as the Company's, the depreciation rate would decline each year and result in reduced depreciation expense.

V. SERVICE LIFE ANALYSIS

Q. Describe the methodology used to estimate the service lives of grouped depreciable assets.

A. The process used to study industrial property retirement is rooted in the actuarial process used to study human mortality. Just as actuarial analysts study historical human mortality data to predict how long a group of people will live, depreciation analysts study historical plant data 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.[20] The retirement rate method is ultimately used to develop an "observed life table," ("OLT") which shows the percentage of property surviving at each age interval. This pattern of property retirement is described as a "survivor curve." The survivor curve derived from the observed life table, however, must be fitted and smoothed with a complete curve in order to determine the ultimate average life of the group.[21] 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."[22] A more detailed explanation of how the Iowa curves are used in the actuarial analysis of depreciable property is set forth in Appendix C.

Q. Describe how you statistically analyzed the Company's historical retirement data in order to determine the most reasonable Iowa curve to apply to each account.

A. I used the aged property data provided by the Company to create 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 required. The Iowa curves are empirically

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[20] 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).

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

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

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 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. As part of my analysis, I may repeat this process several times for any given account to ensure that the most reasonable Iowa curve is selected.

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

A. Not necessarily. Mathematical fitting is an important part of the curve-fitting process because it promotes objective, unbiased results. While mathematical curve-fitting is important, however, it may not always yield the optimum result. For example, if there is insufficient historical data in a particular account and the OLT curve derived from that data is relatively short and flat, the mathematically "best" curve may be one with a very long average life. However, when there is sufficient data available, mathematical curve fitting can be used as part of an objective service life analysis.

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. In fact, "[p]oints 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."[23] 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 greater emphasis on the most valuable portions of the curve. For my analysis in this case, I not only considered the entirety of the OLT curve, but also conducted further analyses that involved fitting Iowa curves to the most significant part of the OLT curve for certain accounts. In other words, to verify the accuracy of my curve selection, I narrowed the focus of my additional calculation to consider approximately 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 some accounts, if necessary. I will illustrate an example of this approach in the discussion below.

Q. Generally, describe the differences between the Company's service life proposals and your service life proposals.

A. For each of the accounts to which I propose adjustments, the Company's proposed average service life, as estimated through an Iowa curve, is too short to provide the most reasonable mortality characteristics of the account. Generally, for the accounts in which I propose a

[23] Wolf *supra* n. 5, at 46.

longer service life, that proposal is based on the objective approach of choosing an Iowa curve that provides a better mathematical fit to the observed historical retirement pattern derived from the Company's plant data.

Q. In support of the Company's service life estimates, did Mr. Spanos present substantial evidence in addition to the historical plant data for each account?

A. No. It appears Mr. Spanos is relying primarily on the Company's historical retirement data in order to make predictions about the remaining average life for the assets in each account. Therefore, I think the Commission should focus primarily on this historical data and objective Iowa curve fitting when assessing fair and reasonable depreciation rates for the Company.

Q. Please describe the criteria you used in selecting the accounts you reviewed and adjusted.

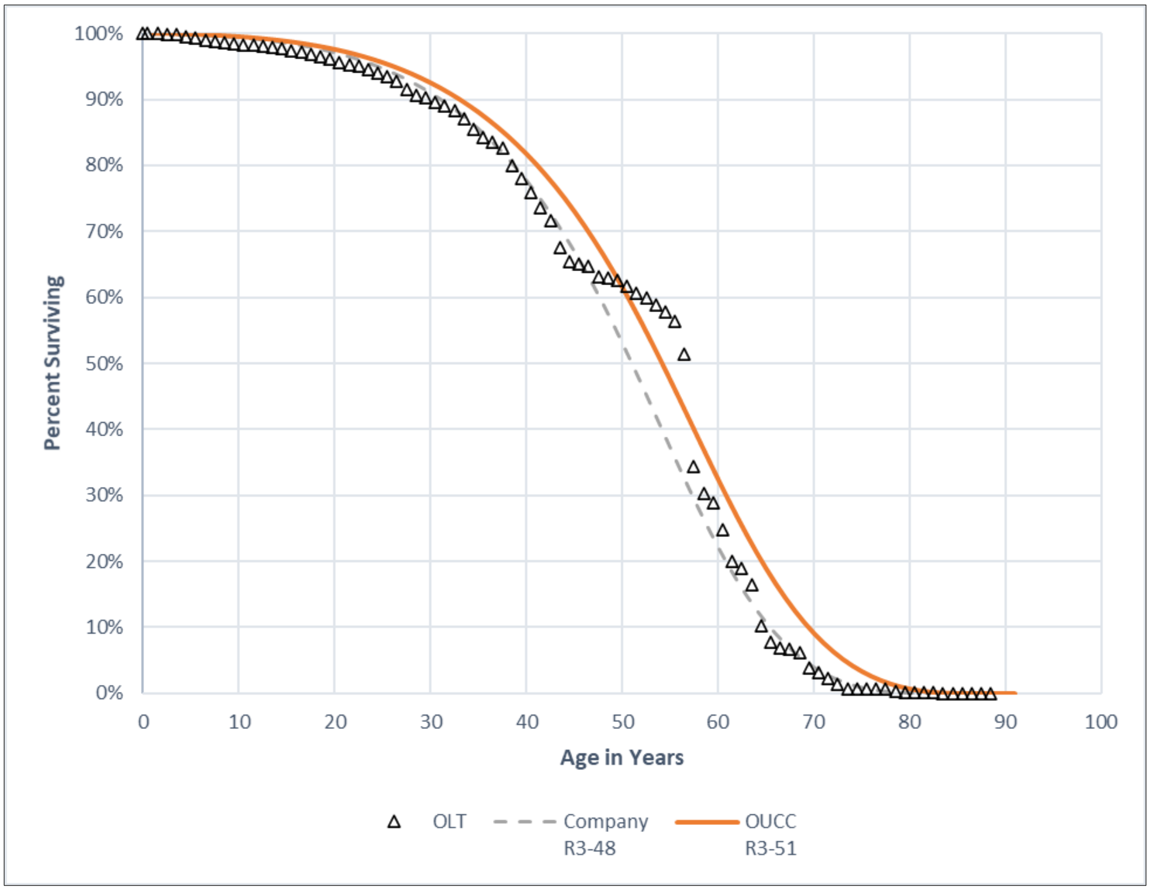
A. I reviewed all of the accounts included in the Company's depreciation study. According to my review, many of the depreciation parameters selected by Mr. Spanos (including service life and net salvage) were reasonable in my opinion. Thus, I do not recommend an adjustment to the depreciation parameters for those accounts. For the accounts discussed below, however, I believe the service lives selected by Mr. Spanos are too short, thus resulting in depreciation rates that are too high.

A. <u>Account 680 – Services</u>

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

A. The observed survivor curve (OLT curve) derived from the Company's data for this account is presented in the graph below. The graph also shows the Iowa curves Mr. Spanos and I selected to represent the average remaining life of the assets in this account. For this account, Mr. Spanos selected the R3-48 Iowa curve, and I selected the R3-51 Iowa curve. Both of these curves are shown in the graph below along with the OLT curve.

Figure 6:
Account 680 – Services



The OLT curve for this account is fairly well suited for conventional Iowa curve fitting techniques because it is relatively smooth and complete. Since both of the selected Iowa curves provide relatively close fits to the OLT curve, we can use mathematical curve fitting to help determine the closer fitting curve.

Q. Does your selected Iowa curve provide a better mathematical fit to the relevant portion of the OLT curve?

A. Yes. While visual curve-fitting techniques can help an analyst identify the most statistically relevant portions of the OLT curve for this account, mathematical curve-fitting techniques can help us determine which of the two Iowa curves provides the better fit (especially in cases where it is not obvious from a visual standpoint which curve provides the better fit). Mathematical curve-fitting essentially involves measuring the "distance" between the OLT curve and the selected Iowa curve. The best fitting curve from a mathematical standpoint 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. In this account, the SSD, or distance between the Company's curve and the OLT curve is 0.3895, while the SSD between the R3-51 curve and the OLT curve is only 0.1283.[24] Thus, the R3-51 curve is a better mathematical fit to the historical data.

B. Account 682 – Meter Installations

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

A. Mr. Spanos selected the R3-40 curve for this account, and I selected the R3-45 curve. These Iowa curves are illustrated in the graph below along with the OLT curve.

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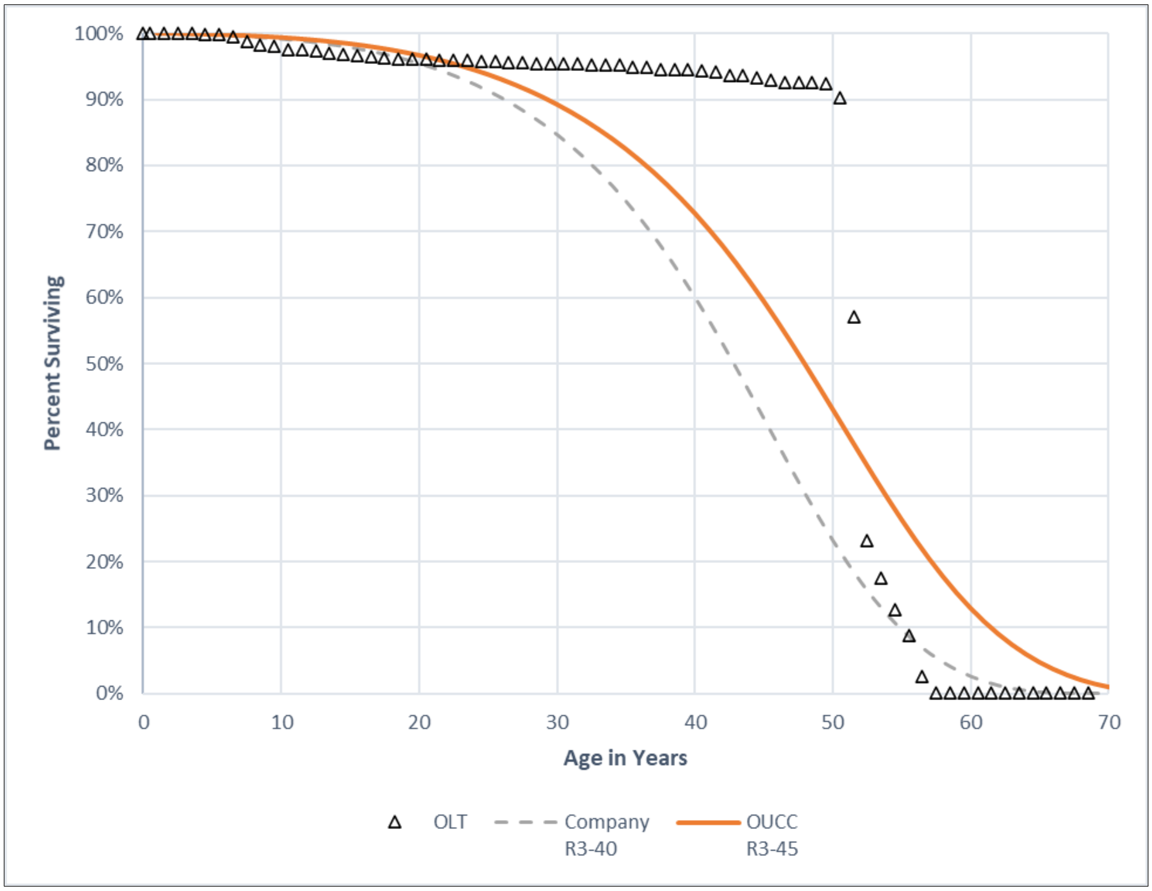
[24] Attachment DJG-8.

Figure 7:
Account 682 – Meter Installations



The OLT curve for this account contains a sharp drop in the percent surviving around year 50. Not surprisingly, the data points occurring after this point are statistically less relevant for the curve fitting process. Another factor worth noting for this account is that the mathematically best fitting Iowa curve (i.e., one that closely fit all of the data points up to age 50) would likely be unreasonably long. Thus, both Iowa curves are effectively anticipating that the retirement rate will increase in this account in future years. However, in my opinion the R3-40 Iowa curve selected by Mr. Spanos does not give enough statistical credit to the historical retirement pattern observed thus far in this account. Assets in this account reaching the age interval of 50 years (which includes relevant data) are surviving at a rate of 90%. Again, there will likely be an increase in retirements going forward, but if that occurs, future depreciation studies can account for the change accordingly. At this time, a longer service life of 45 years is more reasonable than the 40-year average life proposed by Mr. Spanos, given the historical retirement data presented.

Q. Does your selected Iowa curve provide a better mathematical fit to the relevant portion of the OLT curve?

A. Yes. Specifically, the SSD for the curve selected by Mr. Spanos is 4.8594, and the SSD for the R3-45 curve I selected is only 2.3517, which makes it the better mathematical fit.[25]

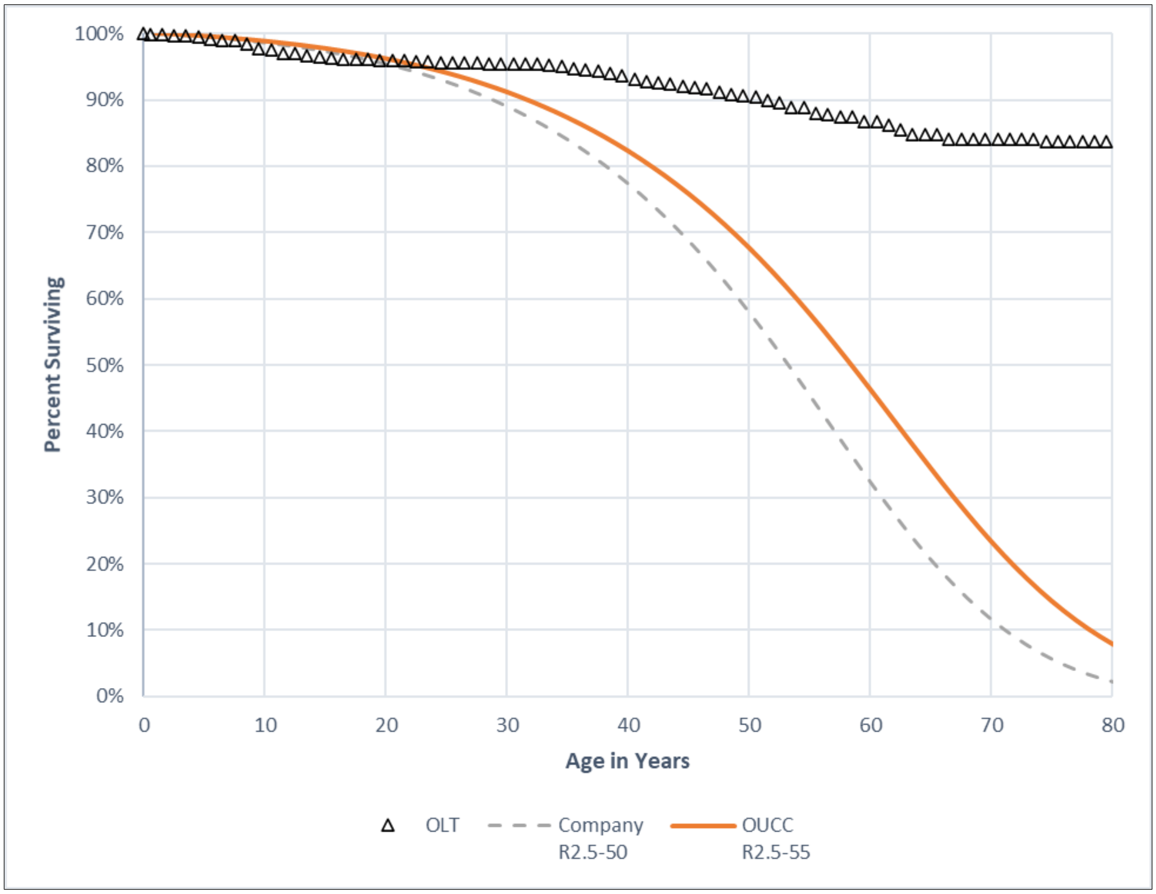
C. Account 685 – Industrial M&R Station Equipment

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

A. Mr. Spanos selected the R2.5-50 curve for this account, and I selected the R2.5-55 curve. These Iowa curves are illustrated in the graph below along with the OLT curve.

[25] Attachment DJG-9.

Figure 8:
Account 685 – Industrial M&R Station Equipment



The OLT curve for this account is similar to the OLT curve for Account 362 above in that it is relatively flat and does not drop below 80% surviving – making it less than ideal for conventional Iowa curve fitting techniques. Again, both Iowa curves are assuming an increasing rate of retirements going forward, but in my opinion, the Iowa curve selected by Mr. Spanos is unreasonably short in that it does not give enough statistical credit to the historical retirement pattern observed thus far in this account.

Q. Does your selected Iowa curve provide a better mathematical fit to the relevant portion of the OLT curve?

A. Yes. Specifically, the SSD for the curve selected by Mr. Spanos is 15.5778, and the SSD for the R2.5-55 curve I selected is 11.1452, which makes it the better mathematical fit.[26]

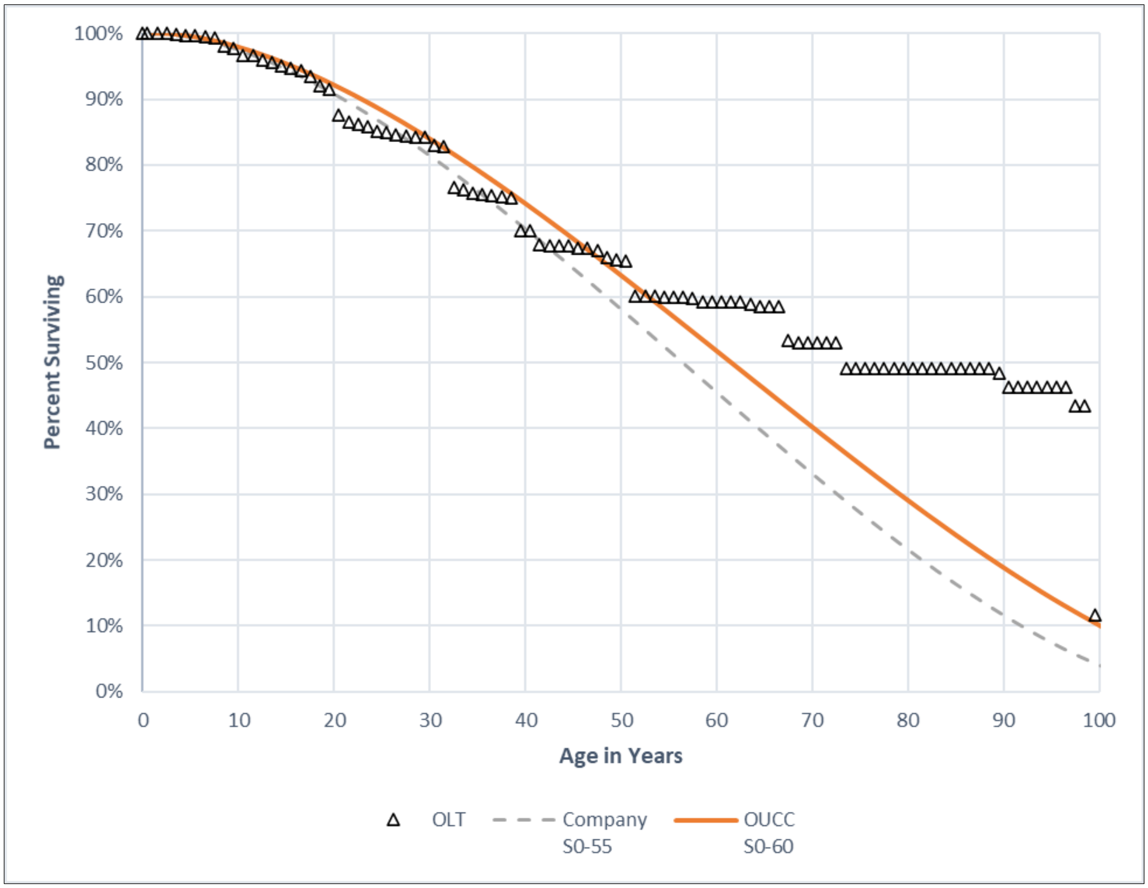
D. Account 690 – Structures and Improvements

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

A. Mr. Spanos selected the S0-55 curve for this account, and I selected the S0-60 curve. These Iowa curves are illustrated in the graph below along with the OLT curve.

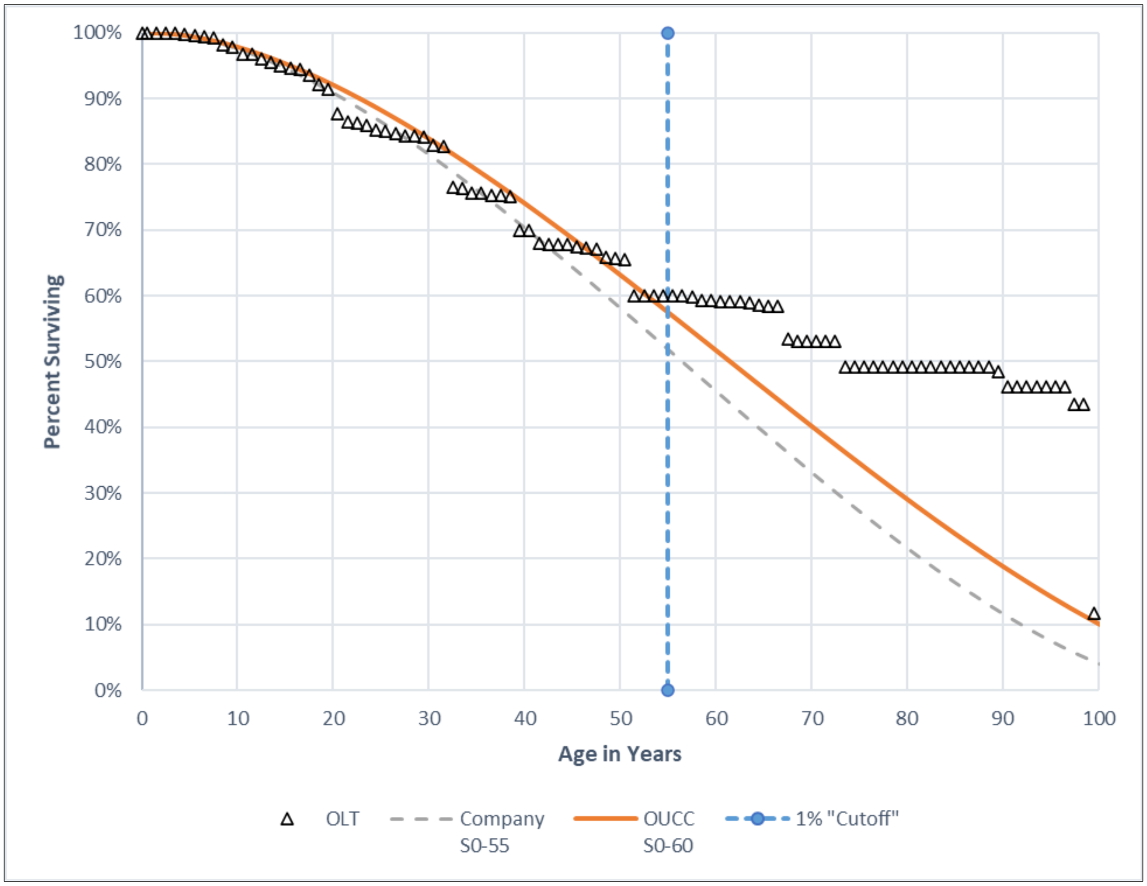
[26] Attachment DJG-10.

Figure 9:
Account 690 – Structures and Improvements



For this account, both Iowa curves ignore the statistically irrelevant "tail" end of this OLT curve. The graph below shows the relevant data points on the OLT curve based on the 1% truncation benchmark discussed above.

Figure 10:
Account 690 – Structures and Improvements – With 1% Truncation



In light of this benchmark, both of the selected Iowa curves provide relatively close fits to the relevant observed data. We can use mathematical curve fitting applied to the relevant OLT curve to determine the closer fitting Iowa curve.

Q. Does your selected Iowa curve provide a better mathematical fit to the relevant portion of the OLT curve?

A. Yes. Specifically, the SSD for the curve selected by Mr. Spanos when applied to the relevant OLT curve portion is 0.0776, and the SSD for the S0-60 curve I selected is only 0.0187, which makes it the better mathematical fit.[27]

VI. CONCLUSION AND RECOMMENDATION

Q. Summarize the key points of your testimony.

A. The Commission has recently rejected the ELG method in favor of the ALG method. I believe it should continue this recent precedent and apply the ALG method to Vectren North's depreciation rates in this case. In addition, I propose reasonable service life adjustments for several of the Company's accounts based on mathematical Iowa curve fitting and industry statistics. Accordingly, I recommend the Commission adopt the depreciation rates I have proposed in Attachment DJG-3.

Q. Does this conclude your depreciation testimony?

A. Yes.

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[27] Attachment DJG-11.

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.[28] 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.[29] The figure below illustrates the basic concept of a depreciation system and includes some of the available parameters.[30]

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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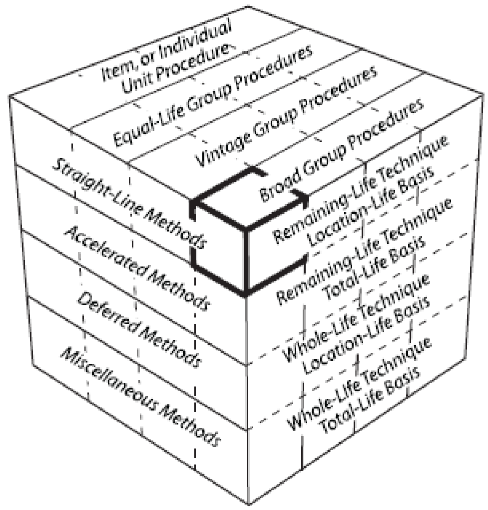
[28] Wolf *supra* n. 5, at 69-70.

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

[30] 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 some of the available parameters of a depreciation system.

Figure 11:
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.[31] 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.[32] The basic formula for the straight-line method is as follows:[33]

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[31] NARUC *supra* n. 6, at 56.

[32] *Id*.

[33] *Id*.

Equation 1:
Straight-Line Accrual

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

Gross plant is a known amount from the utility's records, while both net salvage and service life must be estimated 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.[34] In practice, the annual accrual is expressed as a rate which is applied to the original cost of plant to determine the annual accrual in dollars. The formula for determining the straight-line rate is as follows:[35]

Equation 2:
Straight-Line Rate

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

2. <u>Grouping Procedures</u>

The "procedure" refers to the way the allocation method is applied through subdividing the total property into groups.[36] While single units may be analyzed for depreciation, a group plan of depreciation is particularly adaptable to utility property. Employing a grouping procedure allows for a composite application of depreciation rates to groups of similar property, rather than

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[34] *Id*. at 57.

[35] *Id*. at 56.

[36] Wolf *supra* n. 5, at 74-75.

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.[37] 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.[38]

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.[39] 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.[40] Under the equal life procedure the property is divided into subgroups that each has a common life.[41]

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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[37] *Id*. at 74.

[38] NARUC *supra* n. 6, at 61-62.

[39] *See* Wolf *supr*a n. 5, at 74-75.

[40] *Id*. at 75.

[41] *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.[42]

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.[43] 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.[44] An imbalance exists when the actual accumulated depreciation account does not equal the CAD. The choice of application technique will affect how the imbalance is dealt with.

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

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[42] NARUC *supra* n. 6, at 63-64.

[43] Wolf *supra* n. 5, at 83.

[44] NARUC *supra* n. 6, at 325.

in the annual accrual.[45] 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:[46]

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.[47]

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.[48] 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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[45] NARUC *supra* n. 6, 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.").

[46] *Id*. at 64.

[47] Wolf *supra* n. 5, at 178.

[48] *See* Wolf *supra* n. 5, 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 have 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.[49] 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.[50] A frequency curve is a graph of the frequency of retirements as a function of age. Several types of survivor and frequency curves are illustrated in the figures below.

1. Development

The survivor curves used by analysts today were developed over several decades from extensive analysis of utility and industrial property. In 1931, Edwin Kurtz and Robley Winfrey used extensive data from a range of 65 industrial property groups to create survivor curves representing the life characteristics of each group of property.[51] They generalized the 65 curves

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[49] Wolf *supra* n. 5, at 276.

[50] *Id*. at 23.

[51] *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.[52] 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."[53] 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.[54] 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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[52] *Id*.

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

[54] 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. 5, 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:[55]

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.[56]

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

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[55] *See* Wolf *supra* n. 5, at 37.

[56] *Id*.

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

2. Classification

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

The classification of the survivor curves was made according to whether the mode of the retirement frequency curves was to the left, to the right, or coincident with average service life. There are three modal "families" of curves: six left modal curves (L0, L1, L2, L3, L4, L5); five right modal curves (R1, R2, R3, R4, R5); and seven symmetrical curves (S0, S1, S2, S3, S4, S5, S6).[57] In the figure below, one curve from each family is shown: L0, S3 and R1, with average life at 100 on the x-axis. It is clear from the graphs that the modes for the L0 and R1 curves appear to the left and right of average life respectively, while the S3 mode is coincident with average life.

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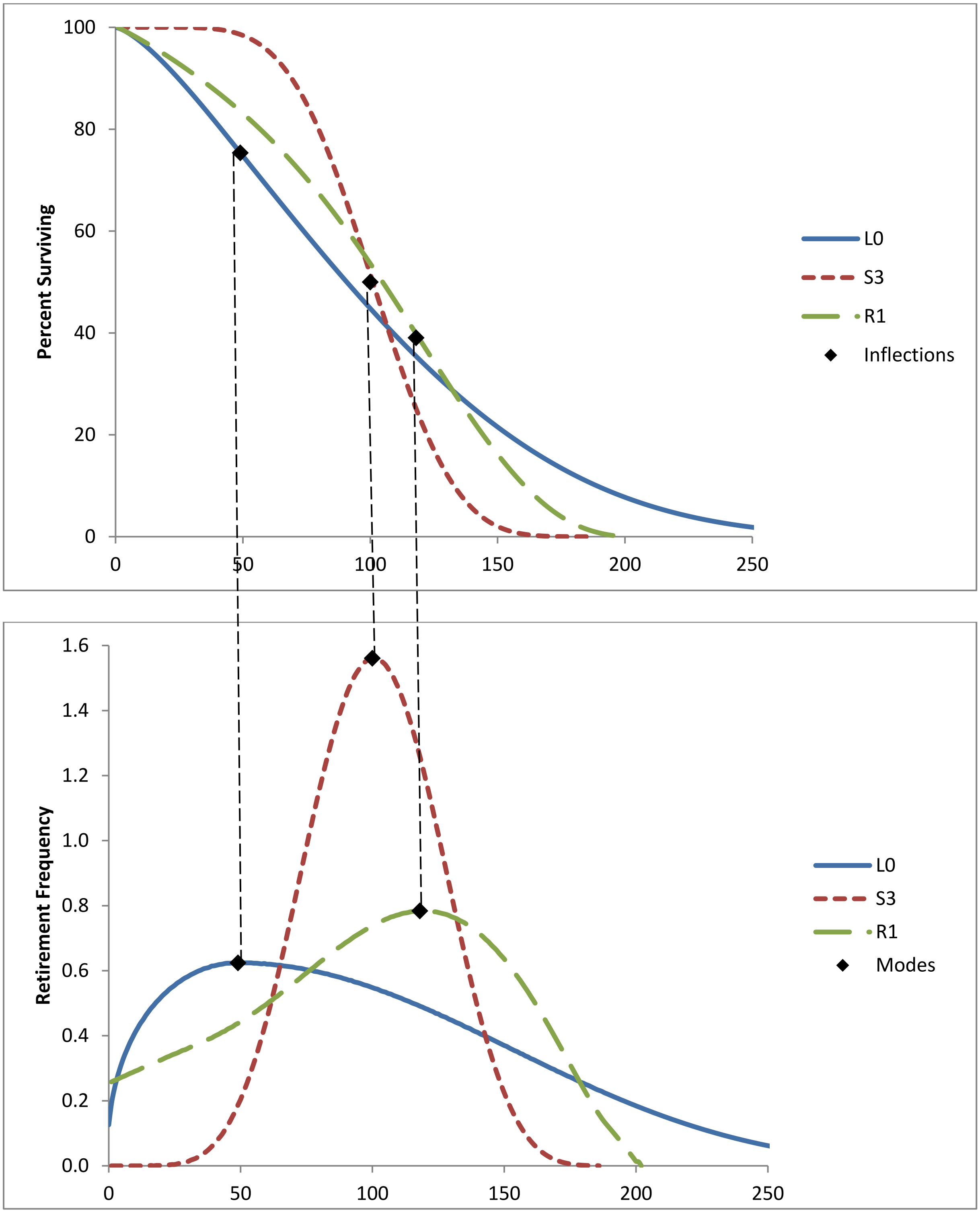
[57] In 1967, Harold A. Cowles added four origin-modal curves known as "O type" curves. There are also several "half" curves and a square curve, so the total amount of survivor curves commonly called "Iowa" curves is about 31 (see NARUC supra n. 6, at 68).

Figure 12:
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 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."[58]

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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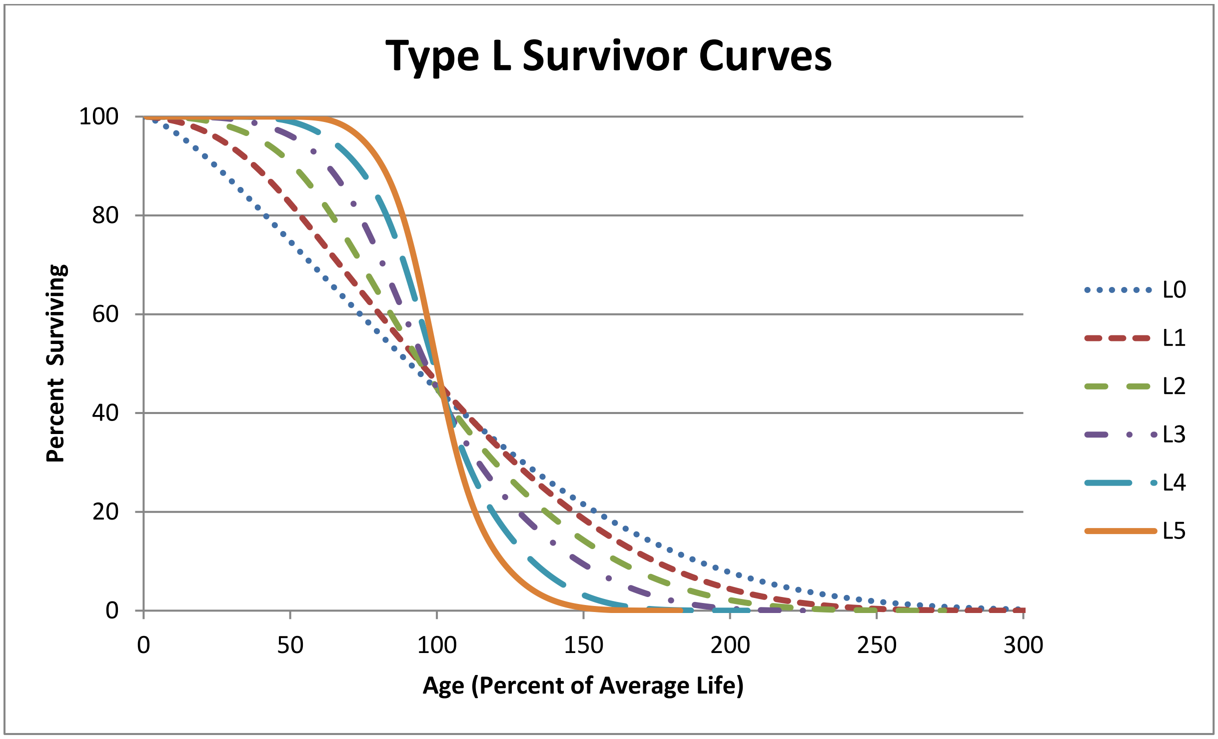
[58] Winfrey *supra* n. 75, at 60.

**Figure 13:
Type L Survivor and Frequency Curves**



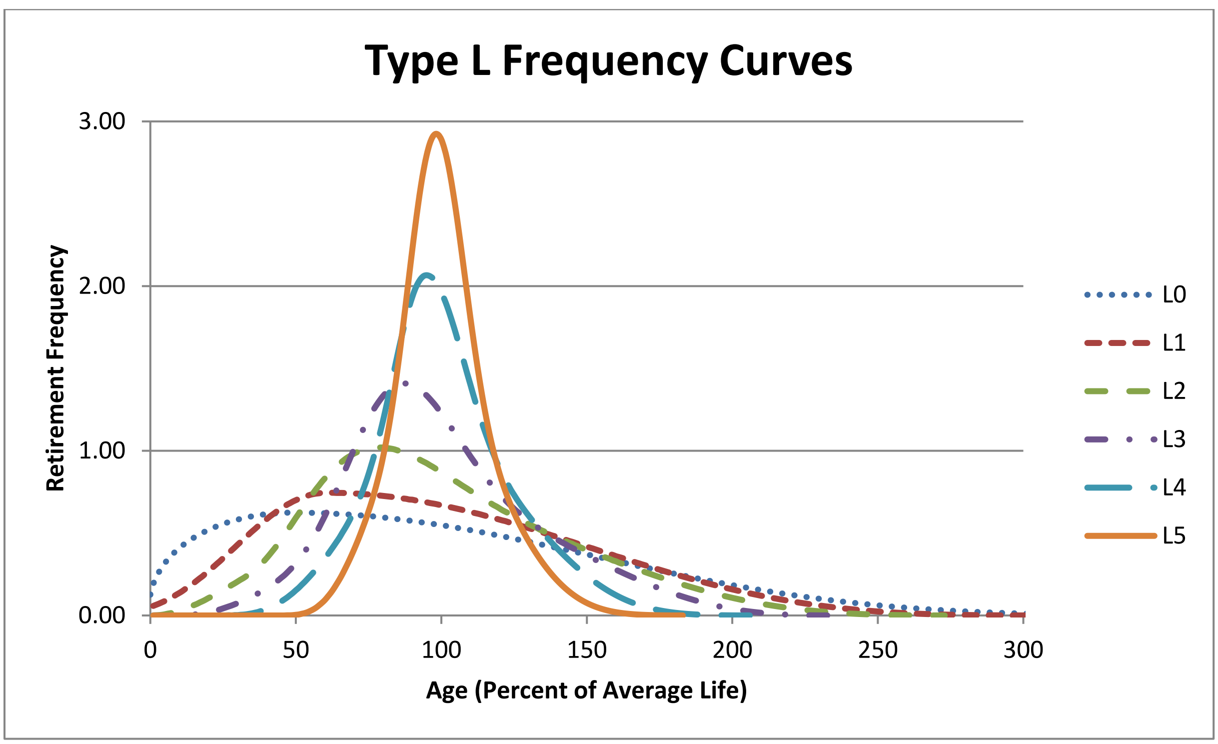
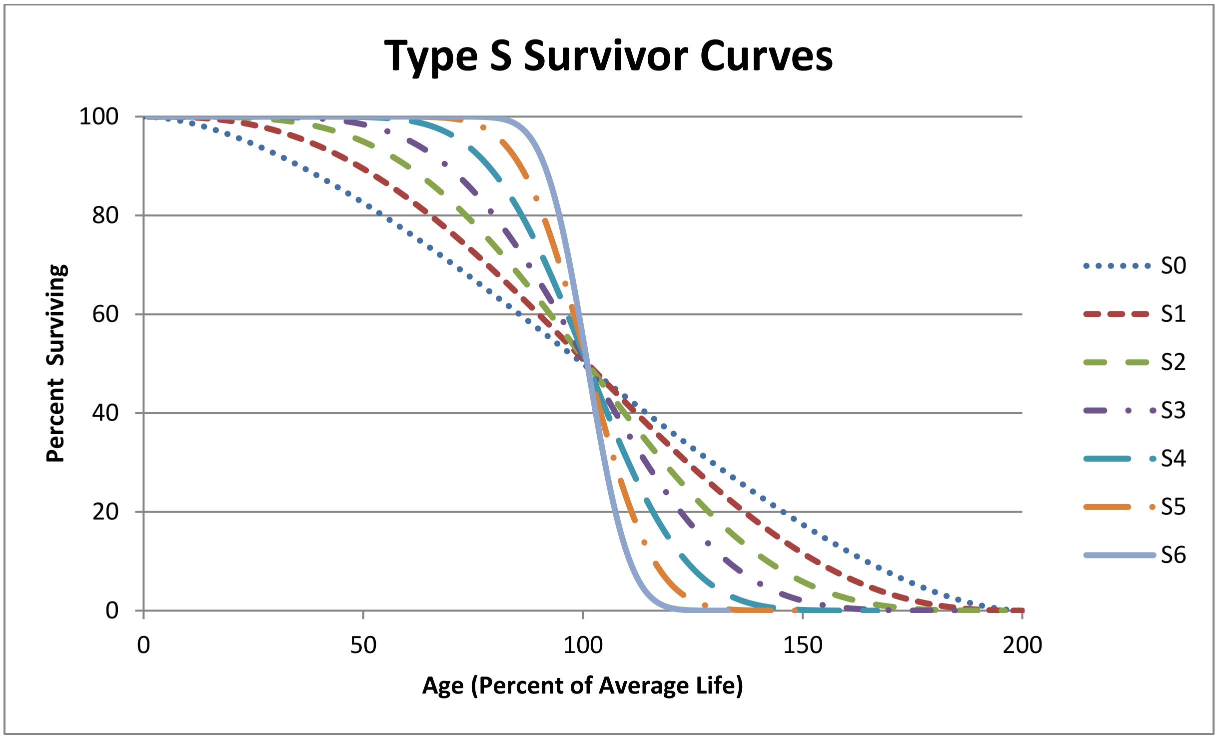


Figure 14:
Type S Survivor and Frequency Curves



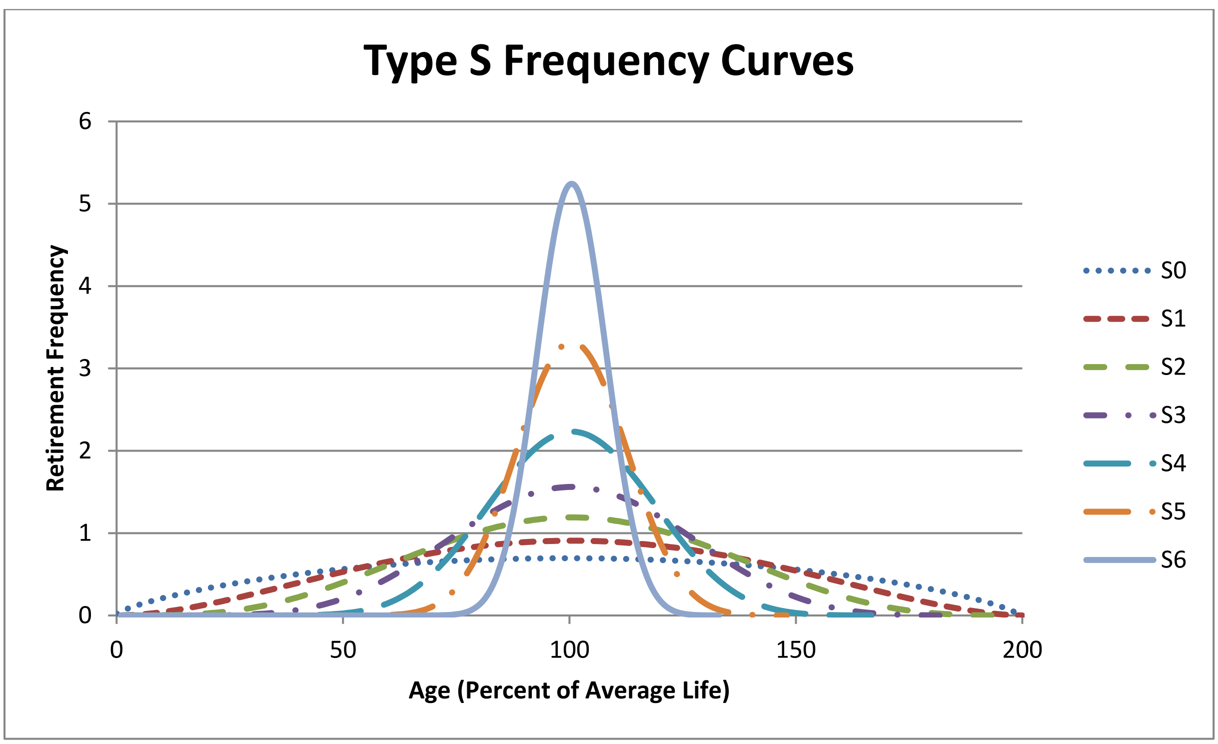
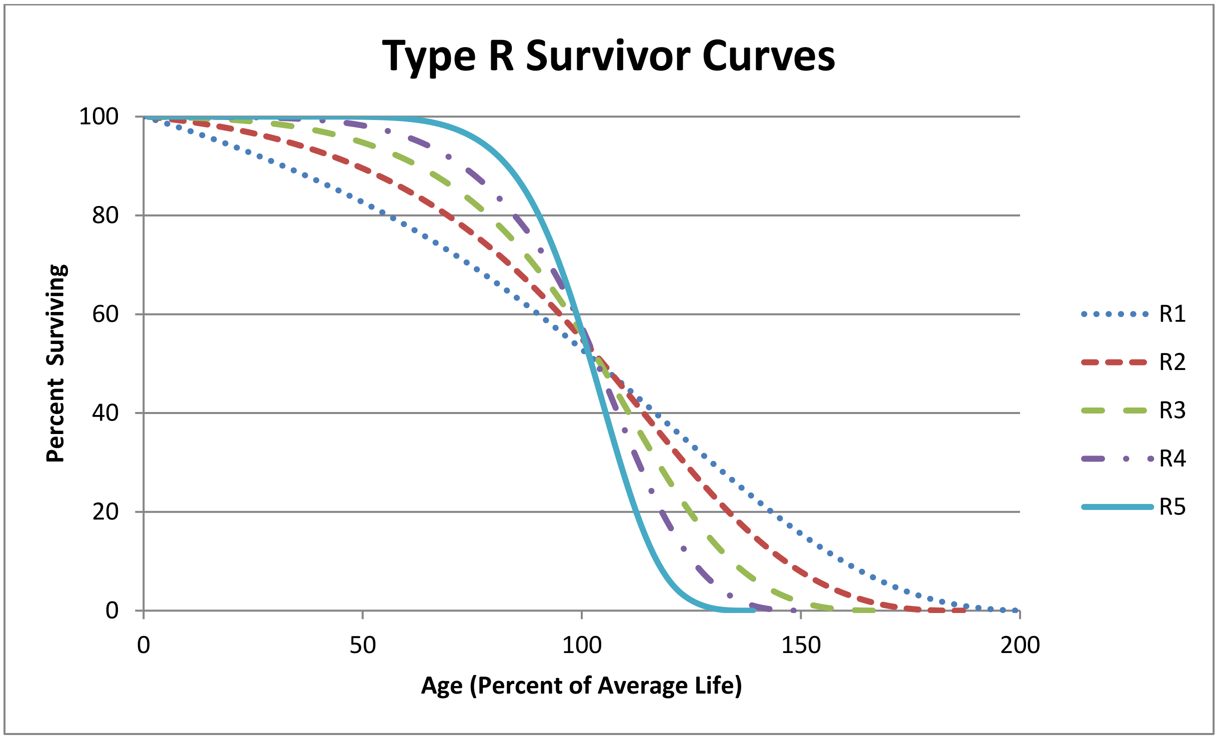
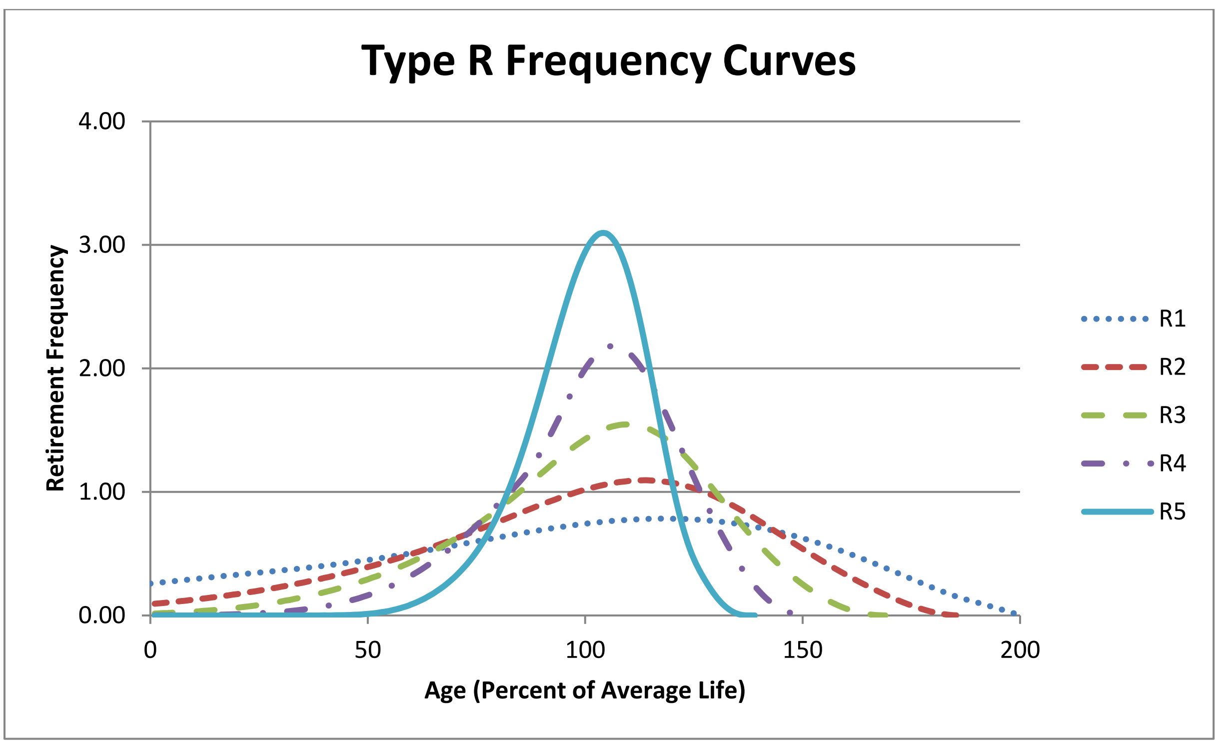


Figure 15:
Type R Survivor and Frequency Curves





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

3. Types of Lives

Several other important statistical analyses and types of lives may be derived from an Iowa curve. These include: 1) average life; 2) realized life; 3) remaining life; and 4) probable life. The figure below illustrates these concepts. It shows the frequency curve, survivor curve, and probable life curve. Age M_x on the x-axis represents the modal age, while age AL_x represents the average age. Thus, this figure illustrates an "L type" Iowa curve since the mode occurs before the average.[59]

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:[60]

Equation 4:
Average Life

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

Thus, average life may not be determined without a complete survivor curve. Many property groups being analyzed will not have experienced full retirement. This results in a "stub" survivor curve. Iowa curves are used to extend stub curves to maximum life in order for the average life calculation to be made (see Appendix C).

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[59] 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.

[60] *See* NARUC *supra* n. 6, at 71.

Realized life is similar to average life, except that realized life is the average years of service experienced to date from the vintage's original installations.[61] As shown in the figure below, realized life is the area under the survivor curve from zero to age RL_X. Likewise, unrealized life is the area under the survivor curve from age RL_X to maximum life. Thus, it could be said that average life equals realized life plus unrealized life.

Average remaining life represents the future years of service expected from the surviving property.[62] 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 S_X). Thus, the average remaining life formula is:

Equation 5:
Average Remaining Life

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

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

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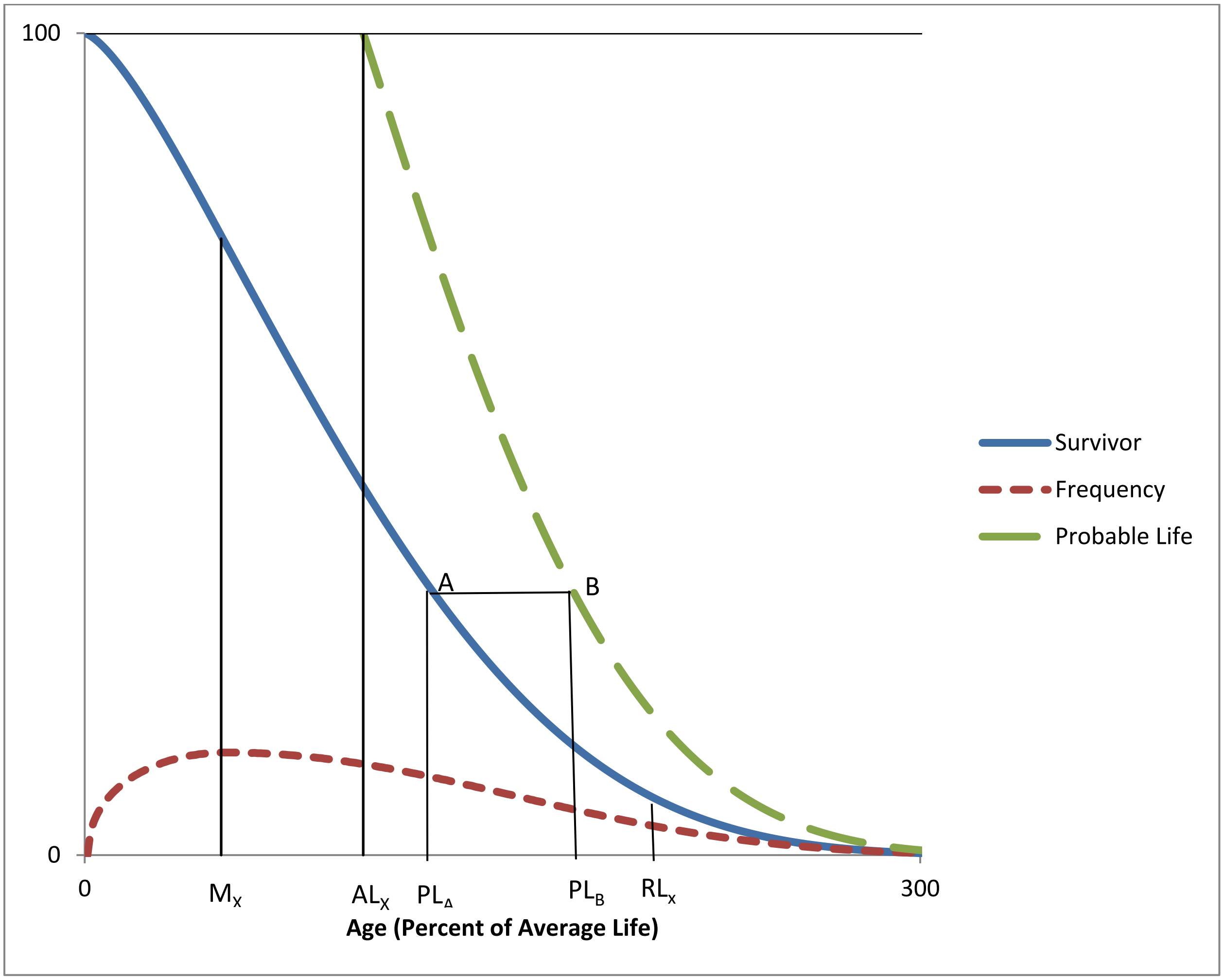
[61] *Id*. at 73.

[62] *Id*. at 74.

Figure 16:
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.[63] 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

[63] Wolf *supra* n. 5, at 28.

corresponding point on the survivor curve above at point "A," then horizontally to point "B" on the probable life curve, and back down to the age corresponding to point "B." It is no coincidence 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 today will live. 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.[64]

Figure 17:
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

[64] NARUC *supra* n. 6, at 14-15.

Property Records ("CPR"). Generally, a CPR should contain 1) an inventory of property record units; 2) the association of costs with such units; and 3) the dates of installation and removal of plant. Since actuarial analysis includes the examination of historical data to forecast future retirements, the historical data used in the analysis should not contain events that are anomalous or unlikely to recur.[65] Historical data is used in the retirement rate actuarial method, which is discussed further below.

The Retirement Rate Method

There are several systematic actuarial methods that use historical data to calculate observed survivor curves for property groups. Of these methods, the retirement rate method is superior, and is widely employed by depreciation analysts.[66] 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 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 into service 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

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

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

matrix is the exposure matrix, which shows the exposures at the beginning of each year.[67] 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 2012 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 were retired during 2012.

Figure 18:
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	

[67] 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 accounting period is called an "exposure" rather than an addition.

Figure 19:
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.[68] 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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[68] Wolf *supra* n. 5, 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 at the beginning of 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 20:
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			

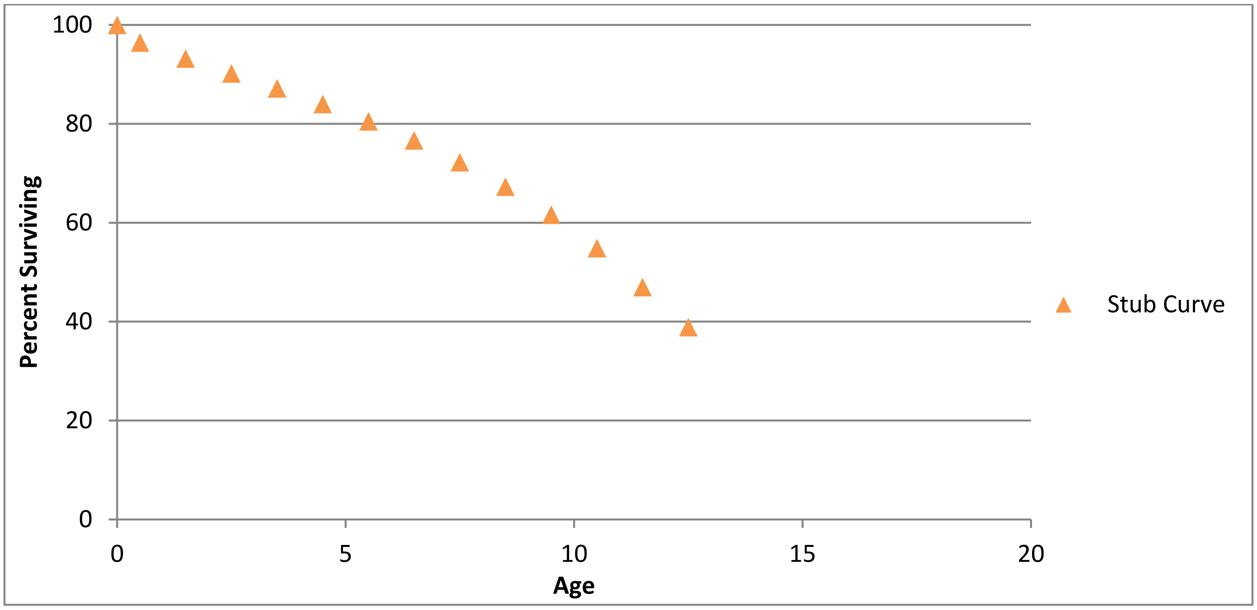
Column F on the right shows the percentages surviving at the beginning of each age interval. This column starts at 100% surviving. Each consecutive number below is calculated by multiplying the percent surviving from the previous age interval by the corresponding survivor ratio for that age interval. 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)[69].

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

[69] 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 above.

Figure 21:
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.

<u>Banding</u>

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.[70] 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.[71]

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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[70] NARUC *supra* n. 6, at 113.

[71] *Id*.

Figure 22:
Placement Bands

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

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

Analysts often use placement bands for comparing the survivor characteristics of properties with different physical characteristics.[72] 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 into service with a special chemical treatment that extended the service lives of those poles, an analyst could use placement bands to isolate and analyze the effect of that change in the property group's physical characteristics. While

[72] Wolf *supra* n. 5, at 182.

placement 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.[73]

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

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[73] NARUC *supra* n. 6, at 114.

Figure 23:
Experience Bands

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

The shaded cells within the experience band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same experience band would be used for the retirement matrix 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.[74] 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

[74] *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 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.

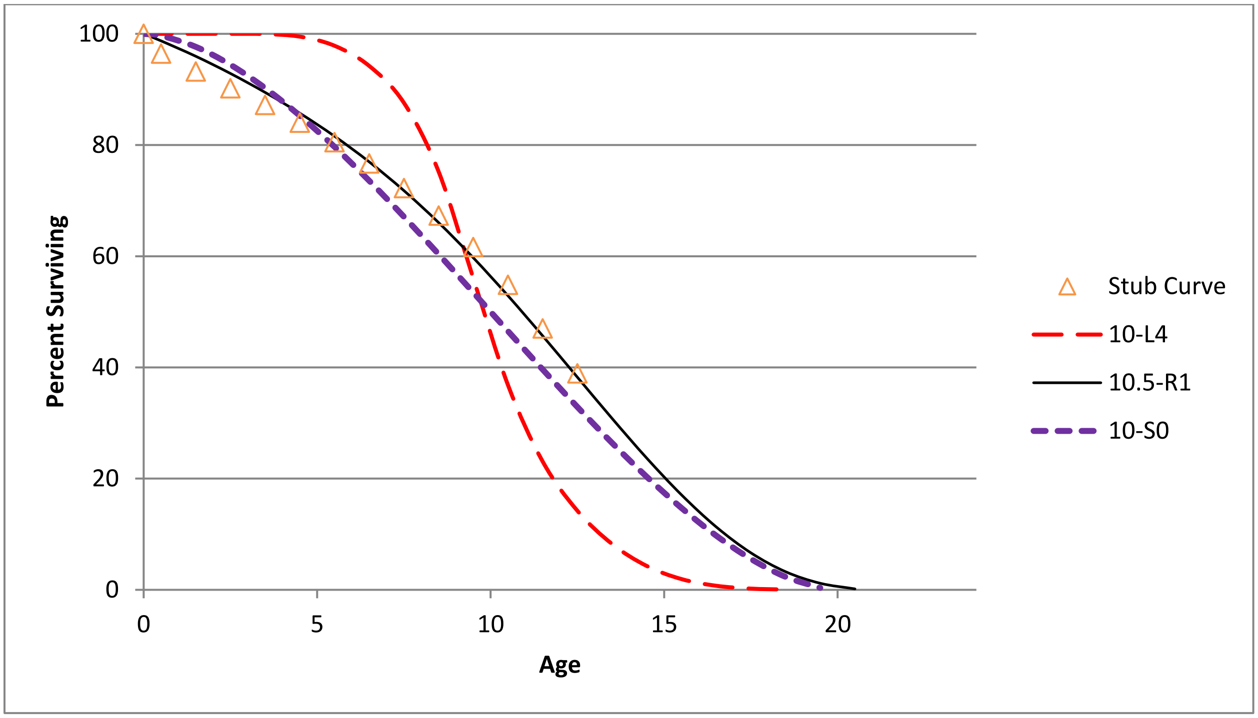
<u>Curve Fitting</u>

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 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."[75]

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.

[75] Wolf *supra* n. 5, at 46 (22 curves includes Winfrey's 18 original curves plus Cowles's four "O" type curves).

Figure 24:
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.[76]

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."[77]

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 for the other two curves. Curve 10-L4 is the worst fit, which was also confirmed visually.

---

[76] Wolf *supra* n. 5, at 47.

[77] *Id*. at 48.

Figure 25:
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 – 2018
Participate in management of operations, attend meetings, review performance, compensation, and financial records. Assist in fundraising events.

Group Facilitator & Fundraiser — 2014 – 2018
Facilitate group meetings designed to help children and families cope with divorce and tragic events. Assist in fundraising events.

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

PROFESSIONAL ASSOCIATIONS

Oklahoma Bar Association — 2007 – Present

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

Society of Utility Regulatory Financial Analysts — 2014 – Present

SELECTED CONTINUING PROFESSIONAL EDUCATION

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

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

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

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

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

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

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

Utility Regulatory Proceedings

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

Utility Regulatory Proceedings

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

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Massachusetts Department of Public Utilities	Massachusetts Electric Company and Nantucket Electric Company	D.P.U. 18-150	Depreciation rates, service lives, net salvage	Massachusetts Office of the Attorney General, Office of Ratepayer Advocacy
Oklahoma Corporation Commission	Oklahoma Gas & Electric Company	PUD 201800140	Cost of capital, authorized ROE, depreciation rates	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Public Service Commission of the State of Montana	Montana-Dakota Utilities Company	D2018.9.60	Depreciation rates, service lives, net salvage	Montana Consumer Counsel and Denbury Onshore
Indiana Utility Regulatory Commission	Northern Indiana Public Service Company	45159	Depreciation rates, grouping procedure, demolition costs	Indiana Office of Utility Consumer Counselor
Public Service Commission of the State of Montana	NorthWestern Energy	D2018.2.12	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Oklahoma Corporation Commission	Public Service Company of Oklahoma	PUD 201800097	Depreciation rates, service lives, net salvage	Oklahoma Industrial Energy Consumers and Wal-Mart
Nevada Public Utilities Commission	Southwest Gas Corporation	18-05031	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	Texas-New Mexico Power Company	PUC 48401	Depreciation rates, service lives, net salvage	Alliance of Texas-New Mexico Power Municipalities
Oklahoma Corporation Commission	Oklahoma Gas & Electric Company	PUD 201700496	Depreciation rates, service lives, net salvage	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Maryland Public Service Commission	Washington Gas Light Company	9481	Depreciation rates, service lives, net salvage	Maryland Office of People's Counsel
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lives, net salvage	Indiana Office of Utility Consumer Counselor
Public Utility Commission of Texas	Entergy Texas, Inc.	PUC 48371	Depreciation rates, decommissioning costs	Texas Municipal Group
Washington Utilities & Transportation Commission	Avista Corporation	UE-180167	Depreciation rates, service lives, net salvage	Washington Office of Attorney General
New Mexico Public Regulation Commission	Southwestern Public Service Company	17-00255-UT	Cost of capital and authorized rate of return	HollyFrontier Navajo Refining; Occidental Permian

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Public Utility Commission of Texas	Southwestern Public Service Company	PUC 47527	Depreciation rates, plant service lives	Alliance of Xcel Municipalities
Public Service Commission of the State of Montana	Montana-Dakota Utilities Company	D2017.9.79	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Florida Public Service Commission	Florida City Gas	20170179-GU	Cost of capital, depreciation rates	Florida Office of Public Counsel
Washington Utilities & Transportation Commission	Avista Corporation	UE-170485	Cost of capital and authorized rate of return	Washington Office of Attorney General
Wyoming Public Service Commission	Powder River Energy Corporation	10014-182-CA-17	Credit analysis, cost of capital	Private customer
Oklahoma Corporation Commission	Public Service Co. of Oklahoma	PUD 201700151	Depreciation, terminal salvage, risk analysis	Oklahoma Industrial Energy Consumers
Public Utility Commission of Texas	Oncor Electric Delivery Company	PUC 46957	Depreciation rates, simulated analysis	Alliance of Oncor Cities
Nevada Public Utilities Commission	Nevada Power Company	17-06004	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	El Paso Electric Company	PUC 46831	Depreciation rates, interim retirements	City of El Paso
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-24	Accelerated depreciation of North Valmy plant	Micron Technology, Inc.
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-23	Depreciation rates, service lives, net salvage	Micron Technology, Inc.
Public Utility Commission of Texas	Southwestern Electric Power Company	PUC 46449	Depreciation rates, decommissioning costs	Cities Advocating Reasonable Deregulation
Massachusetts Department of Public Utilities	Eversource Energy	D.P.U. 17-05	Cost of capital, capital structure, and rate of return	Sunrun Inc.; Energy Freedom Coalition of America
Railroad Commission of Texas	Atmos Pipeline - Texas	GUD 10580	Depreciation rates, grouping procedure	City of Dallas

Utility Regulatory Proceedings

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

ALG - Summary Accrual Adjustment

Plant Function	[1] Plant Balance 12/31/2019	[2] Company Proposed Accrual	[3] OUCC Proposed Accrual	[4] **OUCC Accrual Adjustment**
Manufactured Gas Production	$ 10,592,377	$ 14,691	$ 12,809	$ (1,882)
Underground Storage	45,077,607	281,463	226,412	(55,051)
Transmission	362,418,164	8,335,010	6,661,912	(1,673,098)
Distribution	2,166,237,970	68,207,710	57,932,531	(10,275,179)
General	108,457,476	3,040,717	2,560,090	(480,627)
Total Plant Studied	$ 2,692,783,593	$ 79,879,591	$ 67,393,755	**$ (12,485,836)**

[1], [2] From depreciation study

[3] From Detail Rate Comparison exhibit

[4] = [3] - [2]

ALG - Detailed Rate Comparison

Account No.	Description	[1] Plant 12/31/2019	[2] Company Proposal Rate	Company Proposal Annual Accrual	[3] OUCC Proposal Rate	OUCC Proposal Annual Accrual	[4] Difference Rate	Difference Annual Accrual
	MANUFACTURED GAS PRODUCTION PLANT							
605.00	STRUCTURES AND IMPROVEMENTS	1,353,028	1.09%	14,691	0.95%	12,809	-0.14%	-1,882
611.00	LIQUIFIED PETROLEUM GAS EQUIPMENT	9,239,349	0.00%	0	0.00%	0	0.00%	0
	Total Manufactured Gas Production Plant	**10,592,377**	**0.14%**	**14,691**	**0.12%**	**12,809**	**-0.02%**	**-1,882**
	UNDERGROUND STORAGE PLANT							
650.20	RIGHTS-OF-WAY	337,372	2.84%	9,571	2.63%	8,879	-0.21%	-692
651.20	COMPRESSOR STATION STRUCTURES	562,393	0.15%	826	0.12%	676	-0.03%	-150
651.30	MEASURING AND REGULATING STATION STRUCTURES	85,473	2.93%	2,502	2.64%	2,256	-0.29%	-246
651.40	OTHER STRUCTURES	1,439,858	2.18%	31,324	1.83%	26,357	-0.35%	-4,967
652.00	WELLS	13,616,826	0.20%	26,954	0.17%	22,821	-0.03%	-4,133
652.10	STORAGE LEASEHOLDS AND RIGHTS	666,009	2.43%	16,215	2.26%	15,025	-0.17%	-1,190
652.20	RESERVOIRS	1,605,129	0.36%	5,747	0.33%	5,308	-0.03%	-439
652.30	NONRECOVERABLE NATURAL GAS	2,310,274	1.20%	27,667	1.11%	25,632	-0.09%	-2,035
653.00	LINES	4,914,556	0.87%	42,924	0.67%	32,802	-0.20%	-10,122
654.00	COMPRESSOR STATION EQUIPMENT	4,822,783	0.00%	0	0.00%	0	0.00%	0
655.00	MEASURING AND REGULATING STATION EQUIPMENT	2,374,560	1.76%	41,729	1.09%	25,990	-0.67%	-15,739
656.00	PURIFICATION EQUIPMENT	12,342,375	0.62%	76,004	0.49%	60,667	-0.13%	-15,337
	Total Underground Storage Plant	**45,077,607**	**0.62%**	**281,463**	**0.50%**	**226,412**	**-0.12%**	**-55,051**
	TRANSMISSION PLANT							
665.20	RIGHTS-OF-WAY	11,798,652	1.43%	169,212	1.34%	158,171	-0.09%	-11,041
666.20	MEASURING AND REGULATING STATION STRUCTURES	608,997	2.44%	14,885	2.10%	12,807	-0.34%	-2,078
667.00	MAINS	296,443,906	2.16%	6,389,886	1.71%	5,069,318	-0.45%	-1,320,568
669.00	MEASURING AND REGULATING STATION EQUIPMENT	53,503,826	3.28%	1,756,795	2.65%	1,418,025	-0.63%	-338,770
670.00	COMMUNICATION EQUIPMENT	62,783	6.74%	4,232	5.72%	3,592	-1.02%	-640
	Total Transmission Plant	**362,418,164**	**2.30%**	**8,335,010**	**1.84%**	**6,661,912**	**-0.46%**	**-1,673,098**
	DISTRIBUTION PLANT							
674.20	LAND RIGHTS	16,490,749	0.96%	157,508	0.89%	146,463	-0.07%	-11,045
675.00	STRUCTURES AND IMPROVEMENTS	2,651,048	1.10%	29,282	0.97%	25,768	-0.13%	-3,514

ALG - Detailed Rate Comparison

		[1]	[2]		[3]		[4]	
			Company Proposal		OUCC Proposal		Difference	
Account No.	Description	Plant 12/31/2019	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
676.00	MAINS	1,037,148,446	1.75%	18,174,969	1.63%	16,928,974	-0.12%	-1,245,995
677.00	COMPRESSOR STATION EQUIPMENT	1,555,713	0.00%	0	0.00%	0	0.00%	0
678.00	M&R STATION EQUIPMENT - GENERAL	33,399,470	1.98%	660,256	1.73%	577,579	-0.25%	-82,677
679.00	M&R STATION EQUIPMENT - CITY GATE	10,710,244	1.62%	173,504	1.38%	147,875	-0.24%	-25,629
680.00	SERVICES	795,518,853	4.76%	37,906,029	3.96%	31,501,307	-0.80%	-6,404,722
681.00	METERS	118,315,103	4.49%	5,314,173	3.61%	4,271,713	-0.88%	-1,042,460
682.00	METER INSTALLATIONS	84,394,068	5.87%	4,956,147	4.26%	3,596,592	-1.61%	-1,359,555
683.00	HOUSE REGULATORS	25,546,756	1.49%	380,707	1.38%	352,377	-0.11%	-28,330
684.00	HOUSE REGULATOR INSTALLATIONS	29,182	1.02%	297	0.95%	277	-0.07%	-20
685.00	INDUSTRIAL M&R STATION EQUIPMENT	40,137,520	1.06%	427,256	0.89%	358,119	-0.17%	-69,137
687.00	OTHER EQUIPMENT	340,818	8.09%	27,582	7.48%	25,488	-0.61%	-2,094
	Total Distribution Plant	**2,166,237,970**	**3.15%**	**68,207,710**	**2.67%**	**57,932,531**	**-0.47%**	**-10,275,179**
	GENERAL PLANT							
690.00	STRUCTURES AND IMPROVEMENTS	42,666,784	2.25%	959,318	1.50%	639,730	-0.75%	-319,588
691.10	ELECTRONIC EQUIPMENT	1,402,032	8.96%	125,611	8.94%	125,374	-0.02%	-237
691.20	FURNITURE AND FIXTURES	3,511,778	6.23%	218,858	6.24%	219,268	0.01%	410
692.20	TRANSPORTATION EQUIPMENT - LIGHT TRUCKS	18,557,016	3.11%	577,361	2.41%	447,462	-0.70%	-129,899
692.30	TRANSPORTATION EQUIPMENT - TRAILERS	1,551,434	4.09%	63,430	3.16%	49,049	-0.93%	-14,381
692.40	TRANSPORTATION EQUIPMENT - HEAVY TRUCKS	6,081,499	2.19%	133,477	1.91%	115,885	-0.28%	-17,592
693.00	STORES EQUIPMENT	1,950,642	0.00%	0	0.00%	0	0.00%	0
694.00	TOOLS, SHOP AND GARAGE EQUIPMENT	11,691,249	3.32%	387,910	3.31%	387,221	-0.01%	-689
695.00	LABORATORY EQUIPMENT	2,972,103	1.12%	33,281	1.12%	33,304	0.00%	23
696.00	POWER OPERATED EQUIPMENT	7,550,308	0.00%	0	0.00%	0	0.00%	0
697.00	COMMUNICATION EQUIPMENT	9,783,141	5.16%	505,105	5.18%	506,396	0.02%	1,291
698.00	MISCELLANEOUS EQUIPMENT	739,490	4.92%	36,366	4.92%	36,401	0.00%	35
	Total General Plant	**108,457,476**	**2.80%**	**3,040,717**	**2.36%**	**2,560,090**	**-0.44%**	**-480,627**
	TOTAL PLANT STUDIED	**$ 2,692,783,593**	**2.97%**	**$ 79,879,591**	**2.50%**	**$ 67,393,755**	**-0.46%**	**$ (12,485,836)**

[1], [2] From depreciation study
[3] From Attachment DJG-4
[4] = [3] - [2]

ALG - Depreciation Rate Development

Account No.	Description	[1] Plant 12/31/2019	[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] Rate	[10] Net Salvage Accrual	[11] Rate	[12] Total Accrual	[13] Rate
	MANUFACTURED GAS PRODUCTION PLANT														
605.00	STRUCTURES AND IMPROVEMENTS	1,353,028	R3	45	-5%	1,420,679	978,763	441,916	##########	10,848	0.80%	1,961	0.14%	12,809	**0.95%**
611.00	LIQUIFIED PETROLEUM GAS EQUIPMENT	9,239,349	R3	45	-5%	9,701,316	9,701,316	0							
	Total Manufactured Gas Production Plant	**10,592,377**			**-5%**	**11,121,996**	**10,680,079**	**441,917**	**##########**	**10,848**	**0.10%**	**1,961**	**0.02%**	**12,809**	**0.12%**
	UNDERGROUND STORAGE PLANT														
650.20	RIGHTS-OF-WAY	337,372	R4	65	0%	337,372	106,510	230,862	##########	8,879	2.63%	0	0.00%	8,879	**2.63%**
651.20	COMPRESSOR STATION STRUCTURES	562,393	R2.5	50	-10%	618,632	588,554	30,078	##########	-588	-0.10%	1,264	0.22%	676	**0.12%**
651.30	MEASURING AND REGULATING STATION STRUCTURES	85,473	R3	50	-10%	94,020	54,541	39,479	##########	1,768	2.07%	488	0.57%	2,256	**2.64%**
651.40	OTHER STRUCTURES	1,439,858	R2	40	-10%	1,583,844	998,721	585,122	##########	19,871	1.38%	6,486	0.45%	26,357	**1.83%**
652.00	WELLS	13,616,826	R3	60	-10%	14,978,509	13,625,241	1,353,268	##########	-142	0.00%	22,963	0.17%	22,821	**0.17%**
652.10	STORAGE LEASEHOLDS AND RIGHTS	666,009	R4	60	0%	666,009	389,553	276,456	##########	15,025	2.26%	0	0.00%	15,025	**2.26%**
652.20	RESERVOIRS	1,605,129	R4	55	-5%	1,685,386	1,509,705	175,681	##########	2,883	0.18%	2,425	0.15%	5,308	**0.33%**
652.30	NONRECOVERABLE NATURAL GAS	2,310,274	R4	55	0%	2,310,274	1,233,728	1,076,546	##########	25,632	1.11%	0	0.00%	25,632	**1.11%**
653.00	LINES	4,914,556	R2	50	-10%	5,406,011	3,975,841	1,430,170	##########	21,530	0.44%	11,272	0.23%	32,802	**0.67%**
654.00	COMPRESSOR STATION EQUIPMENT	4,822,783	R4	45	-5%	5,063,922	5,063,922	0							
655.00	MEASURING AND REGULATING STATION EQUIPMENT	2,374,560	S0	45	-5%	2,493,287	1,360,119	1,133,168	##########	23,267	0.98%	2,723	0.11%	25,990	**1.09%**
656.00	PURIFICATION EQUIPMENT	12,342,375	R2.5	55	-5%	12,959,494	10,077,813	2,881,681	##########	47,675	0.39%	12,992	0.11%	60,667	**0.49%**
	Total Underground Storage Plant	**45,077,607**			**-7%**	**48,196,759**	**38,984,247**	**9,212,513**	**##########**	**165,800**	**0.37%**	**60,612**	**0.13%**	**226,412**	**0.50%**
	TRANSMISSION PLANT														
665.20	RIGHTS-OF-WAY	11,798,652	R4	70	0%	11,798,652	2,086,932	9,711,719	##########	158,171	1.34%	0	0.00%	158,171	**1.34%**
666.20	MEASURING AND REGULATING STATION STRUCTURES	608,997	R3	45	-5%	639,447	109,239	530,208	##########	12,071	1.98%	736	0.12%	12,807	**2.10%**
667.00	MAINS	296,443,906	R2.5	70	-25%	370,554,882	40,542,305	330,012,577	##########	3,930,900	1.33%	1,138,417	0.38%	5,069,318	**1.71%**
669.00	MEASURING AND REGULATING STATION EQUIPMENT	53,503,826	R2.5	45	-25%	66,879,783	9,591,588	57,288,195	##########	1,086,937	2.03%	331,088	0.62%	1,418,025	**2.65%**
670.00	COMMUNICATION EQUIPMENT	62,783	L3	20	0%	62,783	10,346	52,436	##########	3,592	5.72%	0	0.00%	3,592	**5.72%**
	Total Transmission Plant	**362,418,164**			**-24%**	**449,935,547**	**52,340,411**	**397,595,136**	**##########**	**5,191,671**	**1.43%**	**1,470,241**	**0.41%**	**6,661,912**	**1.84%**
	DISTRIBUTION PLANT														
674.20	LAND RIGHTS	16,490,749	R4	70	0%	16,490,749	8,449,945	8,040,805	##########	146,463	0.89%	0	0.00%	146,463	**0.89%**
675.00	STRUCTURES AND IMPROVEMENTS	2,651,048	R3	60	-15%	3,048,705	2,097,884	950,821	##########	14,991	0.57%	10,777	0.41%	25,768	**0.97%**
676.00	MAINS	1,037,148,446	R4	70	-40%	1,452,007,825	478,591,846	973,415,979	##########	9,714,028	0.94%	7,214,946	0.70%	16,928,974	**1.63%**
677.00	COMPRESSOR STATION EQUIPMENT	1,555,713	R4	45	-5%	1,633,499	1,633,499	0							
678.00	M&R STATION EQUIPMENT - GENERAL	33,399,470	R3	65	-40%	46,759,258	19,786,322	26,972,936	##########	291,502	0.87%	286,077	0.86%	577,579	**1.73%**
679.00	M&R STATION EQUIPMENT - CITY GATE	10,710,244	R2.5	60	-40%	14,994,342	9,034,980	5,959,363	##########	41,570	0.39%	106,305	0.99%	147,875	**1.38%**
680.00	SERVICES	795,518,853	R3	51	##########	1,750,141,477	564,432,269	1,185,709,208	##########	6,139,389	0.77%	25,361,919	3.19%	31,501,307	**3.96%**
681.00	METERS	118,315,103	S1	35	-10%	130,146,613	28,479,842	101,666,772	##########	3,774,591	3.19%	497,122	0.42%	4,271,713	**3.61%**
682.00	METER INSTALLATIONS	84,394,068	R3	45	##########	168,788,136	64,846,632	103,941,504	##########	676,382	0.80%	2,920,210	3.46%	3,596,592	**4.26%**
683.00	HOUSE REGULATORS	25,546,756	R4	50	-30%	33,210,783	20,454,723	12,756,060	##########	140,664	0.55%	211,713	0.83%	352,377	**1.38%**
684.00	HOUSE REGULATOR INSTALLATIONS	29,182	R4	50	0%	29,182	17,971	11,210	##########	277	0.95%	0	0.00%	277	**0.95%**
685.00	INDUSTRIAL M&R STATION EQUIPMENT	40,137,520	R2.5	55	-20%	48,165,024	36,418,712	11,746,312	##########	113,378	0.28%	244,741	0.61%	358,119	**0.89%**
687.00	OTHER EQUIPMENT	340,818	R4	25	0%	340,818	24,768	316,050	##########	25,488	7.48%	0	0.00%	25,488	**7.48%**
	Total Distribution Plant	**2,166,237,970**			**-69%**	**3,665,756,410**	**1,234,269,392**	**2,431,487,018**	**##########**	**21,078,721**	**0.97%**	**36,853,810**	**1.70%**	**57,932,531**	**2.67%**
	GENERAL PLANT														
690.00	STRUCTURES AND IMPROVEMENTS	42,666,784	S0	60	-15%	49,066,802	18,462,106	30,604,696	##########	505,951	1.19%	133,780	0.31%	639,730	**1.50%**
691.10	ELECTRONIC EQUIPMENT	1,402,032	SQ	10	0%	1,402,032	436,653	965,379	7.70	125,374	8.94%	0	0.00%	125,374	**8.94%**
691.20	FURNITURE AND FIXTURES	3,511,778	SQ	20	0%	3,511,778	1,757,636	1,754,142	8.00	219,268	6.24%	0	0.00%	219,268	**6.24%**
692.20	TRANSPORTATION EQUIPMENT - LIGHT TRUCKS	18,557,016	L2	14	5%	17,629,165	12,125,385	5,503,780	##########	522,897	2.82%	-75,435	-0.41%	447,462	**2.41%**
692.30	TRANSPORTATION EQUIPMENT - TRAILERS	1,551,434	L2	21	0%	1,551,434	766,645	784,790	##########	49,049	3.16%	0	0.00%	49,049	**3.16%**
692.40	TRANSPORTATION EQUIPMENT - HEAVY TRUCKS	6,081,499	S2	18	10%	5,473,349	3,619,187	1,854,161	##########	153,894	2.53%	-38,009	-0.63%	115,885	**1.91%**
693.00	STORES EQUIPMENT	1,950,642	SQ	25	0%	1,950,642	1,950,642	0							
694.00	TOOLS, SHOP AND GARAGE EQUIPMENT	11,691,249	SQ	25	0%	11,691,249	5,882,936	5,808,313	##########	387,221	3.31%	0	0.00%	387,221	**3.31%**

ALG - 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	Plant 12/31/2019	Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
695.00	LABORATORY EQUIPMENT	2,972,103	SQ	- 20	0%	2,972,103	2,808,914	163,189	4.90	33,304	1.12%	0	0.00%	33,304	**1.12%**
696.00	POWER OPERATED EQUIPMENT	7,550,308	S2	- 25	0%	7,550,308	7,550,308	0							
697.00	COMMUNICATION EQUIPMENT	9,783,141	SQ	- 15	0%	9,783,141	4,465,982	5,317,159	##########	506,396	5.18%	0	0.00%	506,396	**5.18%**
698.00	MISCELLANEOUS EQUIPMENT	739,490	SQ	- 20	0%	739,490	273,560	465,930	##########	36,401	4.92%	0	0.00%	36,401	**4.92%**
	Total General Plant	**108,457,476**			**-4%**	**113,321,493**	**60,099,954**	**53,221,539**	**##########**	**2,539,755**	**2.34%**	**20,335**	**0.02%**	**2,560,090**	**2.36%**
	TOTAL PLANT STUDIED	**$ 2,692,783,593**			**-59%**	**$ 4,288,332,205**	**$ 1,396,374,082**	**$ 2,891,958,123**	**##########**	**$ 28,986,795**	**1.08%**	**$ 38,406,959**	**1.43%**	**$ 67,393,755**	**2.50%**

[1] From depreciation study
[2] Average life and Iowa curve shape developed through statistical analysis and professional judgment
[3] Mass net salvage rates developed through statistical analysis and professional judgment
[4] = [1]*(1-[3])
[5] From depreciation study
[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]

ALG Unadjusted - Summary Accrual Adjustment

	[1]	[2]	[3]	[4]
Plant Function	Plant Balance 12/31/2019	Company Proposed Accrual	OUCC Proposed Accrual	**OUCC Accrual Adjustment**
Manufactured Gas Production	$ 10,592,377	$ 14,691	$ 12,809	$ (1,882)
Underground Storage	45,077,607	281,463	226,412	(55,051)
Transmission	362,418,164	8,335,010	6,661,912	(1,673,098)
Distribution	2,166,237,970	68,207,710	60,126,689	(8,081,021)
General	108,457,476	3,040,717	2,572,912	(467,805)
Total Plant Studied	$ 2,692,783,593	$ 79,879,591	$ 69,600,734	**$ (10,278,857)**

[1], [2] From depreciation study

[3] From Detail Rate Comparison exhibit

[4] = [3] - [2]

ALG Unadjusted - Detailed Rate Comparison

		[1]	[2]		[3]		[4]	
			Company Proposal		OUCC Proposal		Difference	
Account No.	Description	Plant 12/31/2019	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	MANUFACTURED GAS PRODUCTION PLANT							
605.00	STRUCTURES AND IMPROVEMENTS	1,353,028	1.09%	14,691	0.95%	12,809	-0.14%	-1,882
611.00	LIQUIFIED PETROLEUM GAS EQUIPMENT	9,239,349	0.00%	0	0.00%	0	0.00%	0
	Total Manufactured Gas Production Plant	**10,592,377**	**0.14%**	**14,691**	**0.12%**	**12,809**	**-0.02%**	**-1,882**
	UNDERGROUND STORAGE PLANT							
650.20	RIGHTS-OF-WAY	337,372	2.84%	9,571	2.63%	8,879	-0.21%	-692
651.20	COMPRESSOR STATION STRUCTURES	562,393	0.15%	826	0.12%	676	-0.03%	-150
651.30	MEASURING AND REGULATING STATION STRUCTURES	85,473	2.93%	2,502	2.64%	2,256	-0.29%	-246
651.40	OTHER STRUCTURES	1,439,858	2.18%	31,324	1.83%	26,357	-0.35%	-4,967
652.00	WELLS	13,616,826	0.20%	26,954	0.17%	22,821	-0.03%	-4,133
652.10	STORAGE LEASEHOLDS AND RIGHTS	666,009	2.43%	16,215	2.26%	15,025	-0.17%	-1,190
652.20	RESERVOIRS	1,605,129	0.36%	5,747	0.33%	5,308	-0.03%	-439
652.30	NONRECOVERABLE NATURAL GAS	2,310,274	1.20%	27,667	1.11%	25,632	-0.09%	-2,035
653.00	LINES	4,914,556	0.87%	42,924	0.67%	32,802	-0.20%	-10,122
654.00	COMPRESSOR STATION EQUIPMENT	4,822,783	0.00%	0	0.00%	0	0.00%	0
655.00	MEASURING AND REGULATING STATION EQUIPMENT	2,374,560	1.76%	41,729	1.09%	25,990	-0.67%	-15,739
656.00	PURIFICATION EQUIPMENT	12,342,375	0.62%	76,004	0.49%	60,667	-0.13%	-15,337
	Total Underground Storage Plant	**45,077,607**	**0.62%**	**281,463**	**0.50%**	**226,412**	**-0.12%**	**-55,051**
	TRANSMISSION PLANT							
665.20	RIGHTS-OF-WAY	11,798,652	1.43%	169,212	1.34%	158,171	-0.09%	-11,041
666.20	MEASURING AND REGULATING STATION STRUCTURES	608,997	2.44%	14,885	2.10%	12,807	-0.34%	-2,078
667.00	MAINS	296,443,906	2.16%	6,389,886	1.71%	5,069,318	-0.45%	-1,320,568
669.00	MEASURING AND REGULATING STATION EQUIPMENT	53,503,826	3.28%	1,756,795	2.65%	1,418,025	-0.63%	-338,770
670.00	COMMUNICATION EQUIPMENT	62,783	6.74%	4,232	5.72%	3,592	-1.02%	-640
	Total Transmission Plant	**362,418,164**	**2.30%**	**8,335,010**	**1.84%**	**6,661,912**	**-0.46%**	**-1,673,098**
	DISTRIBUTION PLANT							
674.20	LAND RIGHTS	16,490,749	0.96%	157,508	0.89%	146,463	-0.07%	-11,045
675.00	STRUCTURES AND IMPROVEMENTS	2,651,048	1.10%	29,282	0.97%	25,768	-0.13%	-3,514

ALG Unadjusted - Detailed Rate Comparison

		[1]	[2]		[3]		[4]	
			Company Proposal		OUCC Proposal		Difference	
Account No.	Description	Plant 12/31/2019	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
676.00	MAINS	1,037,148,446	1.75%	18,174,969	1.63%	16,928,974	-0.12%	-1,245,995
677.00	COMPRESSOR STATION EQUIPMENT	1,555,713	0.00%	0	0.00%	0	0.00%	0
678.00	M&R STATION EQUIPMENT - GENERAL	33,399,470	1.98%	660,256	1.73%	577,579	-0.25%	-82,677
679.00	M&R STATION EQUIPMENT - CITY GATE	10,710,244	1.62%	173,504	1.38%	147,875	-0.24%	-25,629
680.00	SERVICES	795,518,853	4.76%	37,906,029	4.14%	32,936,367	-0.62%	-4,969,662
681.00	METERS	118,315,103	4.49%	5,314,173	3.61%	4,271,713	-0.88%	-1,042,460
682.00	METER INSTALLATIONS	84,394,068	5.87%	4,956,147	5.15%	4,349,017	-0.72%	-607,130
683.00	HOUSE REGULATORS	25,546,756	1.49%	380,707	1.38%	352,377	-0.11%	-28,330
684.00	HOUSE REGULATOR INSTALLATIONS	29,182	1.02%	297	0.95%	277	-0.07%	-20
685.00	INDUSTRIAL M&R STATION EQUIPMENT	40,137,520	1.06%	427,256	0.91%	364,792	-0.15%	-62,464
687.00	OTHER EQUIPMENT	340,818	8.09%	27,582	7.48%	25,488	-0.61%	-2,094
	Total Distribution Plant	**2,166,237,970**	**3.15%**	**68,207,710**	**2.78%**	**60,126,689**	**-0.37%**	**-8,081,021**
	GENERAL PLANT							
690.00	STRUCTURES AND IMPROVEMENTS	42,666,784	2.25%	959,318	1.53%	652,552	-0.72%	-306,766
691.10	ELECTRONIC EQUIPMENT	1,402,032	8.96%	125,611	8.94%	125,374	-0.02%	-237
691.20	FURNITURE AND FIXTURES	3,511,778	6.23%	218,858	6.24%	219,268	0.01%	410
692.20	TRANSPORTATION EQUIPMENT - LIGHT TRUCKS	18,557,016	3.11%	577,361	2.41%	447,462	-0.70%	-129,899
692.30	TRANSPORTATION EQUIPMENT - TRAILERS	1,551,434	4.09%	63,430	3.16%	49,049	-0.93%	-14,381
692.40	TRANSPORTATION EQUIPMENT - HEAVY TRUCKS	6,081,499	2.19%	133,477	1.91%	115,885	-0.28%	-17,592
693.00	STORES EQUIPMENT	1,950,642	0.00%	0	0.00%	0	0.00%	0
694.00	TOOLS, SHOP AND GARAGE EQUIPMENT	11,691,249	3.32%	387,910	3.31%	387,221	-0.01%	-689
695.00	LABORATORY EQUIPMENT	2,972,103	1.12%	33,281	1.12%	33,304	0.00%	23
696.00	POWER OPERATED EQUIPMENT	7,550,308	0.00%	0	0.00%	0	0.00%	0
697.00	COMMUNICATION EQUIPMENT	9,783,141	5.16%	505,105	5.18%	506,396	0.02%	1,291
698.00	MISCELLANEOUS EQUIPMENT	739,490	4.92%	36,366	4.92%	36,401	0.00%	35
	Total General Plant	**108,457,476**	**2.80%**	**3,040,717**	**2.37%**	**2,572,912**	**-0.43%**	**-467,805**
	TOTAL PLANT STUDIED	**$ 2,692,783,593**	**2.97%**	**$ 79,879,591**	**2.58%**	**$ 69,600,734**	**-0.38%**	**$ (10,278,857)**

[1], [2] From depreciation study
[3] From Attachment DJG-7
[4] = [3] - [2]

ALG Unadjusted - Depreciation Rate Development

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Account No.	Description	Plant 12/31/2019	Iowa Curve Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Service Life Accrual	Service Life Rate	Net Salvage Accrual	Net Salvage Rate	Total Accrual	Total Rate
	MANUFACTURED GAS PRODUCTION PLANT														
605.00	STRUCTURES AND IMPROVEMENTS	1,353,028	R3	45	-5%	1,420,679	978,763	441,916	##########	10,848	0.80%	1,961	0.14%	12,809	**0.95%**
611.00	LIQUIFIED PETROLEUM GAS EQUIPMENT	9,239,349	R3	45	-5%	9,701,316	9,701,316	0							
	Total Manufactured Gas Production Plant	**10,592,377**			**-5%**	**11,121,996**	**10,680,079**	**441,917**	**##########**	**10,848**	**0.10%**	**1,961**	**0.02%**	**12,809**	**0.12%**
	UNDERGROUND STORAGE PLANT														
650.20	RIGHTS-OF-WAY	337,372	R4	65	0%	337,372	106,510	230,862	##########	8,879	2.63%	0	0.00%	8,879	**2.63%**
651.20	COMPRESSOR STATION STRUCTURES	562,393	R2.5	50	-10%	618,632	588,554	30,078	##########	-588	-0.10%	1,264	0.22%	676	**0.12%**
651.30	MEASURING AND REGULATING STATION STRUCTURES	85,473	R3	50	-10%	94,020	54,541	39,479	##########	1,768	2.07%	488	0.57%	2,256	**2.64%**
651.40	OTHER STRUCTURES	1,439,858	R2	40	-10%	1,583,844	998,721	585,122	##########	19,871	1.38%	6,486	0.45%	26,357	**1.83%**
652.00	WELLS	13,616,826	R3	60	-10%	14,978,509	13,625,241	1,353,268	##########	-142	0.00%	22,963	0.17%	22,821	**0.17%**
652.10	STORAGE LEASEHOLDS AND RIGHTS	666,009	R4	60	0%	666,009	389,553	276,456	##########	15,025	2.26%	0	0.00%	15,025	**2.26%**
652.20	RESERVOIRS	1,605,129	R4	55	-5%	1,685,386	1,509,705	175,681	##########	2,883	0.18%	2,425	0.15%	5,308	**0.33%**
652.30	NONRECOVERABLE NATURAL GAS	2,310,274	R4	55	0%	2,310,274	1,233,728	1,076,546	##########	25,632	1.11%	0	0.00%	25,632	**1.11%**
653.00	LINES	4,914,556	R2	50	-10%	5,406,011	3,975,841	1,430,170	##########	21,530	0.44%	11,272	0.23%	32,802	**0.67%**
654.00	COMPRESSOR STATION EQUIPMENT	4,822,783	R4	45	-5%	5,063,922	5,063,922	0							
655.00	MEASURING AND REGULATING STATION EQUIPMENT	2,374,560	S0	45	-5%	2,493,287	1,360,119	1,133,168	##########	23,267	0.98%	2,723	0.11%	25,990	**1.09%**
656.00	PURIFICATION EQUIPMENT	12,342,375	R2.5	55	-5%	12,959,494	10,077,813	2,881,681	##########	47,675	0.39%	12,992	0.11%	60,667	**0.49%**
	Total Underground Storage Plant	**45,077,607**			**-7%**	**48,196,759**	**38,984,247**	**9,212,513**	**##########**	**165,800**	**0.37%**	**60,612**	**0.13%**	**226,412**	**0.50%**
	TRANSMISSION PLANT														
665.20	RIGHTS-OF-WAY	11,798,652	R4	70	0%	11,798,652	2,086,932	9,711,719	##########	158,171	1.34%	0	0.00%	158,171	**1.34%**
666.20	MEASURING AND REGULATING STATION STRUCTURES	608,997	R3	45	-5%	639,447	109,239	530,208	##########	12,071	1.98%	736	0.12%	12,807	**2.10%**
667.00	MAINS	296,443,906	R2.5	70	-25%	370,554,882	40,542,305	330,012,577	##########	3,930,900	1.33%	1,138,417	0.38%	5,069,318	**1.71%**
669.00	MEASURING AND REGULATING STATION EQUIPMENT	53,503,826	R2.5	45	-25%	66,879,783	9,591,588	57,288,195	##########	1,086,937	2.03%	331,088	0.62%	1,418,025	**2.65%**
670.00	COMMUNICATION EQUIPMENT	62,783	L3	20	0%	62,783	10,346	52,436	##########	3,592	5.72%	0	0.00%	3,592	**5.72%**
	Total Transmission Plant	**362,418,164**			**-24%**	**449,935,547**	**52,340,411**	**397,595,136**	**##########**	**5,191,671**	**1.43%**	**1,470,241**	**0.41%**	**6,661,912**	**1.84%**
	DISTRIBUTION PLANT														
674.20	LAND RIGHTS	16,490,749	R4	70	0%	16,490,749	8,449,945	8,040,805	##########	146,463	0.89%	0	0.00%	146,463	**0.89%**
675.00	STRUCTURES AND IMPROVEMENTS	2,651,048	R3	60	-15%	3,048,705	2,097,884	950,821	##########	14,991	0.57%	10,777	0.41%	25,768	**0.97%**
676.00	MAINS	1,037,148,446	R4	70	-40%	1,452,007,825	478,591,846	973,415,979	##########	9,714,028	0.94%	7,214,946	0.70%	16,928,974	**1.63%**
677.00	COMPRESSOR STATION EQUIPMENT	1,555,713	R4	45	-5%	1,633,499	1,633,499	0							
678.00	M&R STATION EQUIPMENT - GENERAL	33,399,470	R3	65	-40%	46,759,258	19,786,322	26,972,936	##########	291,502	0.87%	286,077	0.86%	577,579	**1.73%**
679.00	M&R STATION EQUIPMENT - CITY GATE	10,710,244	R2.5	60	-40%	14,994,342	9,034,980	5,959,363	##########	41,570	0.39%	106,305	0.99%	147,875	**1.38%**
680.00	SERVICES	795,518,853	R3	48	##########	1,750,141,477	564,432,269	1,185,709,208	##########	6,419,072	0.81%	26,517,295	3.33%	32,936,367	**4.14%**
681.00	METERS	118,315,103	S1	35	-10%	130,146,613	28,479,842	101,666,772	##########	3,774,591	3.19%	497,122	0.42%	4,271,713	**3.61%**
682.00	METER INSTALLATIONS	84,394,068	R3	40	##########	168,788,136	64,846,632	103,941,504	##########	817,884	0.97%	3,531,133	4.18%	4,349,017	**5.15%**
683.00	HOUSE REGULATORS	25,546,756	R4	50	-30%	33,210,783	20,454,723	12,756,060	##########	140,664	0.55%	211,713	0.83%	352,377	**1.38%**
684.00	HOUSE REGULATOR INSTALLATIONS	29,182	R4	50	0%	29,182	17,971	11,210	##########	277	0.95%	0	0.00%	277	**0.95%**
685.00	INDUSTRIAL M&R STATION EQUIPMENT	40,137,520	R2.5	50	-20%	48,165,024	36,418,712	11,746,312	##########	115,491	0.29%	249,301	0.62%	364,792	**0.91%**
687.00	OTHER EQUIPMENT	340,818	R4	25	0%	340,818	24,768	316,050	##########	25,488	7.48%	0	0.00%	25,488	**7.48%**
	Total Distribution Plant	**2,166,237,970**			**-69%**	**3,665,756,410**	**1,234,269,392**	**2,431,487,018**	**##########**	**21,502,020**	**0.99%**	**38,624,669**	**1.78%**	**60,126,689**	**2.78%**
	GENERAL PLANT														
690.00	STRUCTURES AND IMPROVEMENTS	42,666,784	S0	55	-15%	49,066,802	18,462,106	30,604,696	##########	516,091	1.21%	136,461	0.32%	652,552	**1.53%**
691.10	ELECTRONIC EQUIPMENT	1,402,032	SQ	10	0%	1,402,032	436,653	965,379	7.70	125,374	8.94%	0	0.00%	125,374	**8.94%**
691.20	FURNITURE AND FIXTURES	3,511,778	SQ	20	0%	3,511,778	1,757,636	1,754,142	8.00	219,268	6.24%	0	0.00%	219,268	**6.24%**
692.20	TRANSPORTATION EQUIPMENT - LIGHT TRUCKS	18,557,016	L2	14	5%	17,629,165	12,125,385	5,503,780	##########	522,897	2.82%	-75,435	-0.41%	447,462	**2.41%**
692.30	TRANSPORTATION EQUIPMENT - TRAILERS	1,551,434	L2	21	0%	1,551,434	766,645	784,790	##########	49,049	3.16%	0	0.00%	49,049	**3.16%**
692.40	TRANSPORTATION EQUIPMENT - HEAVY TRUCKS	6,081,499	S2	18	10%	5,473,349	3,619,187	1,854,161	##########	153,894	2.53%	-38,009	-0.63%	115,885	**1.91%**
693.00	STORES EQUIPMENT	1,950,642	SQ	25	0%	1,950,642	1,950,642	0							
694.00	TOOLS, SHOP AND GARAGE EQUIPMENT	11,691,249	SQ	25	0%	11,691,249	5,882,936	5,808,313	##########	387,221	3.31%	0	0.00%	387,221	**3.31%**

ALG Unadjusted - Depreciation Rate Development

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Account		Plant	Iowa Curve		Net	Depreciable	Book	Future	Remaining	Service Life		Net Salvage		Total	
No.	Description	12/31/2019	Type	AL	Salvage	Base	Reserve	Accruals	Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
695.00	LABORATORY EQUIPMENT	2,972,103	SQ	- 20	0%	2,972,103	2,808,914	163,189	4.90	33,304	1.12%	0	0.00%	33,304	**1.12%**
696.00	POWER OPERATED EQUIPMENT	7,550,308	S2	- 25	0%	7,550,308	7,550,308	0							
697.00	COMMUNICATION EQUIPMENT	9,783,141	SQ	- 15	0%	9,783,141	4,465,982	5,317,159	##########	506,396	5.18%	0	0.00%	506,396	**5.18%**
698.00	MISCELLANEOUS EQUIPMENT	739,490	SQ	- 20	0%	739,490	273,560	465,930	##########	36,401	4.92%	0	0.00%	36,401	**4.92%**
	Total General Plant	**108,457,476**			**-4%**	**113,321,493**	**60,099,954**	**53,221,539**	**##########**	**2,549,895**	**2.35%**	**23,017**	**0.02%**	**2,572,912**	**2.37%**
	TOTAL PLANT STUDIED	**$ 2,692,783,593**			**-59%**	**$ 4,288,332,205**	**$ 1,396,374,082**	**$ 2,891,958,123**	**##########**	**$ 29,420,234**	**1.09%**	**$ 40,180,500**	**1.49%**	**$ 69,600,734**	**2.58%**

[1] From depreciation study
[2] Average life and Iowa curve shape developed through statistical analysis and professional judgment
[3] Mass net salvage rates developed through statistical analysis and professional judgment
[4] = [1]*(1-[3])
[5] From depreciation study
[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]

Account 680 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company R3-48	[5] OUCC R3-51	[6] Company SSD	[7] OUCC SSD
0.0	511,182,233	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	478,436,741	99.99%	99.98%	99.98%	0.0000	0.0000
1.5	446,712,770	99.97%	99.95%	99.95%	0.0000	0.0000
2.5	437,561,930	99.92%	99.90%	99.91%	0.0000	0.0000
3.5	429,963,614	99.78%	99.85%	99.86%	0.0000	0.0000
4.5	405,544,549	99.53%	99.79%	99.81%	0.0000	0.0000
5.5	387,259,430	99.30%	99.72%	99.74%	0.0000	0.0000
6.5	376,287,103	99.03%	99.64%	99.67%	0.0000	0.0000
7.5	362,728,593	98.79%	99.54%	99.59%	0.0001	0.0001
8.5	354,248,763	98.55%	99.44%	99.49%	0.0001	0.0001
9.5	345,414,120	98.41%	99.31%	99.38%	0.0001	0.0001
10.5	335,189,680	98.27%	99.17%	99.26%	0.0001	0.0001
11.5	324,983,354	98.18%	99.01%	99.12%	0.0001	0.0001
12.5	322,712,448	98.05%	98.83%	98.96%	0.0001	0.0001
13.5	312,401,061	97.88%	98.62%	98.79%	0.0001	0.0001
14.5	298,909,577	97.72%	98.39%	98.59%	0.0000	0.0001
15.5	281,179,931	97.43%	98.13%	98.37%	0.0000	0.0001
16.5	260,866,378	97.18%	97.84%	98.12%	0.0000	0.0001
17.5	224,308,816	96.89%	97.52%	97.85%	0.0000	0.0001
18.5	228,125,497	96.50%	97.17%	97.55%	0.0000	0.0001
19.5	217,450,810	96.05%	96.77%	97.22%	0.0001	0.0001
20.5	203,528,262	95.62%	96.34%	96.86%	0.0001	0.0002
21.5	191,439,951	95.29%	95.86%	96.46%	0.0000	0.0001
22.5	173,913,778	95.00%	95.34%	96.02%	0.0000	0.0001
23.5	161,589,203	94.58%	94.77%	95.55%	0.0000	0.0001
24.5	148,672,696	93.94%	94.15%	95.03%	0.0000	0.0001
25.5	133,922,952	93.52%	93.47%	94.47%	0.0000	0.0001
26.5	123,406,668	92.74%	92.73%	93.86%	0.0000	0.0001
27.5	111,283,440	91.52%	91.93%	93.20%	0.0000	0.0003
28.5	101,550,587	90.61%	91.07%	92.48%	0.0000	0.0004
29.5	93,020,687	90.28%	90.14%	91.71%	0.0000	0.0002
30.5	84,672,784	89.61%	89.13%	90.88%	0.0000	0.0002
31.5	73,034,091	89.12%	88.04%	89.99%	0.0001	0.0001
32.5	64,549,937	88.27%	86.88%	89.04%	0.0002	0.0001
33.5	55,320,543	87.02%	85.62%	88.01%	0.0002	0.0001
34.5	47,735,060	85.56%	84.27%	86.91%	0.0002	0.0002
35.5	43,338,164	84.24%	82.83%	85.74%	0.0002	0.0002
36.5	39,238,179	83.56%	81.28%	84.48%	0.0005	0.0001
37.5	35,290,547	82.70%	79.62%	83.13%	0.0009	0.0000
38.5	30,480,828	79.97%	77.84%	81.70%	0.0005	0.0003
39.5	26,113,237	78.06%	75.95%	80.17%	0.0004	0.0004
40.5	23,201,977	75.82%	73.93%	78.53%	0.0004	0.0007
41.5	22,695,433	73.68%	71.79%	76.80%	0.0004	0.0010
42.5	22,101,790	71.62%	69.51%	74.96%	0.0004	0.0011
43.5	20,638,096	67.63%	67.10%	73.00%	0.0000	0.0029
44.5	19,132,938	65.52%	64.57%	70.93%	0.0001	0.0029
45.5	17,986,451	65.12%	61.91%	68.75%	0.0010	0.0013
46.5	16,628,564	64.78%	59.12%	66.45%	0.0032	0.0003
47.5	14,608,525	63.18%	56.23%	64.03%	0.0048	0.0001
48.5	12,993,907	62.88%	53.23%	61.51%	0.0093	0.0002
49.5	11,337,579	62.58%	50.15%	58.87%	0.0155	0.0014
50.5	10,266,590	61.68%	47.00%	56.14%	0.0216	0.0031
51.5	8,598,090	60.68%	43.80%	53.32%	0.0285	0.0054
52.5	7,020,672	59.97%	40.58%	50.42%	0.0376	0.0091
53.5	5,884,304	58.94%	37.37%	47.47%	0.0465	0.0132
54.5	4,688,236	57.80%	34.18%	44.46%	0.0558	0.0178
55.5	3,592,084	56.43%	31.05%	41.44%	0.0644	0.0225

Account 680 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company R3-48	[5] OUCC R3-51	[6] Company SSD	[7] OUCC SSD
56.5	2,481,829	51.49%	28.01%	38.41%	0.0551	0.0171
57.5	1,111,941	34.44%	25.07%	35.39%	0.0088	0.0001
58.5	791,543	30.38%	22.26%	32.42%	0.0066	0.0004
59.5	704,175	28.90%	19.61%	29.52%	0.0086	0.0000
60.5	593,865	24.79%	17.13%	26.70%	0.0059	0.0004
61.5	465,880	19.92%	14.83%	23.98%	0.0026	0.0016
62.5	444,767	19.01%	12.73%	21.39%	0.0039	0.0006
63.5	383,284	16.40%	10.81%	18.94%	0.0031	0.0006
64.5	233,008	10.33%	9.08%	16.65%	0.0002	0.0040
65.5	176,860	7.84%	7.55%	14.51%	0.0000	0.0045
66.5	153,053	6.79%	6.19%	12.55%	0.0000	0.0033
67.5	149,091	6.62%	5.00%	10.76%	0.0003	0.0017
68.5	137,528	6.10%	3.97%	9.13%	0.0005	0.0009
69.5	78,575	3.79%	3.09%	7.67%	0.0000	0.0015
70.5	66,820	3.20%	2.35%	6.37%	0.0001	0.0010
71.5	47,803	2.29%	1.73%	5.23%	0.0000	0.0009
72.5	27,653	1.32%	1.23%	4.23%	0.0000	0.0008
73.5	14,292	0.68%	0.84%	3.36%	0.0000	0.0007
74.5	14,232	0.68%	0.54%	2.62%	0.0000	0.0004
75.5	14,739	0.68%	0.32%	1.99%	0.0000	0.0002
76.5	14,739	0.68%	0.17%	1.47%	0.0000	0.0001
77.5	14,261	0.66%	0.08%	1.05%	0.0000	0.0000
78.5	5,356	0.25%	0.03%	0.71%	0.0000	0.0000
79.5	187	0.19%	0.01%	0.46%	0.0000	0.0000
80.5	1,255	0.19%	0.00%	0.27%	0.0000	0.0000
81.5	1,232	0.19%	0.00%	0.15%	0.0000	0.0000
82.5	265	0.04%	0.00%	0.07%	0.0000	0.0000
83.5	164	0.03%	0.00%	0.02%	0.0000	0.0000
84.5	160	0.02%	0.00%	0.01%	0.0000	0.0000
85.5	160	0.02%	0.00%	0.00%	0.0000	0.0000
86.5	160	0.02%	0.00%	0.00%	0.0000	0.0000
87.5	160	0.02%	0.00%	0.00%	0.0000	0.0000
88.5	10	0.00%	0.00%	0.00%	0.0000	0.0000
89.5			0.00%	0.00%		
Sum of Squared Differences				[8]	0.3895	0.1283
Up to 1% of Beginning Exposures				[9]	0.1735	0.0472

[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 682 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company R3-40	[5] OUCC R3-45	[6] Company SSD	[7] OUCC SSD
0.0	38,267,502	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	41,280,256	100.00%	99.98%	99.98%	0.0000	0.0000
1.5	42,771,894	100.00%	99.93%	99.94%	0.0000	0.0000
2.5	41,800,323	100.00%	99.88%	99.90%	0.0000	0.0000
3.5	38,782,398	99.96%	99.81%	99.84%	0.0000	0.0000
4.5	28,921,456	99.86%	99.73%	99.77%	0.0000	0.0000
5.5	29,872,405	99.78%	99.63%	99.69%	0.0000	0.0000
6.5	31,467,856	99.46%	99.51%	99.60%	0.0000	0.0000
7.5	31,970,148	98.86%	99.38%	99.49%	0.0000	0.0000
8.5	32,059,150	98.25%	99.21%	99.37%	0.0001	0.0001
9.5	32,914,785	98.00%	99.03%	99.22%	0.0001	0.0001
10.5	33,533,465	97.54%	98.81%	99.06%	0.0002	0.0002
11.5	34,114,798	97.51%	98.55%	98.87%	0.0001	0.0002
12.5	35,143,921	97.30%	98.26%	98.66%	0.0001	0.0002
13.5	35,649,578	97.02%	97.93%	98.41%	0.0001	0.0002
14.5	36,410,361	96.90%	97.56%	98.14%	0.0000	0.0002
15.5	37,428,650	96.74%	97.13%	97.83%	0.0000	0.0001
16.5	38,312,486	96.51%	96.65%	97.49%	0.0000	0.0001
17.5	39,614,601	96.39%	96.11%	97.10%	0.0000	0.0001
18.5	40,522,081	96.19%	95.50%	96.68%	0.0000	0.0000
19.5	36,672,748	96.09%	94.83%	96.20%	0.0002	0.0000
20.5	33,982,887	96.06%	94.08%	95.68%	0.0004	0.0000
21.5	33,017,503	96.00%	93.25%	95.10%	0.0008	0.0001
22.5	28,683,496	96.00%	92.34%	94.47%	0.0013	0.0002
23.5	25,575,533	95.92%	91.34%	93.77%	0.0021	0.0005
24.5	24,042,577	95.82%	90.23%	93.01%	0.0031	0.0008
25.5	21,692,125	95.73%	89.03%	92.18%	0.0045	0.0013
26.5	20,451,305	95.69%	87.70%	91.28%	0.0064	0.0019
27.5	18,916,030	95.57%	86.26%	90.30%	0.0087	0.0028
28.5	17,685,142	95.47%	84.69%	89.23%	0.0116	0.0039
29.5	16,573,195	95.43%	82.98%	88.08%	0.0155	0.0054
30.5	15,439,363	95.40%	81.12%	86.84%	0.0204	0.0073
31.5	13,539,271	95.34%	79.10%	85.49%	0.0264	0.0097
32.5	12,150,609	95.31%	76.91%	84.04%	0.0339	0.0127
33.5	10,795,729	95.30%	74.55%	82.47%	0.0431	0.0165
34.5	9,783,988	95.23%	72.01%	80.79%	0.0539	0.0209
35.5	8,894,129	94.97%	69.28%	78.98%	0.0660	0.0256
36.5	7,660,173	94.94%	66.36%	77.04%	0.0817	0.0320
37.5	6,638,697	94.57%	63.25%	74.96%	0.0981	0.0385
38.5	5,521,078	94.55%	59.97%	72.73%	0.1196	0.0476
39.5	4,773,311	94.46%	56.52%	70.36%	0.1439	0.0581
40.5	4,231,960	94.36%	52.93%	67.84%	0.1717	0.0703
41.5	3,934,536	94.24%	49.21%	65.17%	0.2028	0.0845
42.5	3,689,224	93.71%	45.41%	62.36%	0.2333	0.0983
43.5	3,404,192	93.65%	41.55%	59.41%	0.2714	0.1173
44.5	3,185,728	93.22%	37.69%	56.33%	0.3084	0.1361
45.5	2,832,000	92.89%	33.87%	53.13%	0.3484	0.1581
46.5	2,479,708	92.54%	30.13%	49.84%	0.3895	0.1824

Account 682 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company R3-40	[5] OUCC R3-45	[6] Company SSD	[7] OUCC SSD
47.5	2,143,797	92.52%	26.52%	46.47%	0.4356	0.2121
48.5	1,835,292	92.50%	23.09%	43.05%	0.4817	0.2445
49.5	1,552,984	92.39%	19.87%	39.62%	0.5259	0.2785
50.5	1,266,670	90.30%	16.90%	36.20%	0.5388	0.2927
51.5	548,790	57.15%	14.18%	32.82%	0.1846	0.0592
52.5	130,880	23.23%	11.74%	29.52%	0.0132	0.0040
53.5	98,107	17.44%	9.58%	26.33%	0.0062	0.0079
54.5	71,002	12.64%	7.69%	23.28%	0.0025	0.0113
55.5	49,699	8.77%	6.06%	20.39%	0.0007	0.0135
56.5	15,359	2.61%	4.67%	17.70%	0.0004	0.0228
57.5	1,624	0.19%	3.51%	15.21%	0.0011	0.0225
58.5	2,969	0.19%	2.56%	12.92%	0.0006	0.0162
59.5	2,967	0.19%	1.79%	10.87%	0.0003	0.0114
60.5	28,625	0.19%	1.19%	9.03%	0.0001	0.0078
61.5	28,540	0.19%	0.74%	7.40%	0.0000	0.0052
62.5	28,527	0.19%	0.42%	5.97%	0.0000	0.0033
63.5	28,527	0.19%	0.21%	4.74%	0.0000	0.0021
64.5	28,309	0.19%	0.08%	3.69%	0.0000	0.0012
65.5	27,620	0.19%	0.02%	2.80%	0.0000	0.0007
66.5	26,503	0.18%	0.00%	2.07%	0.0000	0.0004
67.5	16,407	0.11%	0.00%	1.47%	0.0000	0.0002
68.5	6,368	0.04%	0.00%	1.00%	0.0000	0.0001
69.5			0.00%	0.64%		
Sum of Squared Differences				[8]	4.8594	2.3517
Up to 1% of Beginning Exposures				[9]	4.8343	2.2212

[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 685 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company R2.5-50	[5] OUCC R2.5-55	[6] Company SSD	[7] OUCC SSD
0.0	8,511,290	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	10,774,070	99.95%	99.94%	99.95%	0.0000	0.0000
1.5	13,142,555	99.95%	99.83%	99.84%	0.0000	0.0000
2.5	15,979,896	99.77%	99.70%	99.73%	0.0000	0.0000
3.5	18,228,478	99.63%	99.56%	99.61%	0.0000	0.0000
4.5	20,323,626	99.47%	99.41%	99.47%	0.0000	0.0000
5.5	21,952,634	99.15%	99.25%	99.33%	0.0000	0.0000
6.5	24,200,015	99.02%	99.07%	99.18%	0.0000	0.0000
7.5	26,383,563	98.97%	98.88%	99.01%	0.0000	0.0000
8.5	27,832,981	98.39%	98.68%	98.84%	0.0000	0.0000
9.5	29,181,791	97.80%	98.45%	98.65%	0.0000	0.0001
10.5	29,628,149	97.56%	98.21%	98.44%	0.0000	0.0001
11.5	30,279,188	97.11%	97.95%	98.22%	0.0001	0.0001
12.5	31,106,271	97.02%	97.67%	97.99%	0.0000	0.0001
13.5	31,436,969	96.68%	97.37%	97.74%	0.0000	0.0001
14.5	31,765,077	96.53%	97.04%	97.47%	0.0000	0.0001
15.5	30,960,905	96.31%	96.69%	97.18%	0.0000	0.0001
16.5	29,898,242	96.15%	96.32%	96.87%	0.0000	0.0001
17.5	28,207,240	96.13%	95.91%	96.54%	0.0000	0.0000
18.5	28,361,503	96.09%	95.48%	96.19%	0.0000	0.0000
19.5	26,863,963	96.02%	95.01%	95.81%	0.0001	0.0000
20.5	24,965,532	95.95%	94.51%	95.41%	0.0002	0.0000
21.5	22,233,230	95.91%	93.97%	94.99%	0.0004	0.0001
22.5	20,087,345	95.83%	93.40%	94.53%	0.0006	0.0002
23.5	18,015,200	95.76%	92.79%	94.05%	0.0009	0.0003
24.5	16,342,737	95.68%	92.14%	93.53%	0.0013	0.0005
25.5	14,133,900	95.64%	91.44%	92.99%	0.0018	0.0007
26.5	12,017,877	95.61%	90.70%	92.41%	0.0024	0.0010
27.5	10,520,576	95.59%	89.92%	91.80%	0.0032	0.0014
28.5	9,196,063	95.51%	89.08%	91.15%	0.0041	0.0019
29.5	8,503,027	95.49%	88.19%	90.46%	0.0053	0.0025
30.5	7,115,071	95.48%	87.24%	89.73%	0.0068	0.0033
31.5	6,348,229	95.43%	86.24%	88.96%	0.0084	0.0042
32.5	5,726,259	95.37%	85.18%	88.15%	0.0104	0.0052
33.5	5,198,399	95.23%	84.06%	87.29%	0.0125	0.0063
34.5	4,831,445	95.04%	82.87%	86.38%	0.0148	0.0075
35.5	4,436,117	94.78%	81.62%	85.43%	0.0173	0.0087
36.5	3,852,761	94.53%	80.29%	84.42%	0.0203	0.0102
37.5	3,266,771	94.34%	78.89%	83.36%	0.0239	0.0120
38.5	2,570,367	94.05%	77.41%	82.25%	0.0277	0.0139
39.5	2,160,499	93.72%	75.85%	81.08%	0.0319	0.0160
40.5	2,074,919	93.08%	74.21%	79.85%	0.0356	0.0175
41.5	1,982,816	92.84%	72.49%	78.56%	0.0414	0.0204
42.5	1,943,994	92.54%	70.68%	77.20%	0.0478	0.0235
43.5	1,904,225	92.36%	68.78%	75.78%	0.0556	0.0275
44.5	1,887,620	92.12%	66.80%	74.29%	0.0641	0.0318
45.5	1,874,627	91.83%	64.72%	72.73%	0.0735	0.0365
46.5	1,834,106	91.63%	62.57%	71.10%	0.0845	0.0422
47.5	1,665,188	91.18%	60.32%	69.39%	0.0952	0.0475
48.5	1,467,428	90.85%	58.00%	67.62%	0.1079	0.0540
49.5	1,236,496	90.66%	55.61%	65.77%	0.1229	0.0619
50.5	1,064,080	90.53%	53.14%	63.85%	0.1398	0.0712
51.5	844,381	90.01%	50.62%	61.86%	0.1551	0.0792
52.5	678,393	89.55%	48.06%	59.80%	0.1722	0.0885
53.5	486,030	88.90%	45.45%	57.68%	0.1888	0.0975
54.5	348,171	88.78%	42.82%	55.50%	0.2112	0.1108
55.5	271,920	87.90%	40.19%	53.26%	0.2276	0.1200

Account 685 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company R2.5-50	[5] OUCC R2.5-55	[6] Company SSD	[7] OUCC SSD
56.5	208,627	87.76%	37.56%	50.97%	0.2520	0.1354
57.5	148,028	87.40%	34.96%	48.64%	0.2750	0.1502
58.5	119,198	87.40%	32.39%	46.28%	0.3026	0.1691
59.5	86,899	86.79%	29.88%	43.90%	0.3239	0.1839
60.5	75,030	86.79%	27.43%	41.51%	0.3523	0.2051
61.5	72,255	86.19%	25.07%	39.11%	0.3735	0.2216
62.5	63,699	85.57%	22.81%	36.73%	0.3939	0.2385
63.5	52,341	84.82%	20.65%	34.37%	0.4118	0.2545
64.5	36,935	84.82%	18.60%	32.04%	0.4385	0.2785
65.5	26,625	84.79%	16.67%	29.76%	0.4640	0.3028
66.5	21,934	84.09%	14.87%	27.54%	0.4792	0.3197
67.5	17,206	84.09%	13.19%	25.39%	0.5027	0.3445
68.5	10,830	84.09%	11.64%	23.32%	0.5250	0.3693
69.5	4,075	84.09%	10.21%	21.33%	0.5459	0.3939
70.5	2,766	84.09%	8.90%	19.43%	0.5654	0.4181
71.5	2,617	84.09%	7.71%	17.62%	0.5834	0.4418
72.5	2,617	84.09%	6.63%	15.92%	0.6000	0.4647
73.5	2,614	84.01%	5.66%	14.32%	0.6139	0.4856
74.5	1,818	83.77%	4.79%	12.83%	0.6237	0.5033
75.5	1,730	83.77%	4.03%	11.44%	0.6359	0.5232
76.5	1,730	83.77%	3.35%	10.15%	0.6467	0.5420
77.5	1,730	83.77%	2.76%	8.96%	0.6562	0.5597
78.5	1,730	83.77%	2.25%	7.87%	0.6645	0.5761
79.5	128	83.77%	1.82%	6.87%	0.6716	0.5914
80.5	128	83.77%	1.45%	5.96%	0.6777	0.6054
81.5	85	55.84%	1.14%	5.14%	0.2992	0.2571
82.5	85	55.84%	0.88%	4.40%	0.3021	0.2646
83.5	43	27.92%	0.66%	3.74%	0.0743	0.0585
84.5	43	27.92%	0.49%	3.16%	0.0753	0.0613
85.5	43	27.92%	0.34%	2.64%	0.0761	0.0639
86.5	43	27.92%	0.23%	2.19%	0.0767	0.0662
87.5	43	27.92%	0.14%	1.80%	0.0772	0.0682
88.5			0.08%	1.46%		
Sum of Squared Differences				[8]	15.5778	11.1452
Up to 1% of Beginning Exposures				[9]	3.1713	1.6654

[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 690 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company S0-55	[5] OUCC S0-60	[6] Company SSD	[7] OUCC SSD
0.0	27,002,973	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	21,468,019	100.00%	99.99%	99.99%	0.0000	0.0000
1.5	21,287,618	100.00%	99.88%	99.90%	0.0000	0.0000
2.5	20,254,472	99.98%	99.71%	99.75%	0.0000	0.0000
3.5	21,800,606	99.95%	99.47%	99.55%	0.0000	0.0000
4.5	19,091,596	99.70%	99.18%	99.30%	0.0000	0.0000
5.5	17,876,525	99.63%	98.84%	99.00%	0.0001	0.0000
6.5	14,400,492	99.49%	98.45%	98.67%	0.0001	0.0001
7.5	14,360,934	99.31%	98.02%	98.30%	0.0002	0.0001
8.5	14,274,103	98.13%	97.55%	97.89%	0.0000	0.0000
9.5	14,513,935	97.80%	97.03%	97.44%	0.0001	0.0000
10.5	14,136,963	96.70%	96.48%	96.97%	0.0000	0.0000
11.5	14,170,201	96.66%	95.89%	96.46%	0.0001	0.0000
12.5	14,003,189	95.99%	95.27%	95.92%	0.0001	0.0000
13.5	12,073,635	95.56%	94.61%	95.35%	0.0001	0.0000
14.5	12,920,145	95.03%	93.93%	94.75%	0.0001	0.0000
15.5	13,190,170	94.69%	93.21%	94.13%	0.0002	0.0000
16.5	13,142,798	94.43%	92.46%	93.48%	0.0004	0.0001
17.5	10,213,357	93.50%	91.68%	92.80%	0.0003	0.0000
18.5	11,566,116	92.07%	90.87%	92.10%	0.0001	0.0000
19.5	10,967,414	91.46%	90.04%	91.38%	0.0002	0.0000
20.5	11,627,475	87.65%	89.19%	90.63%	0.0002	0.0009
21.5	11,361,768	86.48%	88.30%	89.87%	0.0003	0.0011
22.5	8,127,324	86.20%	87.40%	89.08%	0.0001	0.0008
23.5	8,458,949	85.89%	86.47%	88.27%	0.0000	0.0006
24.5	7,941,354	85.14%	85.52%	87.44%	0.0000	0.0005
25.5	7,951,671	85.03%	84.55%	86.59%	0.0000	0.0002
26.5	7,710,498	84.68%	83.56%	85.72%	0.0001	0.0001
27.5	7,821,882	84.40%	82.55%	84.84%	0.0003	0.0000
28.5	7,462,424	84.29%	81.52%	83.93%	0.0008	0.0000
29.5	7,562,402	84.22%	80.48%	83.02%	0.0014	0.0001
30.5	7,964,519	82.98%	79.41%	82.08%	0.0013	0.0001
31.5	7,986,427	82.81%	78.34%	81.13%	0.0020	0.0003
32.5	7,756,713	76.57%	77.24%	80.17%	0.0000	0.0013
33.5	6,855,136	76.26%	76.13%	79.19%	0.0000	0.0009
34.5	8,104,655	75.71%	75.01%	78.20%	0.0000	0.0006
35.5	8,059,112	75.56%	73.87%	77.19%	0.0003	0.0003
36.5	7,834,329	75.33%	72.72%	76.18%	0.0007	0.0001
37.5	6,924,898	75.22%	71.56%	75.15%	0.0013	0.0000
38.5	6,865,161	75.07%	70.39%	74.11%	0.0022	0.0001
39.5	5,103,163	70.03%	69.21%	73.06%	0.0001	0.0009
40.5	5,009,099	69.96%	68.01%	72.00%	0.0004	0.0004
41.5	4,817,889	67.95%	66.81%	70.93%	0.0001	0.0009
42.5	4,030,524	67.78%	65.60%	69.85%	0.0005	0.0004
43.5	3,757,184	67.78%	64.38%	68.76%	0.0012	0.0001
44.5	3,335,578	67.74%	63.15%	67.66%	0.0021	0.0000
45.5	3,308,067	67.45%	61.92%	66.56%	0.0031	0.0001
46.5	3,193,609	67.32%	60.68%	65.45%	0.0044	0.0004
47.5	3,035,314	67.10%	59.44%	64.33%	0.0059	0.0008
48.5	2,918,950	65.94%	58.19%	63.21%	0.0060	0.0007
49.5	2,453,043	65.70%	56.94%	62.08%	0.0077	0.0013
50.5	2,389,478	65.49%	55.68%	60.94%	0.0096	0.0021
51.5	1,949,296	60.06%	54.42%	59.80%	0.0032	0.0000
52.5	1,925,939	60.06%	53.16%	58.66%	0.0048	0.0002
53.5	483,472	60.06%	51.90%	57.51%	0.0067	0.0006
54.5	458,757	59.95%	50.64%	56.36%	0.0087	0.0013
55.5	193,782	59.95%	49.37%	55.21%	0.0112	0.0022
56.5	190,635	59.95%	48.11%	54.06%	0.0140	0.0035
57.5	190,167	59.79%	46.85%	52.90%	0.0168	0.0047
58.5	188,765	59.25%	45.58%	51.74%	0.0187	0.0056
59.5	188,678	59.25%	44.32%	50.58%	0.0223	0.0075
60.5	216,498	59.19%	43.07%	49.42%	0.0260	0.0095
61.5	216,728	59.19%	41.82%	48.27%	0.0302	0.0119
62.5	210,022	59.19%	40.57%	47.11%	0.0347	0.0146
63.5	199,467	58.91%	39.32%	45.95%	0.0384	0.0168

Account 690 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] Company S0-55	[5] OUCC S0-60	[6] Company SSD	[7] OUCC SSD
64.5	198,234	58.55%	38.08%	44.80%	0.0419	0.0189
65.5	186,141	58.47%	36.85%	43.64%	0.0467	0.0220
66.5	164,384	58.47%	35.63%	42.49%	0.0522	0.0255
67.5	150,004	53.37%	34.41%	41.35%	0.0360	0.0145
68.5	82,179	53.08%	33.20%	40.20%	0.0395	0.0166
69.5	82,932	53.08%	31.99%	39.06%	0.0445	0.0196
70.5	39,524	53.08%	30.80%	37.93%	0.0496	0.0230
71.5	34,945	53.08%	29.62%	36.80%	0.0550	0.0265
72.5	32,741	53.08%	28.45%	35.68%	0.0607	0.0303
73.5	30,943	49.18%	27.29%	34.56%	0.0479	0.0214
74.5	36,356	49.18%	26.14%	33.45%	0.0531	0.0247
75.5	37,219	49.18%	25.00%	32.34%	0.0585	0.0283
76.5	39,948	49.18%	23.88%	31.25%	0.0640	0.0322
77.5	53,654	49.18%	22.77%	30.16%	0.0698	0.0362
78.5	53,654	49.18%	21.67%	29.08%	0.0757	0.0404
79.5	27,969	49.18%	20.59%	28.01%	0.0817	0.0448
80.5	27,739	49.18%	19.53%	26.95%	0.0879	0.0494
81.5	27,739	49.18%	18.48%	25.90%	0.0942	0.0542
82.5	27,739	49.18%	17.46%	24.86%	0.1006	0.0592
83.5	29,810	49.18%	16.45%	23.83%	0.1072	0.0643
84.5	29,810	49.18%	15.46%	22.81%	0.1137	0.0695
85.5	62,886	49.18%	14.49%	21.81%	0.1204	0.0749
86.5	62,886	49.18%	13.54%	20.82%	0.1271	0.0805
87.5	62,886	49.18%	12.61%	19.84%	0.1338	0.0861
88.5	61,166	49.10%	11.70%	18.87%	0.1399	0.0914
89.5	60,208	48.41%	10.82%	17.92%	0.1413	0.0929
90.5	57,449	46.19%	9.96%	16.99%	0.1312	0.0853
91.5	57,390	46.19%	9.13%	16.07%	0.1373	0.0907
92.5	56,786	46.19%	8.33%	15.17%	0.1434	0.0962
93.5	49,457	46.19%	7.55%	14.29%	0.1493	0.1018
94.5	49,457	46.19%	6.80%	13.42%	0.1552	0.1074
95.5	49,457	46.19%	6.08%	12.57%	0.1609	0.1130
96.5	35,423	46.19%	5.39%	11.74%	0.1664	0.1187
97.5	33,352	43.49%	4.74%	10.93%	0.1502	0.1060
98.5	33,076	43.49%	4.11%	10.14%	0.1551	0.1112
99.5	8,893	11.69%	3.52%	9.37%	0.0067	0.0005
########	8,893	11.69%	2.97%	8.63%	0.0076	0.0009
########	8,893	11.69%	2.46%	7.90%	0.0085	0.0014
########	8,893	11.69%	1.99%	7.20%	0.0094	0.0020
########	8,893	11.69%	1.55%	6.53%	0.0103	0.0027
########			1.16%	5.88%		
Sum of Squared Differences				[8]	3.7239	2.1803
Up to 1% of Beginning Exposures				[9]	0.0776	0.0187

[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.

Vectren North
Gas Division
680.00 Services

Observed Life Table
Retirement Expr. 2001 TO 2019
Placement Years 1920 TO 2019

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	$511,182,232.63	$72,713.57	0.00014	100.00
0.5 - 1.5	$478,436,741.21	$93,087.48	0.00019	99.99
1.5 - 2.5	$446,712,769.63	$213,770.16	0.00048	99.97
2.5 - 3.5	$437,561,930.41	$600,918.40	0.00137	99.92
3.5 - 4.5	$429,963,613.57	$1,073,572.15	0.00250	99.78
4.5 - 5.5	$405,544,549.47	$932,843.98	0.00230	99.53
5.5 - 6.5	$387,259,429.65	$1,064,627.32	0.00275	99.30
6.5 - 7.5	$376,287,103.32	$910,244.22	0.00242	99.03
7.5 - 8.5	$362,728,593.46	$868,172.41	0.00239	98.79
8.5 - 9.5	$354,248,763.10	$504,296.77	0.00142	98.55
9.5 - 10.5	$345,414,119.88	$516,768.50	0.00150	98.41
10.5 - 11.5	$335,189,680.03	$312,559.36	0.00093	98.27
11.5 - 12.5	$324,983,354.25	$414,143.85	0.00127	98.18
12.5 - 13.5	$322,712,447.87	$543,991.26	0.00169	98.05
13.5 - 14.5	$312,401,061.31	$535,840.18	0.00172	97.88
14.5 - 15.5	$298,909,577.30	$868,297.11	0.00290	97.72
15.5 - 16.5	$281,179,930.72	$725,922.47	0.00258	97.43
16.5 - 17.5	$260,866,377.55	$772,029.79	0.00296	97.18
17.5 - 18.5	$224,308,815.83	$902,240.06	0.00402	96.89
18.5 - 19.5	$228,125,497.41	$1,068,223.83	0.00468	96.50
19.5 - 20.5	$217,450,809.76	$973,748.10	0.00448	96.05
20.5 - 21.5	$203,528,261.64	$709,105.00	0.00348	95.62
21.5 - 22.5	$191,439,950.71	$578,585.03	0.00302	95.29
22.5 - 23.5	$173,913,778.01	$778,889.41	0.00448	95.00
23.5 - 24.5	$161,589,202.72	$1,081,074.57	0.00669	94.58
24.5 - 25.5	$148,672,695.69	$667,214.73	0.00449	93.94
25.5 - 26.5	$133,922,951.81	$1,114,137.65	0.00832	93.52
26.5 - 27.5	$123,406,668.48	$1,622,635.79	0.01315	92.74
27.5 - 28.5	$111,283,439.89	$1,106,002.49	0.00994	91.52
28.5 - 29.5	$101,550,587.10	$372,906.63	0.00367	90.61
29.5 - 30.5	$93,020,686.60	$692,299.23	0.00744	90.28
30.5 - 31.5	$84,672,784.22	$459,013.66	0.00542	89.61
31.5 - 32.5	$73,034,091.17	$697,803.62	0.00955	89.12
32.5 - 33.5	$64,549,937.45	$914,999.29	0.01418	88.27
33.5 - 34.5	$55,320,542.96	$930,981.83	0.01683	87.02
34.5 - 35.5	$47,735,059.81	$733,021.62	0.01536	85.56
35.5 - 36.5	$43,338,164.38	$351,276.35	0.00811	84.24

Vectren North
Gas Division
680.00 Services

Observed Life Table
Retirement Expr. 2001 TO 2019
Placement Years 1920 TO 2019

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	$39,238,178.72	$403,798.86	0.01029	83.56
37.5 - 38.5	$35,290,546.98	$1,164,836.21	0.03301	82.70
38.5 - 39.5	$30,480,827.94	$726,635.24	0.02384	79.97
39.5 - 40.5	$26,113,236.79	$750,691.29	0.02875	78.06
40.5 - 41.5	$23,201,977.02	$656,024.60	0.02827	75.82
41.5 - 42.5	$22,695,432.93	$632,987.61	0.02789	73.68
42.5 - 43.5	$22,101,790.23	$1,232,986.33	0.05579	71.62
43.5 - 44.5	$20,638,095.73	$642,952.33	0.03115	67.63
44.5 - 45.5	$19,132,937.60	$115,275.79	0.00602	65.52
45.5 - 46.5	$17,986,451.10	$94,244.47	0.00524	65.12
46.5 - 47.5	$16,628,564.18	$410,835.03	0.02471	64.78
47.5 - 48.5	$14,608,524.57	$70,233.40	0.00481	63.18
48.5 - 49.5	$12,993,906.80	$61,444.12	0.00473	62.88
49.5 - 50.5	$11,337,578.82	$162,928.35	0.01437	62.58
50.5 - 51.5	$10,266,590.02	$166,832.76	0.01625	61.68
51.5 - 52.5	$8,598,090.36	$101,108.58	0.01176	60.68
52.5 - 53.5	$7,020,672.32	$120,462.83	0.01716	59.97
53.5 - 54.5	$5,884,303.99	$113,835.38	0.01935	58.94
54.5 - 55.5	$4,688,235.67	$110,672.26	0.02361	57.80
55.5 - 56.5	$3,592,083.79	$314,362.76	0.08752	56.43
56.5 - 57.5	$2,481,828.58	$821,695.85	0.33108	51.49
57.5 - 58.5	$1,111,940.81	$131,278.41	0.11806	34.44
58.5 - 59.5	$791,542.68	$38,576.96	0.04874	30.38
59.5 - 60.5	$704,175.09	$100,166.53	0.14225	28.90
60.5 - 61.5	$593,864.88	$116,716.25	0.19654	24.79
61.5 - 62.5	$465,879.74	$21,112.55	0.04532	19.92
62.5 - 63.5	$444,767.19	$61,027.99	0.13721	19.01
63.5 - 64.5	$383,284.09	$141,899.54	0.37022	16.40
64.5 - 65.5	$233,007.93	$56,218.68	0.24127	10.33
65.5 - 66.5	$176,860.15	$23,585.23	0.13336	7.84
66.5 - 67.5	$153,053.17	$3,962.42	0.02589	6.79
67.5 - 68.5	$149,090.75	$11,562.65	0.07755	6.62
68.5 - 69.5	$137,528.10	$52,032.26	0.37834	6.10
69.5 - 70.5	$78,574.62	$12,353.57	0.15722	3.79
70.5 - 71.5	$66,820.32	$19,017.74	0.28461	3.20
71.5 - 72.5	$47,802.58	$20,149.31	0.42151	2.29
72.5 - 73.5	$27,653.27	$13,361.09	0.48316	1.32

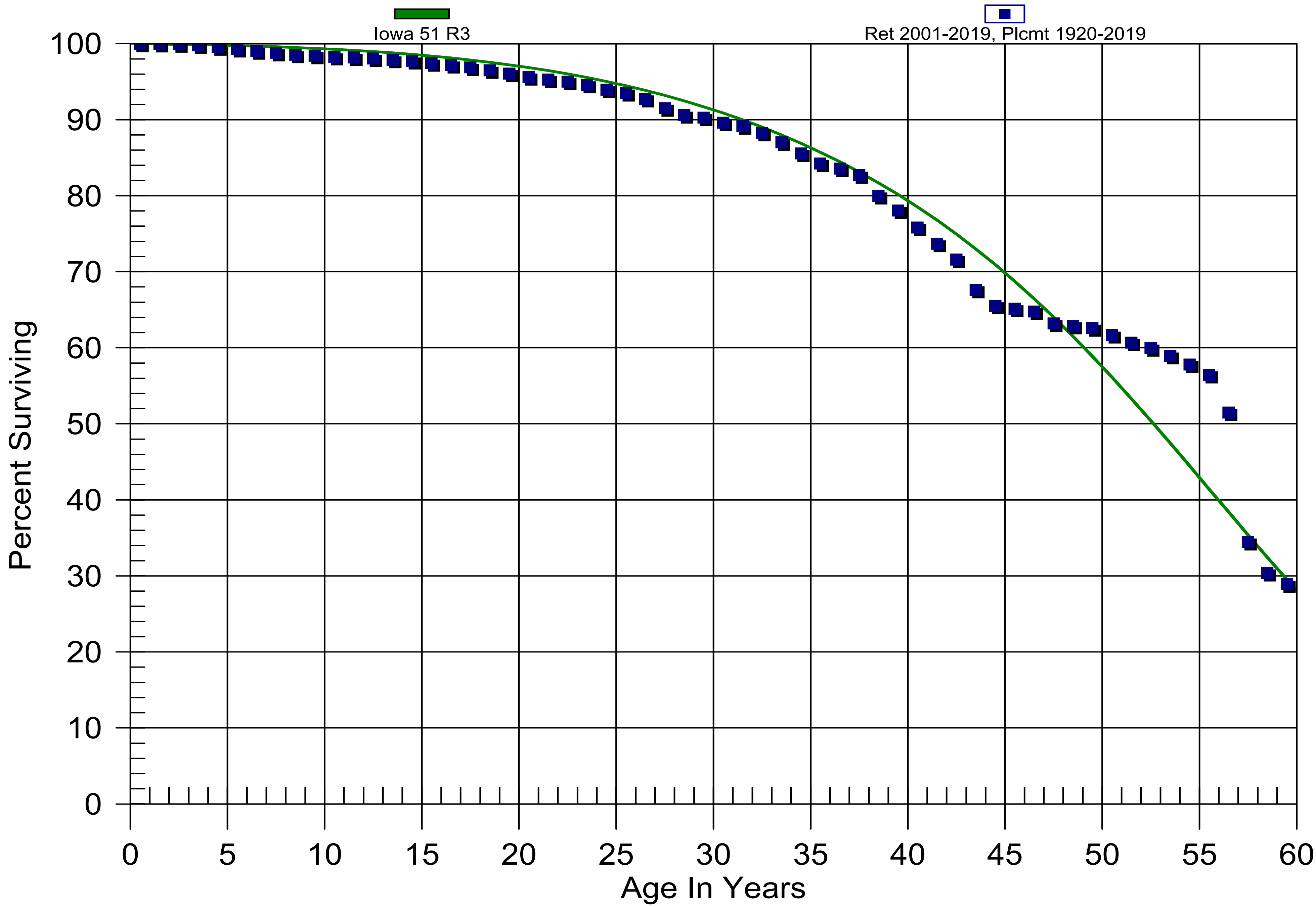
Vectren North
Gas Division
680.00 Services

Observed Life Table
Retirement Expr. 2001 TO 2019
Placement Years 1920 TO 2019

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	$14,292.18	$51.14	0.00358	0.68
74.5 - 75.5	$14,231.64	$0.00	0.00000	0.68
75.5 - 76.5	$14,738.92	$0.00	0.00000	0.68
76.5 - 77.5	$14,738.92	$478.26	0.03245	0.68
77.5 - 78.5	$14,260.66	$8,904.94	0.62444	0.66
78.5 - 79.5	$5,355.72	$1,172.56	0.21894	0.25
79.5 - 80.5	$186.82	$0.00	0.00000	0.19
80.5 - 81.5	$1,255.41	$23.26	0.01853	0.19
81.5 - 82.5	$1,232.15	$966.90	0.78473	0.19
82.5 - 83.5	$265.25	$100.81	0.38006	0.04
83.5 - 84.5	$164.44	$4.30	0.02615	0.03
84.5 - 85.5	$160.14	$0.00	0.00000	0.02
85.5 - 86.5	$160.14	$0.00	0.00000	0.02
86.5 - 87.5	$160.14	$0.00	0.00000	0.02
87.5 - 88.5	$160.14	$149.89	0.93599	0.02
88.5 - 89.5	$10.25	$0.88	0.08585	0.00

Vectren North

Gas Division
680.00 Services
Original And Smooth Survivor Curves



Vectren North
Gas Division
682.00 Meter Installations

Observed Life Table

Retirement Expr. 2001 TO 2019
Placement Years 1940 TO 2019

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	$38,267,501.66	$0.00	0.00000	100.00
0.5 - 1.5	$41,280,256.34	$63.45	0.00000	100.00
1.5 - 2.5	$42,771,893.65	$0.00	0.00000	100.00
2.5 - 3.5	$41,800,323.17	$16,323.47	0.00039	100.00
3.5 - 4.5	$38,782,398.06	$39,870.01	0.00103	99.96
4.5 - 5.5	$28,921,456.30	$23,500.20	0.00081	99.86
5.5 - 6.5	$29,872,405.16	$95,422.76	0.00319	99.78
6.5 - 7.5	$31,467,855.87	$189,684.78	0.00603	99.46
7.5 - 8.5	$31,970,147.54	$197,612.09	0.00618	98.86
8.5 - 9.5	$32,059,150.06	$80,636.40	0.00252	98.25
9.5 - 10.5	$32,914,785.45	$156,211.53	0.00475	98.00
10.5 - 11.5	$33,533,465.10	$8,921.72	0.00027	97.54
11.5 - 12.5	$34,114,798.15	$72,903.65	0.00214	97.51
12.5 - 13.5	$35,143,920.68	$101,531.66	0.00289	97.30
13.5 - 14.5	$35,649,578.23	$44,683.88	0.00125	97.02
14.5 - 15.5	$36,410,361.08	$60,674.44	0.00167	96.90
15.5 - 16.5	$37,428,649.81	$88,539.75	0.00237	96.74
16.5 - 17.5	$38,312,486.04	$45,103.27	0.00118	96.51
17.5 - 18.5	$39,614,601.31	$82,795.98	0.00209	96.39
18.5 - 19.5	$40,522,080.93	$43,648.43	0.00108	96.19
19.5 - 20.5	$36,672,748.05	$10,466.89	0.00029	96.09
20.5 - 21.5	$33,982,886.86	$21,385.03	0.00063	96.06
21.5 - 22.5	$33,017,503.04	$2,040.89	0.00006	96.00
22.5 - 23.5	$28,683,495.75	$23,426.80	0.00082	96.00
23.5 - 24.5	$25,575,533.31	$25,060.19	0.00098	95.92
24.5 - 25.5	$24,042,576.96	$22,972.25	0.00096	95.82
25.5 - 26.5	$21,692,124.56	$8,621.99	0.00040	95.73
26.5 - 27.5	$20,451,304.70	$27,165.32	0.00133	95.69
27.5 - 28.5	$18,916,030.40	$18,673.09	0.00099	95.57
28.5 - 29.5	$17,685,141.63	$7,126.69	0.00040	95.47
29.5 - 30.5	$16,573,194.53	$6,168.56	0.00037	95.43
30.5 - 31.5	$15,439,363.17	$9,553.23	0.00062	95.40
31.5 - 32.5	$13,539,271.44	$4,171.60	0.00031	95.34
32.5 - 33.5	$12,150,609.37	$1,613.13	0.00013	95.31
33.5 - 34.5	$10,795,729.32	$7,618.71	0.00071	95.30
34.5 - 35.5	$9,783,987.51	$26,453.51	0.00270	95.23
35.5 - 36.5	$8,894,128.89	$2,738.51	0.00031	94.97

Vectren North
Gas Division
682.00 Meter Installations

Observed Life Table
Retirement Expr. 2001 TO 2019
Placement Years 1940 TO 2019

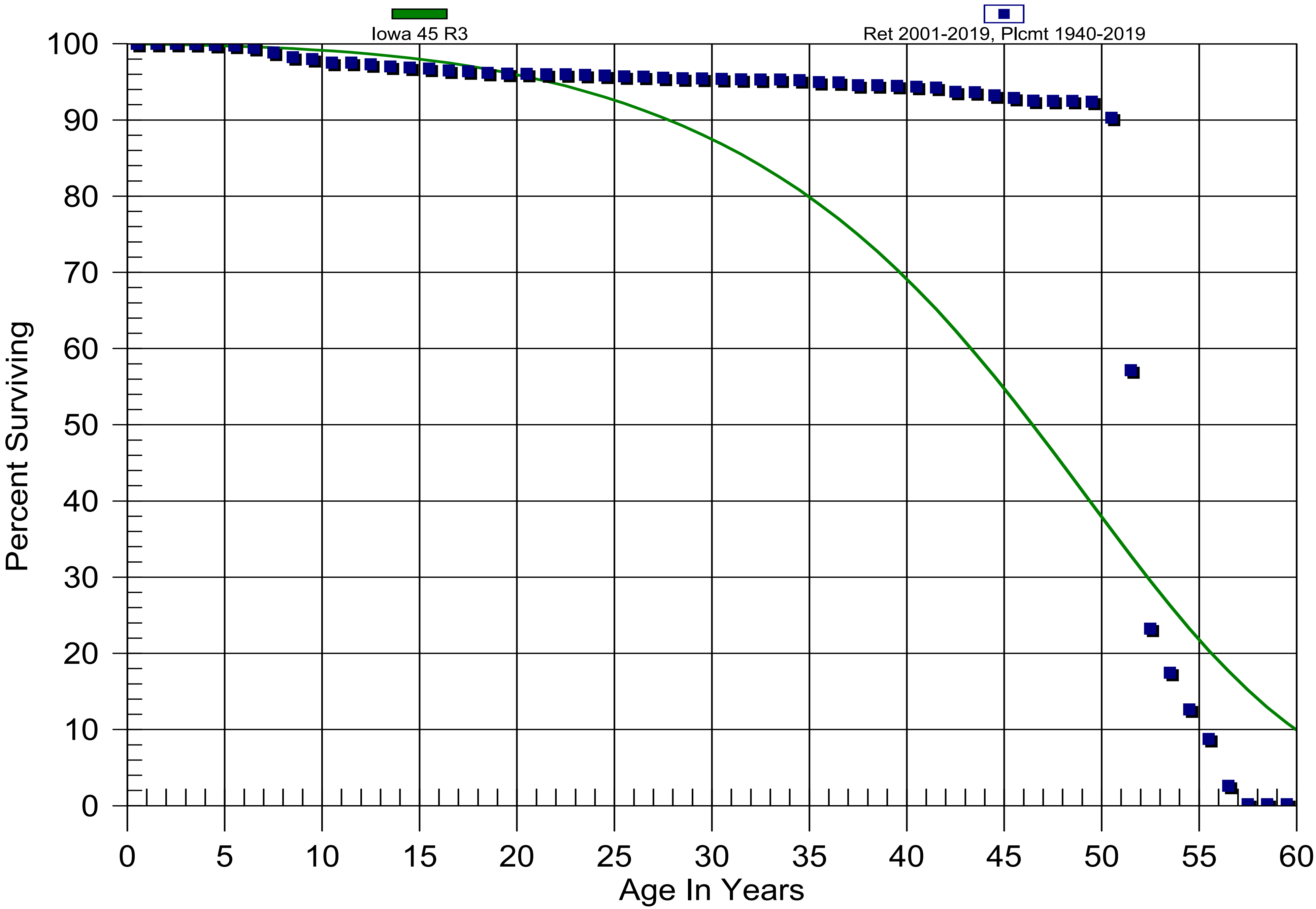
Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$7,660,173.33	$30,480.38	0.00398	94.94
37.5 - 38.5	$6,638,696.76	$1,306.50	0.00020	94.57
38.5 - 39.5	$5,521,077.91	$4,776.06	0.00087	94.55
39.5 - 40.5	$4,773,310.54	$5,287.06	0.00111	94.46
40.5 - 41.5	$4,231,960.33	$5,173.49	0.00122	94.36
41.5 - 42.5	$3,934,535.52	$22,410.43	0.00570	94.24
42.5 - 43.5	$3,689,224.26	$2,278.86	0.00062	93.71
43.5 - 44.5	$3,404,191.58	$15,730.87	0.00462	93.65
44.5 - 45.5	$3,185,728.34	$11,293.11	0.00354	93.22
45.5 - 46.5	$2,832,000.07	$10,705.26	0.00378	92.89
46.5 - 47.5	$2,479,708.38	$350.58	0.00014	92.54
47.5 - 48.5	$2,143,796.70	$583.66	0.00027	92.52
48.5 - 49.5	$1,835,292.49	$2,060.04	0.00112	92.50
49.5 - 50.5	$1,552,984.12	$35,144.47	0.02263	92.39
50.5 - 51.5	$1,266,669.99	$465,026.89	0.36713	90.30
51.5 - 52.5	$548,789.54	$325,731.73	0.59355	57.15
52.5 - 53.5	$130,879.99	$32,596.90	0.24906	23.23
53.5 - 54.5	$98,107.19	$27,008.08	0.27529	17.44
54.5 - 55.5	$71,002.22	$21,733.17	0.30609	12.64
55.5 - 56.5	$49,699.23	$34,890.24	0.70203	8.77
56.5 - 57.5	$15,358.67	$14,213.83	0.92546	2.61
57.5 - 58.5	$1,623.86	$0.00	0.00000	0.19
58.5 - 59.5	$2,969.00	$2.01	0.00068	0.19
59.5 - 60.5	$2,966.99	$0.00	0.00000	0.19
60.5 - 61.5	$28,625.24	$85.29	0.00298	0.19
61.5 - 62.5	$28,539.95	$13.17	0.00046	0.19
62.5 - 63.5	$28,526.78	$0.00	0.00000	0.19
63.5 - 64.5	$28,526.78	$218.11	0.00765	0.19
64.5 - 65.5	$28,308.67	$688.61	0.02433	0.19
65.5 - 66.5	$27,620.06	$1,117.15	0.04045	0.19
66.5 - 67.5	$26,502.91	$10,096.12	0.38094	0.18
67.5 - 68.5	$16,406.79	$10,038.96	0.61188	0.11
68.5 - 69.5	$6,367.83	$6,365.83	0.99969	0.04

Vectren North

Gas Division

682.00 Meter Installations

Original And Smooth Survivor Curves



Vectren North
Gas Division

685.00 Industrial M&R Station Equipment

Observed Life Table

Retirement Expr. 2001 TO 2019
Placement Years 1931 TO 2019

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	$8,511,289.51	$4,182.66	0.00049	100.00
0.5 - 1.5	$10,774,070.49	$0.00	0.00000	99.95
1.5 - 2.5	$13,142,555.35	$23,542.48	0.00179	99.95
2.5 - 3.5	$15,979,896.01	$23,144.11	0.00145	99.77
3.5 - 4.5	$18,228,478.24	$28,070.38	0.00154	99.63
4.5 - 5.5	$20,323,625.85	$65,550.73	0.00323	99.47
5.5 - 6.5	$21,952,634.33	$28,990.45	0.00132	99.15
6.5 - 7.5	$24,200,014.52	$13,632.69	0.00056	99.02
7.5 - 8.5	$26,383,562.50	$154,812.03	0.00587	98.97
8.5 - 9.5	$27,832,981.05	$164,458.83	0.00591	98.39
9.5 - 10.5	$29,181,790.61	$73,583.27	0.00252	97.80
10.5 - 11.5	$29,628,149.18	$136,473.45	0.00461	97.56
11.5 - 12.5	$30,279,187.83	$26,501.73	0.00088	97.11
12.5 - 13.5	$31,106,271.37	$108,965.40	0.00350	97.02
13.5 - 14.5	$31,436,969.18	$48,911.82	0.00156	96.68
14.5 - 15.5	$31,765,076.83	$74,831.32	0.00236	96.53
15.5 - 16.5	$30,960,905.35	$48,513.49	0.00157	96.31
16.5 - 17.5	$29,898,242.32	$7,852.81	0.00026	96.15
17.5 - 18.5	$28,207,240.12	$10,965.95	0.00039	96.13
18.5 - 19.5	$28,361,503.33	$21,862.29	0.00077	96.09
19.5 - 20.5	$26,863,962.90	$17,924.93	0.00067	96.02
20.5 - 21.5	$24,965,531.99	$11,926.38	0.00048	95.95
21.5 - 22.5	$22,233,229.95	$18,865.23	0.00085	95.91
22.5 - 23.5	$20,087,344.97	$14,671.93	0.00073	95.83
23.5 - 24.5	$18,015,199.94	$14,283.06	0.00079	95.76
24.5 - 25.5	$16,342,736.52	$6,996.09	0.00043	95.68
25.5 - 26.5	$14,133,899.57	$4,784.15	0.00034	95.64
26.5 - 27.5	$12,017,876.74	$2,282.92	0.00019	95.61
27.5 - 28.5	$10,520,575.82	$8,391.25	0.00080	95.59
28.5 - 29.5	$9,196,062.96	$2,280.47	0.00025	95.51
29.5 - 30.5	$8,503,027.00	$698.83	0.00008	95.49
30.5 - 31.5	$7,115,071.46	$3,579.34	0.00050	95.48
31.5 - 32.5	$6,348,228.81	$3,961.54	0.00062	95.43
32.5 - 33.5	$5,726,258.82	$8,813.30	0.00154	95.37
33.5 - 34.5	$5,198,399.38	$10,460.38	0.00201	95.23
34.5 - 35.5	$4,831,444.81	$13,131.33	0.00272	95.04
35.5 - 36.5	$4,436,117.47	$11,580.35	0.00261	94.78

Vectren North
Gas Division
685.00 Industrial M&R Station Equipment
Observed Life Table
Retirement Expr. 2001 TO 2019
Placement Years 1931 TO 2019

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	$3,852,760.57	$7,904.18	0.00205	94.53
37.5 - 38.5	$3,266,771.26	$10,053.90	0.00308	94.34
38.5 - 39.5	$2,570,367.42	$8,966.98	0.00349	94.05
39.5 - 40.5	$2,160,499.49	$14,758.61	0.00683	93.72
40.5 - 41.5	$2,074,918.63	$5,272.90	0.00254	93.08
41.5 - 42.5	$1,982,815.81	$6,434.72	0.00325	92.84
42.5 - 43.5	$1,943,993.69	$3,731.15	0.00192	92.54
43.5 - 44.5	$1,904,225.12	$4,998.39	0.00262	92.36
44.5 - 45.5	$1,887,619.57	$5,959.93	0.00316	92.12
45.5 - 46.5	$1,874,626.57	$4,097.28	0.00219	91.83
46.5 - 47.5	$1,834,106.22	$8,959.38	0.00488	91.63
47.5 - 48.5	$1,665,188.34	$6,006.40	0.00361	91.18
48.5 - 49.5	$1,467,428.37	$3,089.49	0.00211	90.85
49.5 - 50.5	$1,236,495.54	$1,822.06	0.00147	90.66
50.5 - 51.5	$1,064,080.23	$6,038.52	0.00567	90.53
51.5 - 52.5	$844,380.84	$4,331.19	0.00513	90.01
52.5 - 53.5	$678,393.49	$4,907.49	0.00723	89.55
53.5 - 54.5	$486,029.72	$662.69	0.00136	88.90
54.5 - 55.5	$348,171.28	$3,440.09	0.00988	88.78
55.5 - 56.5	$271,920.20	$444.72	0.00164	87.90
56.5 - 57.5	$208,626.94	$856.92	0.00411	87.76
57.5 - 58.5	$148,028.18	$0.00	0.00000	87.40
58.5 - 59.5	$119,197.60	$838.59	0.00704	87.40
59.5 - 60.5	$86,898.72	$0.00	0.00000	86.79
60.5 - 61.5	$75,029.66	$510.83	0.00681	86.79
61.5 - 62.5	$72,255.35	$519.74	0.00719	86.19
62.5 - 63.5	$63,699.46	$561.70	0.00882	85.57
63.5 - 64.5	$52,340.57	$0.00	0.00000	84.82
64.5 - 65.5	$36,935.23	$14.55	0.00039	84.82
65.5 - 66.5	$26,624.66	$217.59	0.00817	84.79
66.5 - 67.5	$21,934.11	$0.00	0.00000	84.09
67.5 - 68.5	$17,205.69	$0.00	0.00000	84.09
68.5 - 69.5	$10,830.33	$0.00	0.00000	84.09
69.5 - 70.5	$4,074.66	$0.00	0.00000	84.09
70.5 - 71.5	$2,765.67	$0.00	0.00000	84.09
71.5 - 72.5	$2,616.92	$0.00	0.00000	84.09
72.5 - 73.5	$2,616.92	$2.62	0.00100	84.09

Vectren North
Gas Division

685.00 Industrial M&R Station Equipment

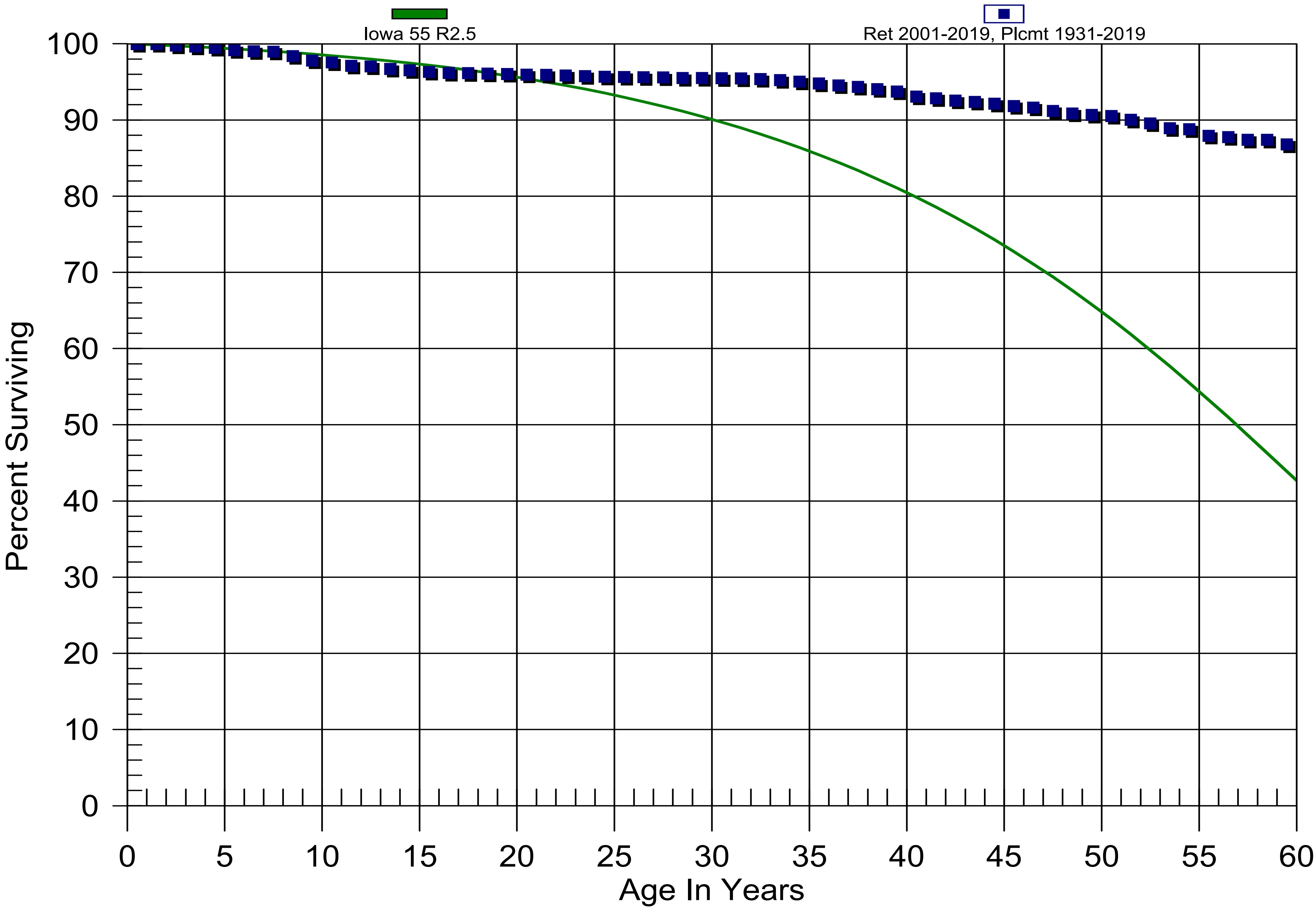
Observed Life Table

Retirement Expr. 2001 TO 2019
Placement Years 1931 TO 2019

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	$2,614.30	$7.53	0.00288	84.01
74.5 - 75.5	$1,817.73	$0.00	0.00000	83.77
75.5 - 76.5	$1,729.73	$0.00	0.00000	83.77
76.5 - 77.5	$1,729.73	$0.00	0.00000	83.77
77.5 - 78.5	$1,729.73	$0.00	0.00000	83.77
78.5 - 79.5	$1,729.73	$0.00	0.00000	83.77
79.5 - 80.5	$128.00	$0.00	0.00000	83.77
80.5 - 81.5	$128.00	$42.67	0.33336	83.77
81.5 - 82.5	$85.33	$0.00	0.00000	55.84
82.5 - 83.5	$85.33	$42.66	0.49994	55.84
83.5 - 84.5	$42.67	$0.00	0.00000	27.92
84.5 - 85.5	$42.67	$0.00	0.00000	27.92
85.5 - 86.5	$42.67	$0.00	0.00000	27.92
86.5 - 87.5	$42.67	$0.00	0.00000	27.92
87.5 - 88.5	$42.67	$0.00	0.00000	27.92

Vectren North

Gas Division
685.00 Industrial M&R Station Equipment
Original And Smooth Survivor Curves



Vectren North
Gas Division
690.00 Structures and Improvements

Observed Life Table
Retirement Expr. 2001 TO 2019
Placement Years 1915 TO 2019

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	$27,002,973.09	$0.00	0.00000	100.00
0.5 - 1.5	$21,468,019.44	$0.00	0.00000	100.00
1.5 - 2.5	$21,287,618.20	$4,317.55	0.00020	100.00
2.5 - 3.5	$20,254,472.10	$6,783.47	0.00033	99.98
3.5 - 4.5	$21,800,606.07	$54,619.99	0.00251	99.95
4.5 - 5.5	$19,091,595.56	$11,765.43	0.00062	99.70
5.5 - 6.5	$17,876,524.54	$25,902.08	0.00145	99.63
6.5 - 7.5	$14,400,491.65	$25,933.70	0.00180	99.49
7.5 - 8.5	$14,360,933.91	$170,778.39	0.01189	99.31
8.5 - 9.5	$14,274,103.42	$48,132.67	0.00337	98.13
9.5 - 10.5	$14,513,934.75	$163,376.05	0.01126	97.80
10.5 - 11.5	$14,136,963.34	$5,995.00	0.00042	96.70
11.5 - 12.5	$14,170,200.82	$98,075.98	0.00692	96.66
12.5 - 13.5	$14,003,189.04	$62,059.32	0.00443	95.99
13.5 - 14.5	$12,073,634.91	$66,741.06	0.00553	95.56
14.5 - 15.5	$12,920,145.29	$47,032.36	0.00364	95.03
15.5 - 16.5	$13,190,169.84	$35,433.26	0.00269	94.69
16.5 - 17.5	$13,142,797.91	$129,991.94	0.00989	94.43
17.5 - 18.5	$10,213,356.96	$155,714.14	0.01525	93.50
18.5 - 19.5	$11,566,116.05	$76,738.51	0.00663	92.07
19.5 - 20.5	$10,967,414.17	$457,797.74	0.04174	91.46
20.5 - 21.5	$11,627,475.09	$154,415.03	0.01328	87.65
21.5 - 22.5	$11,361,768.04	$37,120.32	0.00327	86.48
22.5 - 23.5	$8,127,324.13	$29,171.91	0.00359	86.20
23.5 - 24.5	$8,458,948.89	$73,459.36	0.00868	85.89
24.5 - 25.5	$7,941,354.05	$10,865.42	0.00137	85.14
25.5 - 26.5	$7,951,670.68	$32,379.22	0.00407	85.03
26.5 - 27.5	$7,710,497.88	$25,529.01	0.00331	84.68
27.5 - 28.5	$7,821,882.09	$9,992.70	0.00128	84.40
28.5 - 29.5	$7,462,423.54	$6,227.42	0.00083	84.29
29.5 - 30.5	$7,562,402.11	$111,897.08	0.01480	84.22
30.5 - 31.5	$7,964,518.67	$15,898.26	0.00200	82.98
31.5 - 32.5	$7,986,427.03	$601,740.56	0.07535	82.81
32.5 - 33.5	$7,756,713.31	$31,570.50	0.00407	76.57
33.5 - 34.5	$6,855,136.10	$49,430.22	0.00721	76.26
34.5 - 35.5	$8,104,655.01	$15,641.42	0.00193	75.71
35.5 - 36.5	$8,059,112.07	$24,600.01	0.00305	75.56

Vectren North
Gas Division

690.00 Structures and Improvements

Observed Life Table

Retirement Expr. 2001 TO 2019
Placement Years 1915 TO 2019

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	$7,834,329.46	$12,005.77	0.00153	75.33
37.5 - 38.5	$6,924,897.69	$13,703.72	0.00198	75.22
38.5 - 39.5	$6,865,160.81	$460,608.44	0.06709	75.07
39.5 - 40.5	$5,103,163.18	$4,922.40	0.00096	70.03
40.5 - 41.5	$5,009,099.39	$143,925.87	0.02873	69.96
41.5 - 42.5	$4,817,889.14	$12,196.43	0.00253	67.95
42.5 - 43.5	$4,030,524.45	$0.00	0.00000	67.78
43.5 - 44.5	$3,757,184.18	$2,502.35	0.00067	67.78
44.5 - 45.5	$3,335,578.05	$13,919.12	0.00417	67.74
45.5 - 46.5	$3,308,067.22	$6,696.06	0.00202	67.45
46.5 - 47.5	$3,193,609.36	$10,306.89	0.00323	67.32
47.5 - 48.5	$3,035,313.83	$52,376.51	0.01726	67.10
48.5 - 49.5	$2,918,949.68	$10,858.07	0.00372	65.94
49.5 - 50.5	$2,453,043.01	$7,856.22	0.00320	65.70
50.5 - 51.5	$2,389,478.44	$197,892.01	0.08282	65.49
51.5 - 52.5	$1,949,296.33	$0.00	0.00000	60.06
52.5 - 53.5	$1,925,939.31	$195.00	0.00010	60.06
53.5 - 54.5	$483,472.23	$864.00	0.00179	60.06
54.5 - 55.5	$458,756.76	$0.00	0.00000	59.95
55.5 - 56.5	$193,782.09	$0.00	0.00000	59.95
56.5 - 57.5	$190,634.72	$498.00	0.00261	59.95
57.5 - 58.5	$190,166.87	$1,730.58	0.00910	59.79
58.5 - 59.5	$188,764.62	$0.00	0.00000	59.25
59.5 - 60.5	$188,678.34	$185.56	0.00098	59.25
60.5 - 61.5	$216,497.90	$0.00	0.00000	59.19
61.5 - 62.5	$216,728.07	$0.00	0.00000	59.19
62.5 - 63.5	$210,021.73	$984.84	0.00469	59.19
63.5 - 64.5	$199,467.11	$1,233.00	0.00618	58.91
64.5 - 65.5	$198,234.11	$266.00	0.00134	58.55
65.5 - 66.5	$186,141.11	$0.00	0.00000	58.47
66.5 - 67.5	$164,384.27	$14,341.04	0.08724	58.47
67.5 - 68.5	$150,004.23	$822.00	0.00548	53.37
68.5 - 69.5	$82,178.97	$0.00	0.00000	53.08
69.5 - 70.5	$82,932.48	$0.00	0.00000	53.08
70.5 - 71.5	$39,524.43	$0.00	0.00000	53.08
71.5 - 72.5	$34,945.43	$0.00	0.00000	53.08
72.5 - 73.5	$32,740.68	$2,401.90	0.07336	53.08

Vectren North
Gas Division

690.00 Structures and Improvements

Observed Life Table

Retirement Expr. 2001 TO 2019
Placement Years 1915 TO 2019

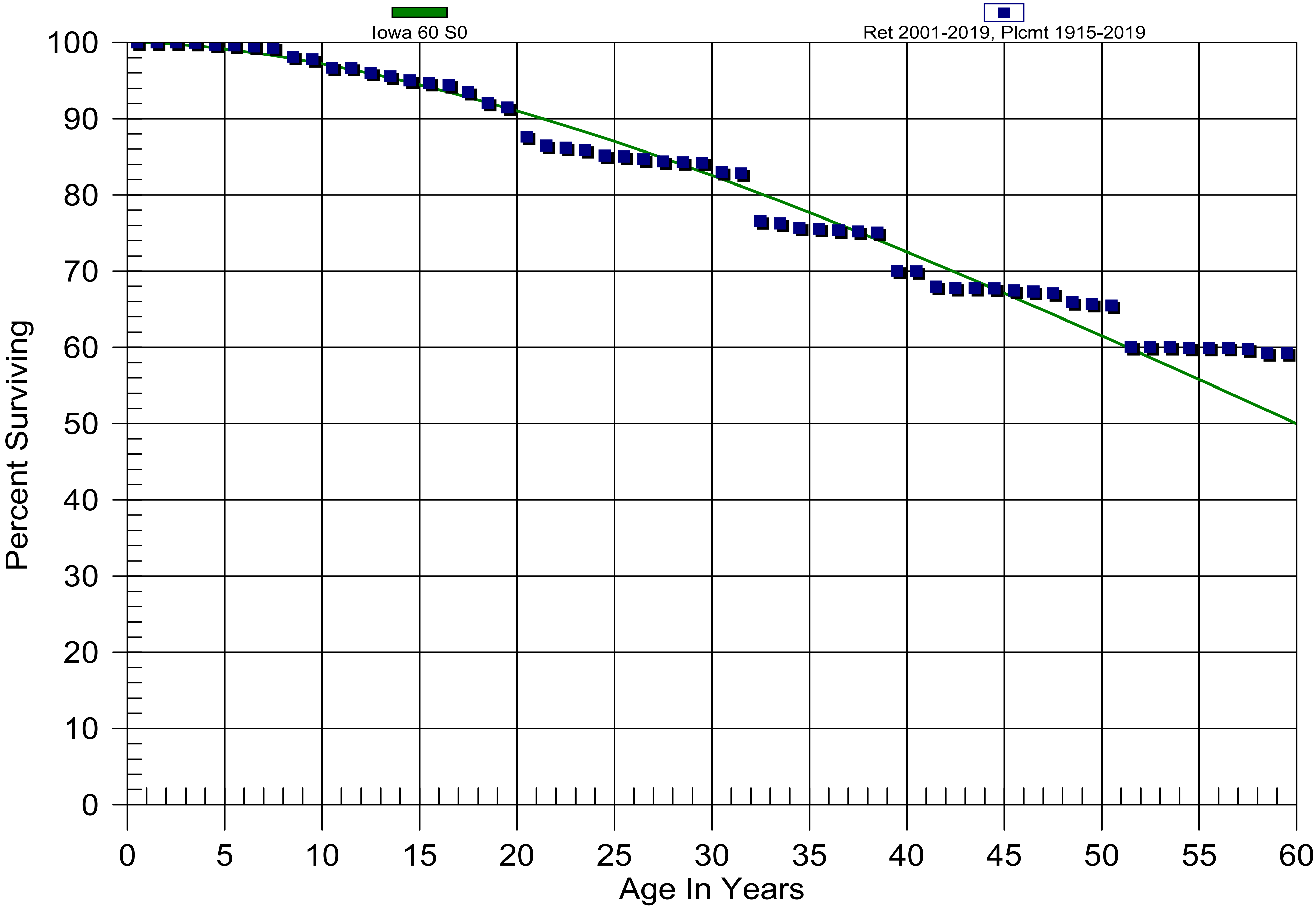
Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
73.5 - 74.5	$30,942.86	$0.00	0.00000	49.18
74.5 - 75.5	$36,356.17	$0.00	0.00000	49.18
75.5 - 76.5	$37,219.17	$0.00	0.00000	49.18
76.5 - 77.5	$39,948.02	$0.00	0.00000	49.18
77.5 - 78.5	$53,654.08	$0.00	0.00000	49.18
78.5 - 79.5	$53,654.08	$0.00	0.00000	49.18
79.5 - 80.5	$27,968.78	$0.00	0.00000	49.18
80.5 - 81.5	$27,738.61	$0.00	0.00000	49.18
81.5 - 82.5	$27,738.61	$0.00	0.00000	49.18
82.5 - 83.5	$27,738.61	$0.00	0.00000	49.18
83.5 - 84.5	$29,809.61	$0.00	0.00000	49.18
84.5 - 85.5	$29,809.61	$0.00	0.00000	49.18
85.5 - 86.5	$62,885.74	$0.00	0.00000	49.18
86.5 - 87.5	$62,885.74	$0.00	0.00000	49.18
87.5 - 88.5	$62,885.74	$102.55	0.00163	49.18
88.5 - 89.5	$61,166.23	$863.00	0.01411	49.10
89.5 - 90.5	$60,207.75	$2,759.00	0.04582	48.41
90.5 - 91.5	$57,448.75	$0.00	0.00000	46.19
91.5 - 92.5	$57,389.84	$0.00	0.00000	46.19
92.5 - 93.5	$56,785.76	$0.00	0.00000	46.19
93.5 - 94.5	$49,457.44	$0.00	0.00000	46.19
94.5 - 95.5	$49,457.44	$0.00	0.00000	46.19
95.5 - 96.5	$49,457.44	$0.00	0.00000	46.19
96.5 - 97.5	$35,423.05	$2,071.00	0.05846	46.19
97.5 - 98.5	$33,352.05	$0.00	0.00000	43.49
98.5 - 99.5	$33,076.13	$24,183.61	0.73115	43.49
99.5 - 100.5	$8,892.52	$0.00	0.00000	11.69
100.5 - 101.5	$8,892.52	$0.00	0.00000	11.69
101.5 - 102.5	$8,892.52	$0.00	0.00000	11.69
102.5 - 103.5	$8,892.52	$0.00	0.00000	11.69
103.5 - 104.5	$8,892.52	$141.69	0.01593	11.69

Vectren North

Gas Division

690.00 Structures and Improvements

Original And Smooth Survivor Curves



Vectren North
Gas Division
680.00 Services

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 51 **Survivor Curve:** R3

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1930	9.37	0.00	0.00	0.00	0.00
1940	3,996.34	51.00	78.36	1.62	126.79
1945	9.40	51.00	0.18	2.86	0.53
1950	6,921.22	51.00	135.71	4.15	562.77
1953	221.75	51.00	4.35	4.93	21.42
1954	264.88	51.00	5.19	5.19	26.96
1955	8,376.62	51.00	164.25	5.46	897.11
1956	455.11	51.00	8.92	5.74	51.27
1958	11,268.89	51.00	220.96	6.32	1,396.99
1959	96,404.29	51.00	1,890.28	6.63	12,528.06
1960	48,790.63	51.00	956.68	6.95	6,644.67
1961	189,119.72	51.00	3,708.24	7.28	26,986.12
1962	548,191.92	51.00	10,748.88	7.62	81,949.89
1963	795,892.45	51.00	15,605.76	7.99	124,636.08
1964	994,966.42	51.00	19,509.18	8.37	163,206.89
1965	1,082,232.94	51.00	21,220.29	8.76	185,932.47
1966	1,015,905.50	51.00	19,919.75	9.18	182,787.34
1967	1,476,309.46	51.00	28,947.29	9.61	278,142.27
1968	1,501,666.90	51.00	29,444.49	10.06	296,196.18
1969	1,194,751.91	51.00	23,426.54	10.53	246,659.48
1970	1,594,883.86	51.00	31,272.28	11.02	344,538.73
1971	1,544,384.37	51.00	30,282.09	11.52	348,983.12
1972	1,729,414.25	51.00	33,910.14	12.05	408,616.18
1973	1,436,863.77	51.00	28,173.84	12.59	354,816.95
1974	1,267,992.74	51.00	24,862.64	13.16	327,085.28
1975	1,115,159.46	51.00	21,865.91	13.74	300,331.02
1976	540,954.87	51.00	10,606.97	14.33	152,015.93

Vectren North
Gas Division
680.00 Services

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 51 **Survivor Curve:** R3

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1977	227,074.04	51.00	4,452.44	14.94	66,541.24
1978	244,750.53	51.00	4,799.04	15.57	74,741.17
1979	2,575,747.76	51.00	50,504.94	16.22	819,142.43
1980	4,348,385.99	51.00	85,262.60	16.88	1,439,140.34
1981	4,449,625.04	51.00	87,247.69	17.55	1,531,478.47
1982	4,463,418.86	51.00	87,518.15	18.24	1,596,248.52
1983	4,833,701.68	51.00	94,778.61	18.94	1,795,210.81
1984	4,889,155.25	51.00	95,865.94	19.66	1,884,343.85
1985	7,737,175.61	51.00	151,709.56	20.38	3,092,360.25
1986	9,885,441.98	51.00	193,832.50	21.12	4,094,297.86
1987	9,616,445.83	51.00	188,558.05	21.87	4,124,515.79
1988	12,879,135.44	51.00	252,532.46	22.64	5,716,437.86
1989	9,763,747.11	51.00	191,446.32	23.41	4,481,749.51
1990	10,483,052.80	51.00	205,550.37	24.19	4,973,131.72
1991	11,312,055.58	51.00	221,805.36	24.99	5,542,697.12
1992	12,874,852.16	51.00	252,448.47	25.79	6,511,677.94
1993	11,529,986.75	51.00	226,078.52	26.61	6,015,773.37
1994	15,985,354.74	51.00	313,438.81	27.43	8,598,946.54
1995	13,333,557.81	51.00	261,442.72	28.27	7,390,683.32
1996	12,734,150.30	51.00	249,689.61	29.11	7,269,191.92
1997	17,952,776.06	51.00	352,015.76	29.97	10,548,575.56
1998	16,045,211.95	51.00	314,612.49	30.83	9,699,026.24
1999	19,307,451.70	51.00	378,578.07	31.70	12,000,748.59
2000	16,538,900.60	51.00	324,292.67	32.58	10,565,163.78
2001	535,020.88	51.00	10,490.62	33.47	351,088.90
2002	41,146,461.95	51.00	806,794.62	34.36	27,723,676.79
2003	25,133,964.90	51.00	492,823.61	35.27	17,380,046.77

Vectren North
Gas Division
680.00 Services

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 51 **Survivor Curve:** R3

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2004	25,050,078.28	51.00	491,178.77	36.18	17,769,466.92
2005	23,216,431.41	51.00	455,224.85	37.10	16,886,661.41
2006	19,900,588.24	51.00	390,208.22	38.02	14,835,719.73
2007	16,094,438.37	51.00	315,577.71	38.95	12,291,840.38
2008	20,652,446.61	51.00	404,950.56	39.89	16,152,589.73
2009	21,152,897.71	51.00	414,763.34	40.83	16,935,241.93
2010	18,801,928.03	51.00	368,665.83	41.78	15,402,785.53
2011	21,056,749.91	51.00	412,878.09	42.73	17,643,766.17
2012	24,475,427.10	51.00	479,911.08	43.69	20,968,338.61
2013	28,477,322.59	51.00	558,379.74	44.66	24,934,492.38
2014	31,069,807.37	51.00	609,212.85	45.62	27,793,572.00
2015	39,763,926.45	51.00	779,686.04	46.59	36,327,827.67
2016	31,255,741.23	51.00	612,858.62	47.57	29,151,926.14
2017	53,635,345.55	51.00	1,051,675.07	48.54	51,053,063.59
2018	51,877,354.73	51.00	1,017,204.61	49.52	50,376,822.54
2019	50,006,357.35	51.00	980,518.33	50.51	49,523,637.74
Total	795,518,853.27	50.27	15,598,432.89	37.64	587,179,529.60

Composite Average Remaining Life ... 37.64 Years

Vectren North
Gas Division

682.00 Meter Installations

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2020

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 45 **Survivor Curve:** R3

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1963	77.77	45.00	1.73	4.94	8.53
1964	87.21	45.00	1.94	5.21	10.11
1965	96.89	45.00	2.15	5.51	11.86
1966	175.90	45.00	3.91	5.81	22.72
1967	92,177.82	45.00	2,048.39	6.13	12,556.50
1968	252,853.56	45.00	5,618.96	6.46	36,307.77
1969	251,169.66	45.00	5,581.54	6.81	38,021.54
1970	280,248.33	45.00	6,227.74	7.18	44,716.85
1971	307,920.55	45.00	6,842.67	7.57	51,780.72
1972	350,323.61	45.00	7,784.96	7.97	62,076.47
1973	358,274.29	45.00	7,961.65	8.40	66,893.90
1974	362,414.90	45.00	8,053.66	8.85	71,275.99
1975	222,566.09	45.00	4,945.91	9.32	46,091.77
1976	304,281.12	45.00	6,761.80	9.81	66,327.69
1977	238,243.66	45.00	5,294.30	10.32	54,650.59
1978	315,932.24	45.00	7,020.71	10.86	76,210.60
1979	614,411.03	45.00	13,653.57	11.41	155,760.60
1980	794,820.53	45.00	17,662.67	11.98	211,614.63
1981	1,183,069.70	45.00	26,290.42	12.57	330,552.86
1982	1,049,835.32	45.00	23,329.66	13.19	307,658.68
1983	1,366,587.75	45.00	30,368.60	13.82	419,615.54
1984	1,024,470.26	45.00	22,765.99	14.46	329,304.17
1985	1,140,523.11	45.00	25,344.94	15.13	383,437.19
1986	1,626,262.33	45.00	36,139.14	15.81	571,406.39
1987	1,650,112.53	45.00	36,669.15	16.51	605,313.24
1988	2,150,000.43	45.00	47,777.76	17.22	822,647.84
1989	1,409,785.53	45.00	31,328.55	17.94	562,131.50

Vectren North
Gas Division
682.00 Meter Installations

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 45 **Survivor Curve: R3**

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1990	1,449,678.35	45.00	32,215.06	18.68	601,828.42
1991	1,570,134.48	45.00	34,891.86	19.44	678,150.43
1992	1,872,488.11	45.00	41,610.82	20.20	840,569.73
1993	1,608,922.86	45.00	35,753.82	20.98	750,043.70
1994	2,553,615.76	45.00	56,746.98	21.77	1,235,223.91
1995	1,815,485.71	45.00	40,344.10	22.57	910,565.49
1996	3,337,515.01	45.00	74,166.96	23.38	1,734,235.19
1997	4,664,943.61	45.00	103,665.35	24.21	2,509,407.41
1998	1,579,990.72	45.00	35,110.88	25.04	879,232.31
1999	3,535,451.90	45.00	78,565.55	25.89	2,033,822.02
2000	5,030,721.65	45.00	111,793.75	26.74	2,989,866.23
2001	65,142.29	45.00	1,447.61	27.61	39,969.35
2002	20,908.10	45.00	464.62	28.49	13,235.53
2003	70,940.45	45.00	1,576.45	29.37	46,303.24
2004	61,631.92	45.00	1,369.60	30.27	41,454.12
2005	881,188.32	45.00	19,581.95	31.17	610,384.80
2006	1,133,006.26	45.00	25,177.90	32.08	807,769.66
2007	1,098,022.89	45.00	24,400.49	33.00	805,267.23
2008	881,729.67	45.00	19,593.98	33.93	664,808.15
2009	753,103.13	45.00	16,735.62	34.86	583,479.78
2010	691,694.36	45.00	15,370.98	35.81	550,368.78
2011	1,687,068.86	45.00	37,490.40	36.75	1,377,887.59
2012	918,915.43	45.00	20,420.33	37.71	769,973.96
2013	924,809.21	45.00	20,551.30	38.67	794,625.30
2014	856,121.75	45.00	19,024.92	39.63	753,940.49
2015	13,377,604.51	45.00	297,279.93	40.60	12,068,752.85
2016	7,807,164.09	45.00	173,492.43	41.57	7,211,999.73

Vectren North
Gas Division
682.00 Meter Installations

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 45 **Survivor Curve:** R3

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2017	2,699,448.45	45.00	59,987.71	42.55	2,552,208.69
2018	2,043,751.14	45.00	45,416.67	43.53	1,976,776.28
2019	2,056,146.94	45.00	45,692.13	44.51	2,033,655.70
Total	84,394,068.05	45.00	1,875,422.65	28.90	54,192,212.33

Composite Average Remaining Life ... 28.90 Years

Vectren North
Gas Division

685.00 Industrial M&R Station Equipment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2020

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 **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)
1931	42.67	55.00	0.78	3.60	2.79
1940	1,601.73	55.00	29.12	5.61	163.33
1944	88.00	55.00	1.60	6.52	10.43
1945	789.04	55.00	14.35	6.76	96.94
1948	148.75	55.00	2.70	7.50	20.28
1949	1,308.99	55.00	23.80	7.76	184.60
1950	6,883.67	55.00	125.16	8.02	1,003.88
1951	6,375.36	55.00	115.92	8.30	961.81
1952	4,728.42	55.00	85.97	8.58	737.33
1953	4,472.96	55.00	81.33	8.87	721.03
1954	10,296.02	55.00	187.20	9.17	1,715.97
1955	15,405.34	55.00	280.10	9.48	2,655.01
1956	10,804.69	55.00	196.45	9.80	1,925.95
1957	8,036.15	55.00	146.11	10.14	1,481.95
1958	2,263.48	55.00	41.15	10.49	431.86
1959	13,718.77	55.00	249.43	10.86	2,708.66
1960	31,460.29	55.00	572.00	11.24	6,429.32
1961	29,065.21	55.00	528.46	11.64	6,149.07
1962	60,065.96	55.00	1,092.11	12.05	13,155.83
1963	62,958.54	55.00	1,144.70	12.47	14,278.48
1964	73,609.28	55.00	1,338.35	12.92	17,287.17
1965	138,241.42	55.00	2,513.48	13.38	33,620.10
1966	187,456.28	55.00	3,408.29	13.85	47,207.88
1967	161,826.16	55.00	2,942.29	14.34	42,196.94
1968	215,063.05	55.00	3,910.23	14.85	58,051.05
1969	180,989.95	55.00	3,290.72	15.37	50,572.69
1970	235,020.50	55.00	4,273.09	15.91	67,966.18

Vectren North
Gas Division
685.00 Industrial M&R Station Equipment

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *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)
1971	203,225.59	55.00	3,695.00	16.46	60,811.02
1972	165,003.90	55.00	3,000.06	17.02	51,073.04
1973	50,581.18	55.00	919.66	17.60	16,187.68
1974	24,488.20	55.00	445.24	18.20	8,101.95
1975	29,912.61	55.00	543.86	18.80	10,227.34
1976	45,384.09	55.00	825.16	19.43	16,029.43
1977	35,412.17	55.00	643.86	20.06	12,915.06
1978	102,737.01	55.00	1,867.94	20.70	38,673.93
1979	109,519.64	55.00	1,991.26	21.36	42,531.29
1980	435,074.86	55.00	7,910.44	22.03	174,250.50
1981	763,489.32	55.00	13,881.60	22.71	315,219.51
1982	651,409.97	55.00	11,843.79	23.40	277,121.80
1983	653,532.42	55.00	11,882.38	24.10	286,349.30
1984	531,092.59	55.00	9,656.21	24.81	239,543.40
1985	563,410.56	55.00	10,243.81	25.53	261,508.09
1986	684,512.70	55.00	12,445.66	26.26	326,811.25
1987	851,171.26	55.00	15,475.81	27.00	417,830.24
1988	955,925.38	55.00	17,380.43	27.75	482,269.06
1989	1,632,436.99	55.00	29,680.61	28.51	846,063.00
1990	903,505.65	55.00	16,427.34	29.27	480,838.10
1991	1,484,518.34	55.00	26,991.19	30.05	810,985.25
1992	1,546,216.89	55.00	28,112.98	30.83	866,731.26
1993	2,137,353.01	55.00	38,860.88	31.62	1,228,874.93
1994	2,231,753.47	55.00	40,577.25	32.42	1,315,616.52
1995	1,704,865.79	55.00	30,997.50	33.23	1,030,012.49
1996	2,093,354.26	55.00	38,060.91	34.05	1,295,790.80
1997	2,232,699.92	55.00	40,594.46	34.87	1,415,485.62

Vectren North
Gas Division

685.00 Industrial M&R Station Equipment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2020

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 **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)
1998	2,836,948.49	55.00	51,580.78	35.70	1,841,432.81
1999	2,334,410.38	55.00	42,443.74	36.54	1,550,816.48
2000	2,252,551.44	55.00	40,955.40	37.38	1,531,048.76
2001	521,007.79	55.00	9,472.85	38.23	362,187.24
2002	2,358,828.27	55.00	42,887.70	39.09	1,676,625.49
2003	1,556,546.11	55.00	28,300.78	39.96	1,130,868.50
2004	1,301,530.97	55.00	23,664.15	40.83	966,222.91
2005	323,021.71	55.00	5,873.11	41.71	244,958.20
2006	445,063.75	55.00	8,092.05	42.59	344,648.35
2007	168,065.70	55.00	3,055.73	43.48	132,865.50
2008	897,335.84	55.00	16,315.16	44.38	723,999.76
2009	409,013.43	55.00	7,436.59	45.28	336,701.17
2010	26,486.48	55.00	481.57	46.18	22,239.78
2011	84,821.45	55.00	1,542.21	47.09	72,625.46
2012	76,476.75	55.00	1,390.48	48.01	66,751.88
2013	110,118.79	55.00	2,002.16	48.93	97,957.46
2014	109,056.07	55.00	1,982.83	49.85	98,844.25
2015	4,790.77	55.00	87.10	50.78	4,423.01
2016	26,248.52	55.00	477.24	51.71	24,678.35
2019	9,888.57	55.00	179.79	54.53	9,803.59
Total	40,137,519.73	55.00	729,771.59	32.80	23,939,287.38

Composite Average Remaining Life ... 32.80 Years

Vectren North
Gas Division
690.00 Structures and Improvements

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 60 *Survivor Curve:* S0

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1915	8,750.83	60.00	145.85	5.75	838.18
1921	275.92	60.00	4.60	8.03	36.92
1923	14,034.39	60.00	233.91	8.80	2,057.74
1926	7,328.32	60.00	122.14	9.96	1,216.46
1927	604.08	60.00	10.07	10.35	104.19
1928	58.91	60.00	0.98	10.74	10.55
1930	95.48	60.00	1.59	11.53	18.34
1931	1,616.96	60.00	26.95	11.92	321.25
1939	230.17	60.00	3.84	15.13	58.04
1940	25,961.22	60.00	432.69	15.54	6,723.70
1942	328.33	60.00	5.47	16.36	89.52
1943	30.15	60.00	0.50	16.77	8.43
1945	1,915.01	60.00	31.92	17.60	561.82
1947	2,263.66	60.00	37.73	18.44	695.71
1948	4,579.00	60.00	76.32	18.86	1,439.47
1949	43,503.53	60.00	725.06	19.29	13,982.92
1950	966.00	60.00	16.10	19.71	317.34
1951	67,003.26	60.00	1,116.72	20.14	22,488.50
1952	39.00	60.00	0.65	20.57	13.37
1953	21,756.84	60.00	362.61	21.00	7,614.46
1954	11,827.00	60.00	197.12	21.43	4,224.64
1956	9,569.78	60.00	159.50	22.31	3,557.68
1957	6,706.34	60.00	111.77	22.75	2,542.35
1959	358.00	60.00	5.97	23.63	141.01
1960	86.28	60.00	1.44	24.08	34.63
1963	3,147.37	60.00	52.46	25.44	1,334.31
1964	266,889.68	60.00	4,448.15	25.89	115,180.94

Vectren North
Gas Division

690.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2020

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 60 *Survivor Curve:* S0

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1965	24,673.47	60.00	411.22	26.35	10,837.55
1966	1,458,876.78	60.00	24,314.55	26.82	652,055.52
1967	27,936.02	60.00	465.60	27.28	12,703.15
1968	286,059.63	60.00	4,767.65	27.75	132,312.54
1969	57,738.35	60.00	962.30	28.22	27,160.22
1970	535,448.90	60.00	8,924.12	28.70	256,112.13
1971	65,757.22	60.00	1,095.95	29.18	31,976.89
1972	169,745.48	60.00	2,829.08	29.66	83,907.79
1973	119,588.80	60.00	1,993.14	30.14	60,081.23
1974	13,591.71	60.00	226.53	30.63	6,939.04
1975	428,673.56	60.00	7,144.54	31.12	222,369.26
1976	280,658.17	60.00	4,677.62	31.62	147,904.11
1977	775,168.26	60.00	12,919.44	32.12	414,964.16
1978	47,642.38	60.00	794.04	32.62	25,903.92
1979	90,091.67	60.00	1,501.52	33.13	49,746.38
1980	1,301,584.19	60.00	21,693.01	33.64	729,793.41
1981	46,033.16	60.00	767.22	34.16	26,206.67
1982	901,613.37	60.00	15,026.85	34.68	521,095.79
1983	470,948.88	60.00	7,849.13	35.20	276,313.57
1984	59,158.99	60.00	985.98	35.73	35,232.13
1985	179,857.51	60.00	2,997.62	36.27	108,716.82
1986	898,897.73	60.00	14,981.59	36.81	551,425.11
1987	138,307.01	60.00	2,305.11	37.35	86,100.59
1988	31,931.63	60.00	532.19	37.90	20,170.72
1989	37,485.34	60.00	624.75	38.46	24,026.58
1990	112,677.95	60.00	1,877.96	39.02	73,277.45
1991	522,283.16	60.00	8,704.70	39.59	344,596.73

Vectren North
Gas Division

690.00 Structures and Improvements

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2020

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 60 **Survivor Curve: S0**

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1992	78,291.74	60.00	1,304.86	40.16	52,403.98
1993	228,439.37	60.00	3,807.31	40.74	155,115.43
1994	409,098.77	60.00	6,818.29	41.33	281,780.34
1995	731,099.06	60.00	12,184.95	41.92	510,817.22
1996	436,088.91	60.00	7,268.13	42.52	309,068.54
1997	3,246,642.30	60.00	54,110.56	43.13	2,333,942.82
1998	211,831.14	60.00	3,530.51	43.75	154,455.48
1999	681,405.73	60.00	11,356.73	44.37	503,947.71
2000	590,027.21	60.00	9,833.76	45.01	442,579.86
2002	3,289,952.29	60.00	54,832.39	46.30	2,538,874.26
2003	77,784.95	60.00	1,296.41	46.96	60,882.44
2006	2,011,582.50	60.00	33,526.29	49.01	1,643,177.03
2007	125,962.20	60.00	2,099.36	49.72	104,379.39
2008	59,172.61	60.00	986.21	50.44	49,744.00
2009	337,476.90	60.00	5,624.60	51.17	287,826.36
2010	244,711.65	60.00	4,078.52	51.92	211,750.40
2011	44,471.61	60.00	741.19	52.68	39,047.39
2012	372,979.81	60.00	6,216.31	53.46	332,308.85
2013	4,208,506.95	60.00	70,141.60	54.26	3,805,581.96
2014	2,184,056.77	60.00	36,400.85	55.07	2,004,674.39
2015	3,108,907.97	60.00	51,814.99	55.91	2,896,899.26
2016	1,771,848.98	60.00	29,530.74	56.76	1,676,309.79
2017	1,357,696.48	60.00	22,628.21	57.65	1,304,522.02
2018	1,010,880.31	60.00	16,847.96	58.56	986,575.15
2019	6,265,513.36	60.00	104,424.94	59.51	6,214,086.81

Vectren North
Gas Division

690.00 Structures and Improvements

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2020
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: *60* *Survivor Curve:* *S0*

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
Total	42,666,784.40	60.00	711,111.18	47.84	34,018,292.82

Composite Average Remaining Life ... 47.84 Years

CERTIFICATE OF SERVICE

This is to certify that a copy of the foregoing ***OUCC'S TESTIMONY OF DAVID J. GARRETT*** has been served upon the following counsel of record in the captioned proceeding by electronic service on March 31, 2021.

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