STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC PURSUANT TO IND. CODE §§ 8-1-42.7,8-1-2-61 AND IND. CODE § 8-1-2.5-6 FOR (1) AUTHORITY TO MODIFY ITS RATES AND CHARGES FOR ELECTRIC UTILITY SERVICE THROUGH A PHASE IN OF RATES; (2) APPROVAL OF NEW SCHEDULES OF RATES AND CHARGES, GENERAL RULES AND REGULATIONS, AND RIDERS; (3) APPROVAL OF REVISED COMMON AND ELECTRIC DEPRECIATION RATES APPLICABLE TO ITS ELECTRIC PLANT IN SERVICE; (4) APPROVAL OF NECESSARY AND APPROPRIATE ACCOUNTING RELIEF; AND (5) APPROVAL OF A NEW SERVICE STRUCTURE FOR INDUSTRIAL RATES.	)	**CAUSE NO. 45159**

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

TESTIMONY OF

DAVID J. GARRETT - PUBLIC'S EXHIBIT NO. 5

FEBRUARY 13, 2019

Respectfully submitted,

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STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC PURSUANT TO IND. CODE §§ 8-1-2-42.7, 8-1-2-61 AND IND. CODE § 8-1-2.5-6 FOR (1) AUTHORITY TO MODIFY ITS RATES AND CHARGES FOR ELECTRIC UTILITY SERVICE THROUGH A PHASE IN OF RATES; (2) APPROVAL OF NEW SCHEDULES OF RATES AND CHARGES, GENERAL RULES AND REGULATIONS, AND RIDERS; (3) APPROVAL OF REVISED COMMON AND ELECTRIC DEPRECIATION RATES APPLICABLE TO ITS ELECTRIC PLANT IN SERVICE; (4) APPROVAL OF NECESSARY AND APPROPRIATE ACCOUNTING RELIEF; AND (5) APPROVAL OF A NEW SERVICE STRUCTURE FOR INDUSTRIAL RATES.	**CAUSE NO. 45159**

OUCC PREFILED TESTIMONY

OF

DAVID J. GARRETT – PUBLIC'S EXHIBIT NO. 1

ON BEHALF OF THE

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

FEBRUARY 13, 2019

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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]

[1] Attachment DJG-1.

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

A. I am testifying on behalf of the Indiana Office of Utility Consumer Counselor ("OUCC") regarding the depreciation rates proposed by the petitioner in this cause, Northern Indiana Public Service Company LLC ("NIPSCO" or "Company"). Specifically, I respond to the direct testimony of Company witness John J. Spanos, who sponsors NIPSCO's depreciation studies. I also respond to the direct testimony of Company witness Victor F. Ranalletta, who sponsors NIPSCO's demolition studies.

Q. Have you previously submitted testimony before the Indiana Utility Regulatory Commission ("IURC" or "Commission")?

A. Yes. I submitted testimony in June 2018 in Cause No. 45039 regarding the proposed depreciation rates of Citizens Energy Group.

Q. As part of your analysis in this case, did you observe portions of NIPSCO's generating units and speak with NIPSCO personnel about the Company's depreciable assets?

A. Yes. In January, I conducted a site tour of NIPSCO's Schahfer generating station with other OUCC representatives. We spoke with several employees of the Company about its generating assets at the facility and about the Company's operations in general. We conducted a tour of the facility and physically observed the plant in operation. We also spoke with Company personnel about the Transmission, Distribution, and Storage Improvement Charge ("TDSIC"), including factors that could affect the retirement rates of the Company's transmission and distribution assets.

II. EXECUTIVE SUMMARY

Q. Summarize the key points of your testimony.

A. In this case, Mr. Spanos conducted a depreciation study on NIPSCO's assets as of December 31, 2017 ("2017 Depreciation Study"). In addition, Mr. Spanos applied the depreciation parameters he estimated in the 2017 Depreciation Study to projected plant and reserve balances as of December 31, 2019 ("2019 Depreciation Study"). I conducted my analysis in this case in a substantially similar fashion. First, I obtained the same historical plant and net salvage data used in the 2017 Depreciation Study. Using statistical analysis, I developed my own options as to the most reasonable service life and net salvage parameters for NIPSCO's assets. While I do not disagree with Mr. Spanos's recommended depreciation parameters for most of the Company's accounts, I propose reasonable adjustments to the proposed service lives for nine of the Company's transmission and distribution accounts. After developing my depreciation parameters as part of my analysis of the 2017 Depreciation Study, I applied them to the updated plant and reserve balances the Company provided in forming my adjustments to the 2019 Depreciation Study. In addition, I also performed my analysis using two different procedures to analyze depreciation data: the average life grouping procedure ("ALG") and the equal life grouping procedure ("ELG"). The differences between these procedures are discussed later in the testimony. The following three tables summarize the OUCC's proposed adjustments to the 2019 Depreciation Study under three scenarios.[2]

[2] *See* Attachment DJG-2.

Figure 1:
Summary of Depreciation Adjustment Scenarios

Scenario 1: 2019 Depreciation Study - ALG Adjusted
(Uses ALG Method and proposes reasonable adjustments to service lives and salvage)

Plant Function	NIPSCO Proposal	OUCC Proposal	OUCC Adjustment
Steam Production Plant	$ 175,789,673	$ 167,065,973	$ (8,723,700)
Hydo Plant	2,583,002	2,572,967	(10,035)
Gas Turbine Plant	17,197,425	16,642,650	(554,775)
Transmission Plant	46,356,440	31,627,100	(14,729,340)
Distribution Plant	68,237,053	49,322,513	(18,914,540)
General Plant	(1,936,181)	(1,912,660)	23,521
Total	$ 308,227,412	$ 265,318,543	**$ (42,908,869)**

Scenario 2: 2019 Depreciation Study - ALG Unadjusted
(Uses ALG Method and NIPSCO's mass property service lives and net salvage estimates)

Plant Function	NIPSCO Proposal	OUCC Proposal	OUCC Adjustment
Steam Production Plant	$ 175,789,673	$ 167,065,973	$ (8,723,700)
Hydo Plant	2,583,002	2,572,967	(10,035)
Gas Turbine Plant	17,197,425	16,642,650	(554,775)
Transmission Plant	46,356,440	34,573,801	(11,782,639)
Distribution Plant	68,237,053	52,302,451	(15,934,602)
General Plant	(1,936,181)	(1,912,660)	23,521
Total	$ 308,227,412	$ 271,245,182	**$ (36,982,230)**

Scenario 3: 2019 Depreciation Study - ELG Adjusted
(Uses ELG Method and proposes reasonable adjustments to service lives and salvage)

Plant Function	NIPSCO Proposal	OUCC Proposal	OUCC Adjustment
Steam Production Plant	$ 175,789,673	$ 167,065,973	$ (8,723,700)
Hydo Plant	2,583,002	2,572,967	(10,035)
Gas Turbine Plant	17,197,425	16,642,650	(554,775)
Transmission Plant	46,356,440	45,428,561	(927,879)
Distribution Plant	68,237,053	66,072,289	(2,164,764)
General Plant	(1,936,181)	(1,912,660)	23,521
Total	$ 308,227,412	$ 295,869,780	**$ (12,357,632)**

In Scenario 1, I adjusted the service lives of several transmission and distribution accounts, and made adjustments to production net salvage. More pertinently, I developed the depreciation rates in Scenario 1 by using the most commonly applied grouping procedure – the ALG procedure. As described in more detail in this testimony, the ALG procedure results in a straight-line application of depreciation rates each year, while the ELG procedure results in higher depreciation rates in the early years of an asset's service life, which effectively makes it a form of accelerated depreciation. When a utility has a substantial amount of relatively new plant investments, the discrepancy in depreciation accruals resulting from the ALG and ELG procedures will be greater.

In Scenario 2, I calculated proposed depreciation rates using all of the service life and net salvage parameters proposed by the Company, and conducted the analysis using the ALG procedure. As shown in the table above for Scenario two, this procedure nonetheless results in an adjustment reducing the Company's proposed depreciation accrual by $36.9 million. Of this amount, about 27.7 million is related to the Company's transmission and distribution accounts. In other words, even if we agreed entirely with Mr. Spanos's proposed service lives and net salvage rates for NIPSCO's mass property accounts, using the ALG procedure would still result in a substantial 27.7 million decrease to the Company's proposed depreciation expense.

Finally, in Scenario 3, I applied the same adjustments to service lives and net salvage as I did in Scenario 1, except in this scenario I calculated proposed depreciation rates under the ELG procedure, which is the procedure Mr. Spanos used to conduct his analysis. Not surprisingly, this scenario results in a much smaller reduction of $12.4 million to NIPSCO's proposed depreciation accrual.

Q. Summarize the primary factors driving your proposed adjustments.

A. The primary factors driving the OUCC's proposed adjustments in this case are as follows:

1. <u>Production Net Salvage Adjustments</u>

Under all three scenarios, the OUCC is proposing reasonable adjustments to the Company's proposed production net salvage rates. When the Company's generating facilities are ultimately retired, NIPSCO will likely incur costs to dismantle those units. Conceptually, the customers who receive benefits from these generating facilities throughout the course of their service lives should not only pay for the costs to install and maintain the facilities, but also the costs to remove the facilities from service. The estimated costs to dismantle NIPSCO's generating units are presented in the demolition studies sponsored by Mr. Ranalletta in this case. Mr. Spanos applied these demolition costs as part of his net salvage estimates for the Company's production plant accounts. The

OUCC is proposing several reasonable adjustments to the demolition cost estimates which, in turn, reduces the production net salvage rates proposed in the depreciation studies.

2. Mass Property Service Life Adjustments

The term "mass property" refers to the Company's grouped assets, such as those in its transmission and distribution accounts. Through depreciation expense, a utility recovers the original cost of its plant assets over the average service life of those assets. When service life estimates are extended (reduced), depreciation rates decrease (increase) accordingly. Several of the average service lives proposed by Mr. Spanos for NIPSCO's mass property accounts were shorter than what was otherwise indicated by the historical retirement data for these assets as provided by the Company, which would result in depreciation rates that are unnecessarily high. Accordingly, I am proposing longer average service life estimates for these accounts, which results in a reduction of the Company's proposed depreciation accrual.

3. Depreciation System Grouping Procedure

As discussed above, the Company calculated its proposed depreciation rates under the ELG procedure. In contrast, under Scenarios 1 and 2 presented above, I calculated my proposed depreciation rates under the ALG procedure. Although analysts might debate which procedure is preferable from a technical standpoint, what is not debatable is this: depreciation rates calculated under the ELG procedure for a particular vintage group of property will be higher in earlier years relative to later years. In contrast, depreciation rates calculated under the ALG procedure for a particular vintage group of property will be the same each year. In order for depreciation rates calculated under the ELG procedure to be accurately applied, a utility's depreciation rates would need to be adjusted each year to reflect the decreasing depreciation rates for applicable account. In my experience, however, utilities that ask for depreciation rate approval under the ELG procedure also do not request that their rates be adjusted each year. Likewise, NIPSCO is not making such a request in this case. Rather, under NIPSCO's request, the higher depreciation rates approved under the ELG procedure would simply be applied each year until the next depreciation study is filed, regardless of the fact that depreciation rates should decrease annually during that time under the ELG procedure. This arrangement does not result in a systematic and rational cost recovery mechanism, and by proposing depreciation rates under this arrangement, NIPSCO has failed to meet its burden to make a convincing showing that its proposed depreciation rates are not excessive.

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

A. Under the regulatory model we use, 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 being used, a utility may be incented to retire and replace the asset to increase rate base, even though the retired asset may not have reached the end of its economic useful life. If, on the other hand, an asset must be retired and taken out of service before it is fully depreciated, there are regulatory mechanisms that can ensure the utility fully recovers its prudent investment in the retired asset. Thus, it is preferable for regulators to ensure that assets are not depreciated before the end of their economic useful lives.

Q. How does this concept relate to NIPSCO's request to recover capital under the ELG procedure in this case?

A. 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. Utility stocks are inherently low risk assets; however, all rational investors will nonetheless seek to reduce the risk associated with any investment for a given expected rate of return. One way utility investors can reduce risk is by seeking to accelerate the rate at which the company recovers its capital investments through higher depreciation expense. While it is not appropriate for depreciation to be used simply as a tool for utility finance departments to increase cash flow, it does not prevent utility managers from attempting such a strategy.[3] Rather, the rules and standards governing capital recovery through depreciation require that public utilities recover their capital investments in a systematic and rational manner. This is accomplished by estimating service life through actuarial analysis and other objective techniques. Thus, a utility's ability to recover its capital investment through depreciation is somewhat constrained by the objective analysis inherent in estimating service lives and net salvage. Recently

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[3] *See e.g.*, Rebuttal Testimony of Brian J. Van Abel filed May 2, 2018 Before the New Mexico Public Regulatory Commission, Case No. 17-00255-UT, p. 3. (In Southwestern Public Service Company's New Mexico rate case, the Treasurer of SPS's parent company, Xcel Energy Inc. testified that the commission consider certain courses of action to improve the company's cash flow, such as a "higher authorized return on equity ("ROE"), and increased depreciation expense.").

however, I am aware of several utilities who have made recent substantial plant investments as part of various infrastructure upgrade programs. Just as NIPSCO has requested in this case, these utilities sought to have their depreciation rates calculated under the ELG procedure, as opposed to the ALG procedure. I suspect some utility managers have simply figured out the mathematical realities inherent in the ELG procedure and realized they can use the ELG procedure as a clever way to increase cash flows and accelerate capital recovery without necessarily proposing depreciation parameters (service lives and salvage) that are far outside the range of reasonableness.

My understanding is that the IURC has consistently adopted use of the ELG procedure to calculate depreciation rates. In this case, I am recommending the Commission deviate from this practice and instead adopt a procedure that will result in a more systematic and accurate application of depreciation rates – the ALG procedure. At the very least, if the Commission decides to continue to adopt the ELG procedure, it should be aware of the problems this procedure presents so that it can make a fully-informed decision on this issue.

I sometimes refer to ELG as an "ivory tower" procedure – it is sound in theory, but problematic in practical applications. The main reason for this is that in order to be applied accurately, <u>depreciation rates calculated under the ELG procedure would need to be recalculated every year</u>. This is because unlike the ALG procedure, which results in the same annual depreciation rate for a vintage group of assets, the ELG procedure results in depreciation rates that should <u>decline</u> each year for a particular vintage group of assets. In theory, this could be accomplished, but in reality, it would be impractical to litigate a depreciation study each year. In cases where a utility proposed use of the ELG procedure, I have never heard of that utility also proposing to update its rates each year to reflect the mathematically proper application of the ELG procedure. Instead, once the higher ELG depreciation rates are applied in early vintage years after a substantial investment in plant assets, utility investors can enjoy the artificially high cash flows that are generated each subsequent year until the utility's next depreciation study is filed. In other words, the ELG procedure is a de facto form of accelerated depreciation that provides a windfall to shareholders at the expense of current ratepayers when there has been a recent, substantial investment in plant, as is the case here. I will present an example later in testimony showing how rates calculated under the ELG procedure should decline each year in order to be accurately applied.

Q. What is your recommendation to the Commission with regard to depreciation?

A. Given the fact that there is a substantial discrepancy between the depreciation accruals calculated under the ALG and ELG procedures, I think it is preferable to present several options for the Commission to consider. These options were presented in the three scenarios discussed above. It would be preferable for the Commission to consider a scenario that includes adoption of the ALG procedure. Use of the ELG procedure alone would burden current customers with an accelerated form of cost recovery in the amount of $28 million. Moreover, the deprecation rates that should decline each year under an accurate application of the ELG procedure would not be adjusted until the next depreciation study is litigated.

Q. Is the OUCC recommending an adjustment that would impact the depreciation rates proposed in in your testimony if adopted?

A. Yes. The OUCC is recommending an adjustment that would further impact the depreciation rates proposed in this testimony. The rates proposed in the depreciation study were calculated based on book reserve balances that include the net book value of the previously-retired Bailly units. As discussed in the testimony of Lauren Aguilar, the OUCC recommends the remaining net book value for Bailly units 7 and 8 be excluded from the calculation of depreciation rates. I issued a data request (OUCC DR 21) to understand exactly how the Company allocated Bailly's remaining book value to the reserve of NIPSCO's other production plant accounts; however, I was not able to resolve this issue based on the Company's response. In response to OUCC DR 21, the Company provided the total plant investment for Bailly by account, rather than by each generating unit and account. In conducting my analysis and calculating my proposed depreciation rates, I used the same book reserve values as those used in the depreciation study, which include the unrecovered balances of the retired Bailly units. To be clear, I am not suggesting that it is appropriate that the Company included the unrecovered balances of the retired Bailly units in the depreciation reserve. By using the same reserve as the Company to calculate my proposed depreciation rates, it should allow the Commission to better see the discrepancies that occur between using the ALG and ELG procedures. To the extent the Commission adopts some or all of OUCC's recommendations with regard to service lives, net salvage, demolition costs, grouping procedure (ALG vs. ELG), or the inclusion of Bailly's net book value in the reserve, the depreciation rates can be simply recalculated to reflect the Commission's substantive findings.

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

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

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

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

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

[6] *Id*. at 169.

IV. ANALYTIC METHODS

Q. Discuss your approach to analyzing the Company's depreciable property in this case.

A. I obtained and reviewed the data used to conduct the Company's depreciation study. The depreciation rates proposed by Mr. Spanos were developed based on depreciable property recorded as of December 31, 2017. I used the same historical retirement data in my analysis that Mr. Spanos used to conduct the 2017 Depreciation Study. In addition, I applied the same updated plant and reserve balances Mr. Spanos used in the 2019 Depreciation Study to develop my proposed adjustments to the Company's projected depreciation accruals.

Q. In addition to the adjustments discussed in your testimony related to electric plant, are you recommending adjustments to the Company's proposed depreciation rates for common plant?

A. No. My adjustments in this case are related to NIPSCO's electric plant. I examined the depreciation parameters proposed by Mr. Spanos for NIPSCO's common plant and consider those parameters reasonable.

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

A. The legal and technical 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 model for analyzing the characteristics of vintage property groups.[7] In this case, I used the straight line method, the average life grouping procedure, the remaining life technique, and the broad group model to analyze the Company's actuarial data; this system would be denoted as an "SL-AL-RL-BG" system. I provide a more detailed discussion of depreciation system parameters, theories, and equations in Appendix A.

Q. In addition to calculating your proposed depreciation rates under the average life grouping procedure, did you conduct a scenario under which you applied the equal life grouping procedure?

A. Yes. As discussed above, the OUCC presents three scenarios for the Commission to consider when making its decision in this case. The first two scenarios present rates that were calculated under the ALG procedure, while Scenario 3 presents rates that were calculated under the ELG procedure.

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.

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.[8] In the ELG procedure, property is divided

[7] Frank K. Wolf & W. Chester Fitch, *Depreciation Systems* 70, 140 (Iowa State University Press 1994).

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

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 higher during the early years and lower in the later years.[9]

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

> [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.[10]

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

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.[11] Thus, the average life of this group is 6.4 years.[12] Under the ALG procedure, the depreciation rate is 15.625% per year (1/6.4 = 15.625%). The following table illustrates this example.

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

[10] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices* 176 (NARUC 1996) (emphasis added).

[11] *See* Wolf *supra* n. 7, at 82.

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

Figure 2:
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

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 tables illustrates the same scenario except that the rate is calculated under the ELG procedure.

Figure 3:
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 4:
ELG Rate Development

				Annual Accrual	
Group	Group Amount	Group Life	Group 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 attempts 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 NIPSCO's the depreciation rate would decline each year and result in reduced depreciation expense.

Q. Does use of the ELG procedure as presented in this case result in a "systematic and rational" allocation of cost recovery in conformance with the accounting standard discussed above?

A. No, not as it is presented by the Company in this case. The ELG procedure could result in a systematic and rational allocation of cost, but only if the rates developed under the ELG procedure are adjusted each year, which would require a separate depreciation study each year. If there is any marginal benefit obtained in this process from using the ELG procedure over the ALG procedure, it would be far outweighed by the marginal costs imposed from the excessive time and expense associated with litigating depreciation studies every year.

Q. By proposing depreciation rates calculated under the ELG procedure, has NIPSCO met its burden to make a convincing showing that its proposed depreciation rates are not excessive?

A. No. This burden could be met with regard to this issue if NIPSCO was also proposing to have its depreciation rates adjusted every year in order to reflect a mathematically proper application of the ELG procedure, but I did not see such a request in the Company's filing.[13] Instead, to the extent the Company's ELG-derived rates are adopted, I presume the Company is willing to accept the arbitrarily higher cash flows for its investors it will receive each subsequent year after this proceeding until its next depreciation study is filed. Under these circumstances, the Company has not made a convincing showing that its proposed rates are not excessive. In fact, just by using the ELG procedure, the Company's proposed depreciation accrual in this case is about $27 million higher than what it would be under the ALG procedure. Given the fact that the ALG procedure is most widely used across the country,[14] it appears to me that the Company has made a calculated decision to deviate from the majority approach in this case, and perhaps the primary reason NIPSCO is proposing use of the ELG procedure is for the very purpose of generating higher

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[13] Note: This statement does not necessarily apply to the depreciation parameters (life and net salvage) proposed by NIPSCO in this case. Part of making a convincing showing that the Company's proposed depreciation rates are not excessive includes reasonable and well-supported estimates for service life and net salvage for all accounts.

[14] Based on my experience, the ALG procedure is the grouping procedure that most analysts use when conducting depreciation analysis. For example, out of the jurisdictions in which I have testified, as listed in Attachment DJG-1, the IURC and Railroad Commission of Texas are the only jurisdictions that have adopted the ELG procedure that I am aware of.

depreciation expense than could otherwise be achieved by changing depreciation parameters (service life and salvage). Thus, if any convincing showing has been made in this case, it is that the Company's proposed deprecation rates <u>are</u> excessive.

V. <u>LIFE SPAN PROPERTY ANALYSIS</u>

Q. Describe life span property.

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

Q. Describe the approach to analyzing life span property.

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

A. <u>Interim Retirement Analysis</u>

Q. Discuss the concept of interim retirements.

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

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

A. No. I accepted the Company's proposed interim retirement curves as well as the Company's proposed weighting of interim and terminal retirements because they are within a reasonable range given the Company's data provided in this case.

B. <u>Terminal Net Salvage Analysis (Demolition Costs)</u>

Q. Describe terminal net salvage.

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

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

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

Q. Did NIPSCO provide demolition studies in this case as part of its proposed terminal net salvage rates?

A. Yes. The demolition studies were conducted by Burns & McDonnell and sponsored in the direct testimony of Mr. Ranalletta.[15]

Q. Do you and the OUCC agree with NIPSCO's proposed demolition costs?

A. No. While I do not dispute the entirety of NIPSCO's proposed demolition costs, there are several important adjustments that should be made to these proposed costs, including removing the contingency factor applied by Mr. Ranalletta and removing the escalation factor applied by Mr. Spanos. In addition, OUCC witness Lauren Aguilar recommends in her testimony that proposed demolition costs for the Company's retired Bailly and Michigan City units be excluded from the depreciation rate calculations. Thus, I used a net salvage rate of 0% when calculating the depreciation rate for these units.

1. <u>Contingency Factor</u>

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

A. NIPSCO's demolition studies include direct and indirect cost estimates to dismantle NIPSCO's generating facilities, which include labor, material, and scrap value estimates.

[15] *See* Direct Testimony of Victor F. Ranalletta, Attachments 12-A through 12-E.

However, in addition to these cost estimates, Mr. Ranalletta applied a 20% contingency on the demolition costs estimated in the study.[16]

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

A. The total amount of the contingency costs is about $20 million.[17]

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

A. No. Mr. Ranalletta states that "[w]hen preparing a cost estimate, there is always some uncertainty as to the precision of the quantities in the estimate. . . ."[18] This is essentially the same argument used by other utility witnesses proposing such contingency factors in demolition studies. The problem with this argument regarding "uncertainty" is that it does not meet the standard for charging costs to utility customers in the context of ratemaking. Under the Company's logic, one could argue that a 20% contingency charge should be added to every projected cost in a utility rate case because such costs are "uncertain" by definition. Moreover, if the cost is "uncertain," a similar argument could be made for applying a <u>negative</u> 20% contingency to ensure that ratepayers are not overcharged. Such a proposal, however, would be just as dubious as the 20% positive contingency NIPSCO has proposed in this case. In a ratemaking context, ratepayers should be not be charged for costs that are entirely "unknown" by definition. While many of the other costs proposed

[16] *See* Direct Testimony of Victor F. Ranalletta, Attachments 12-A through 12-E.

[17] *See Id.*; *see also* Attachment DJG-12.

[18] Direct Testimony of Victor F. Ranalletta, p. 16, lines 6-7.

in the demolition studies have some objective, measurable basis behind them, there is really no basis to support an arbitrary 20% increase to these costs for factors that are entirely unknown.

Q. Are you aware of other cases where regulatory commissions rejected such contingency factors in proposed demolition costs?

A. Yes. In Public Service Company of Oklahoma's 2015 rate case, the Administrative Law Judge ("ALJ") specifically addressed the company's request for contingency costs in its demolition studies:

> In its demolition cost study, [Sargent & Lundy] applied a 15% contingency factor to its cost estimates, and a negative 15% contingency factor to its scrap metal value estimates. The Company provides little justification for this contingency factor other than the plants might experience uncertainties and unplanned occurrences. This reasoning fails to consider the fact that certain occurrences could reduce estimated costs.[19]

NIPSCO is essentially making the same arguments in this case, as discussed above, and for the same reasons the Company's arguments should be rejected in this case.

2. Escalation Factor

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

A. To calculate his proposed net salvage rates for NIPSCO's production accounts, Mr. Spanos escalated the demolition cost estimates provided by Mr. Ranalletta by 2.5% each year until the estimated retirement year for each generating facility.[20]

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[19] Before the Oklahoma Corporation Commission, Report and Recommendation of the Administrative Law Judge p. 164, filed May 31, 2016 in Cause No. PUD 201500208.

[20] *See* response to OUCC DR 20-001(b).

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

A. The escalation factor alone would add $38 million to NIPSCO's proposed demolition costs.[21]

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

A. No. There are two important reasons the Commission should disallow the cost escalation factor applied by Mr. Spanos. First, it is not appropriate to escalate a cost that is so remotely unknown, and moreover, may never even occur as estimated by the Company. The second problem with the Company's cost escalation factor is a technical one: It is not proper to charge current ratepayers for a future cost that has not been discounted to present value. The "time value of money" concept is a cornerstone of finance and valuation. For example, the DCF Model, which is used to estimate the cost of equity, applies a growth rate to a company's dividends many years into the future. However, that dividend stream is then discounted back to the current year by a discount rate in order to arrive at the present value of an asset. Likewise, accounting for asset retirement obligations involves escalating the present value of an estimated future cost, but the cost is then discounted back to present value by using a discount rate. In contrast to these calculations, NIPSCO proposes to escalate the present value of its demolition costs as much as 40 years into the future and expects current ratepayers to pay the future value of these costs with present-day dollars. This proposal completely disregards the elemental "time value of money" principle. For

[21] *See id*. 20-001 Attachment A.

these reasons, the Commission should exclude the escalation factor applied by Mr. Spanos when determining appropriate net salvage and depreciation rates for NIPSCO's production accounts.

Q. Are you aware of other cases where regulatory commissions rejected such contingency factors in proposed demolition costs?

A. Yes. In Public Service Company of Oklahoma's 2015 rate case, the ALJ specifically addressed the company's request for the same type of escalation factor being requested in this case:

> The ALJ adopts Staff witness Garrett's recommendation that the Commission should deny the proposed escalation of demolition costs in this case because (1) the escalated costs do not appear to be calculated in the same manner as other calculations; (2) the Company did not offer any testimony in support of the escalation factor; (3) an escalation factor that does not consider any improvements in technology or economic efficiencies likely overstates future costs; (4) it is inappropriate to apply an escalation factor to demolition costs that are likely overstated; (5) asking ratepayers to pay for future costs that may not occur, are not known and measurable changes within the meaning of 17 O.S. § 284; and (6) the Commission has not approved escalated demolition costs in previous cases.[22]

While some of the ALJ's reasoning would not be applicable in this case, the IURC should be aware that another commission has rejected the request for escalation factors. Furthermore, the ALJ's reasons for denying the escalation cost in Oklahoma do not even address what I believe to be the most pertinent reason to reject escalation factors – the time value of money concept discussed above.

[22] Report and Recommendation of the Administrative Law Judge p. 164, filed May 31, 2016 in Cause No. PUD 201500208.

VI. SERVICE LIFE ANALYSIS

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

A. The process used to study the 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.[23] 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.[24] 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."[25] A more detailed explanation of

[23] 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).

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

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

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 NIPSCO'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-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."[26] 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

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

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 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 its service life estimates, did NIPSCO present substantial evidence in addition to the historical plant data for each account?

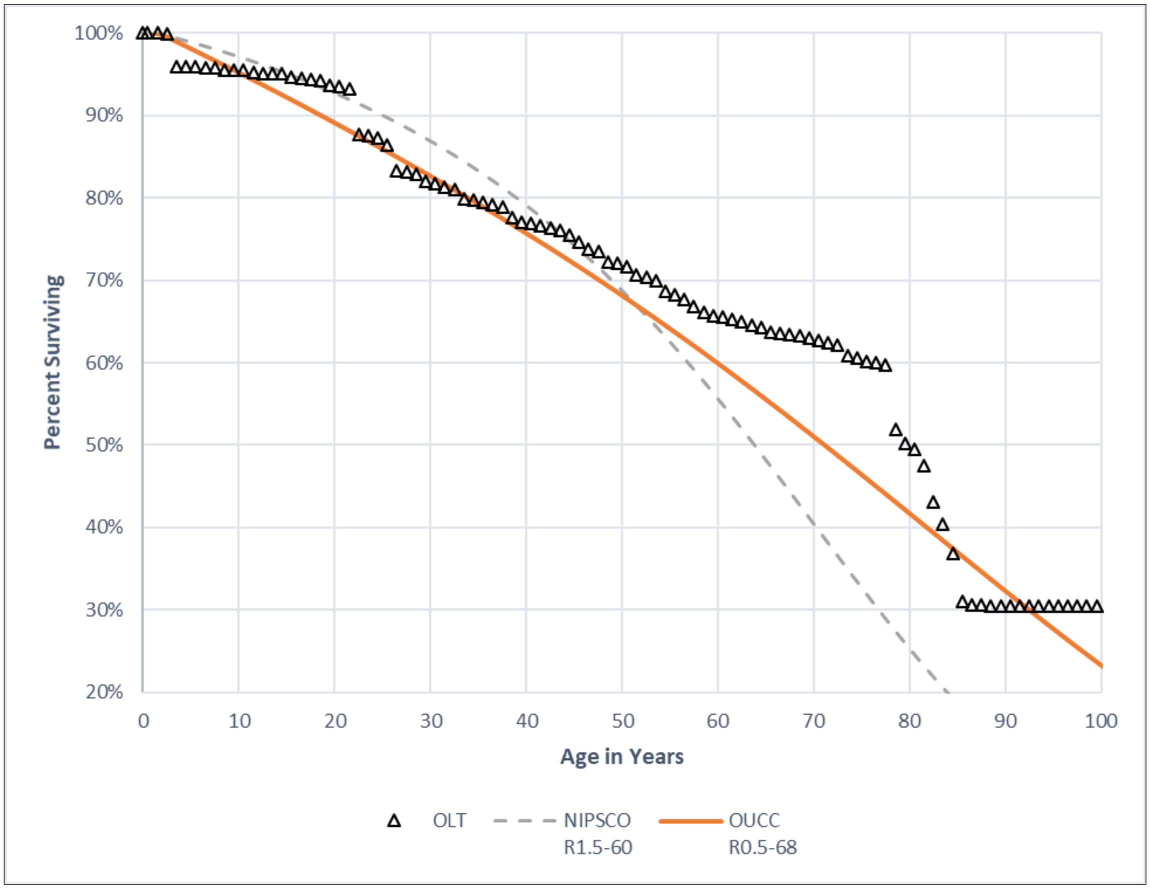
A. No. It appears that NIPSCO is relying primarily on its historical retirement data in order to make predictions about the remaining average life for the assets in each account. Therefore, I think the Commission should focus primarily on this historical data and objective Iowa curve fitting when assessing fair and reasonable depreciation rates for NIPSCO. The service lives I propose in this case are based on Iowa curves that provide better mathematical fits to NIPSCO's historical retirement data, and they result in more reasonable service life estimates and depreciation rates for the accounts to which I propose adjustments.

A. Account 352 – Structures and Improvements

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 R1.5-60 Iowa curve and I selected the R0.5-68 Iowa curve. Both of these curves are in the same modal family (the "R" family), which means the greatest rate of retirement occurs after the average life in both curves – or to the "right" of the curves. The numbers after the "R" are related to the relative heights of the modes of the curves. The R0.5 frequency curve has a lower mode than the R1.5 curve and thus has a flatter, smoother trajectory.

Figure 5:
Account 352 – Structures and Improvements

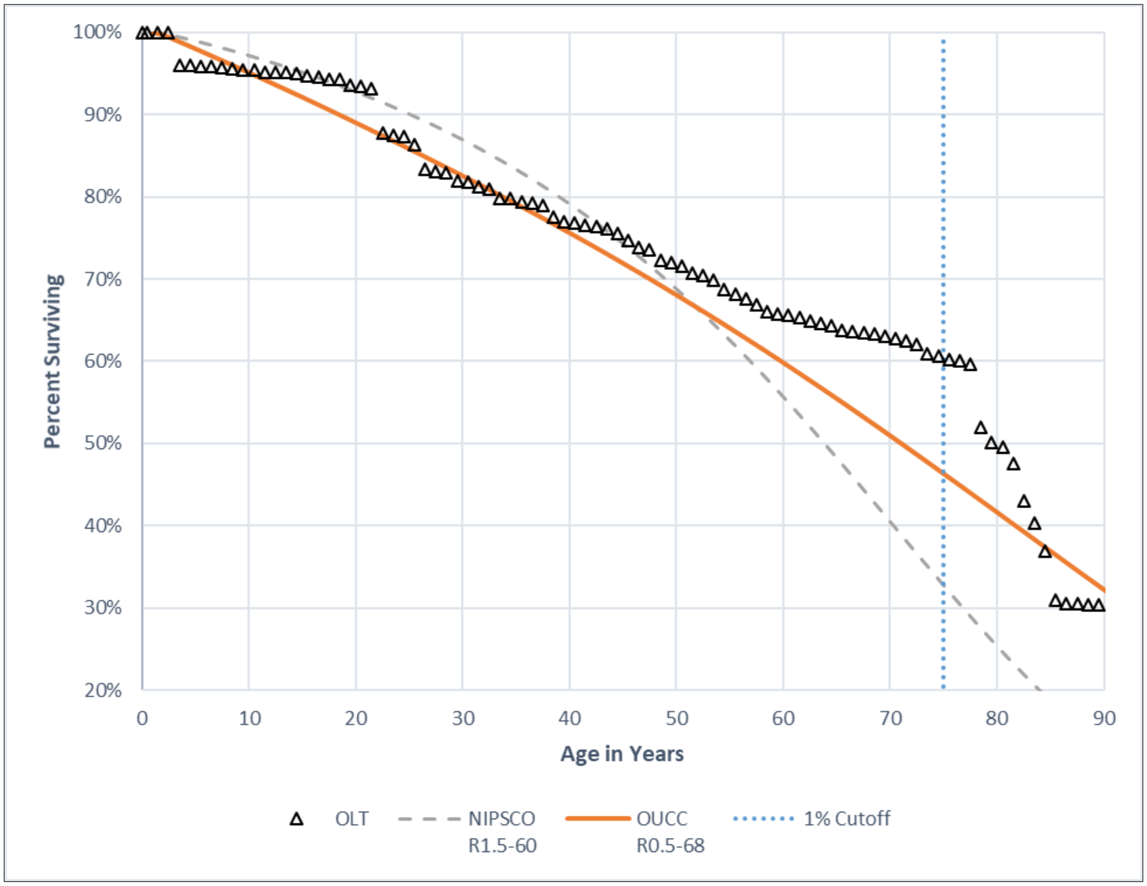


As shown in the graph, NIPSCO's R1.5-60 curve does not provide a good fit to the observed data, especially after the 40-year age interval.

Q. Are all of the data points on this graph statistically relevant?

A. No. While it is not an authoritative standard, I typically consider data points occurring approximately after the data point corresponding to 1% of the beginning exposures in a particular account to be statistically irrelevant. The graph below shows where this 1% cutoff would be for this account.

Figure 6:
Account 352 – Structures and Improvements (with 1% cutoff)



The data points occurring to the right of the dotted blue line are less relevant for statistical analyses. Often, the shape of the curve occurring after this point will also be erratic, as is the case here. Regardless, one can visually observe that the Company's R1.5-60 curve does not provide a good fit to the historical OLT curve up to this point. For example, by selecting the R1.5-60 curve, the Company is essentially suggesting that when the assets in this account reach the age of 70 years, about 40% of the assets will be surviving. However, because the OLT curve represents historical data, we already know that the Company's estimate is inaccurate. In other words, the historical data tell us there are about 63% of the assets surviving that have reached age 70, not 38%. Iowa curves provide an objective technique for predicting future retirement rates, but they should not be used to rewrite history by ignoring significant historical data points. By ignoring these data points, the Iowa curve selected by NIPSCO for this account underestimates the average service life otherwise indicated by the Company's historical data, which ultimately results in a proposed depreciation rate for this account that is unreasonably high.

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 (though not exclusively) 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 mathematically-fitted curve is the one that minimizes the distance between the OLT curve and the Iowa curve, thus providing the closest fit. The distance between the curves is calculated using the "sum-of-squared differences" ("SSD") technique. In this account, the total SSD, or distance between the Company's curve and the OLT curve is 3.2019, while the total SSD between the R0.5-68 curve and the OLT curve is only 0.6521.[27] Thus, the

[27] Attachment DJG-27.

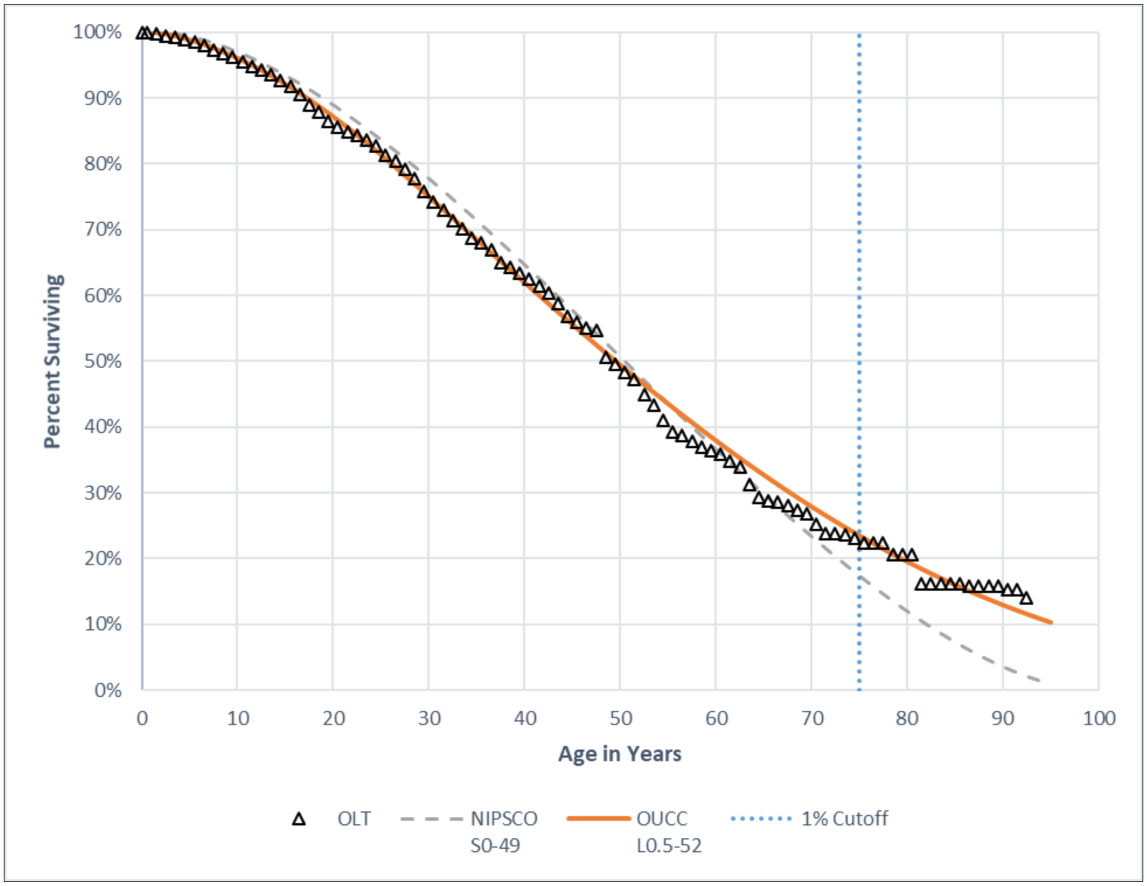
R0.5-68 curve is a better mathematical fit to the historical data and provides a more reasonable service life estimate and depreciation rate for this account.

B. Account 353 – Station Equipment

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

A. The observed survivor curve derived from the Company's data for this account is fairly well-suited for conventional curve-fitting techniques in that it is relatively smooth and follows the pattern of a typical survivor curve for utility property. In addition, it reaches past 10% surviving without any erratic shape changes towards the end of the curve, so it is a relatively smooth complete OLT curve. For this account, the Company selected the S0-49 curve and I selected the L0.5-52 curve. The curves are illustrated in the graph below along with the OLT curve.

Figure 7:
Account 353 – Station Equipment



As shown in the graph, both curves provide a relatively good fit to the observed data. The reason I selected the L0.5 curve for this account is that the OLT curve is nearly complete and seems to be following the pattern of an L-shaped Iowa curve.

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

A. Yes, when applied to the entirety of the OLT curve. If the 1% cutoff benchmark is considered, the Company's curve provides a slightly better mathematical fit. However, since this OLT curve is relatively smooth and almost a complete curve (i.e., reaches zero percent surviving), I think it is reasonable to consider the entire curve in the mathematical analysis. When the mathematical analysis is conducted on the entire OLT curve, the Company's curve has an SSD of 0.2183 while the SSD for the L0.5-52 curve I selected is only 0.0315, which makes it the better mathematical fit under this scenario.[28]

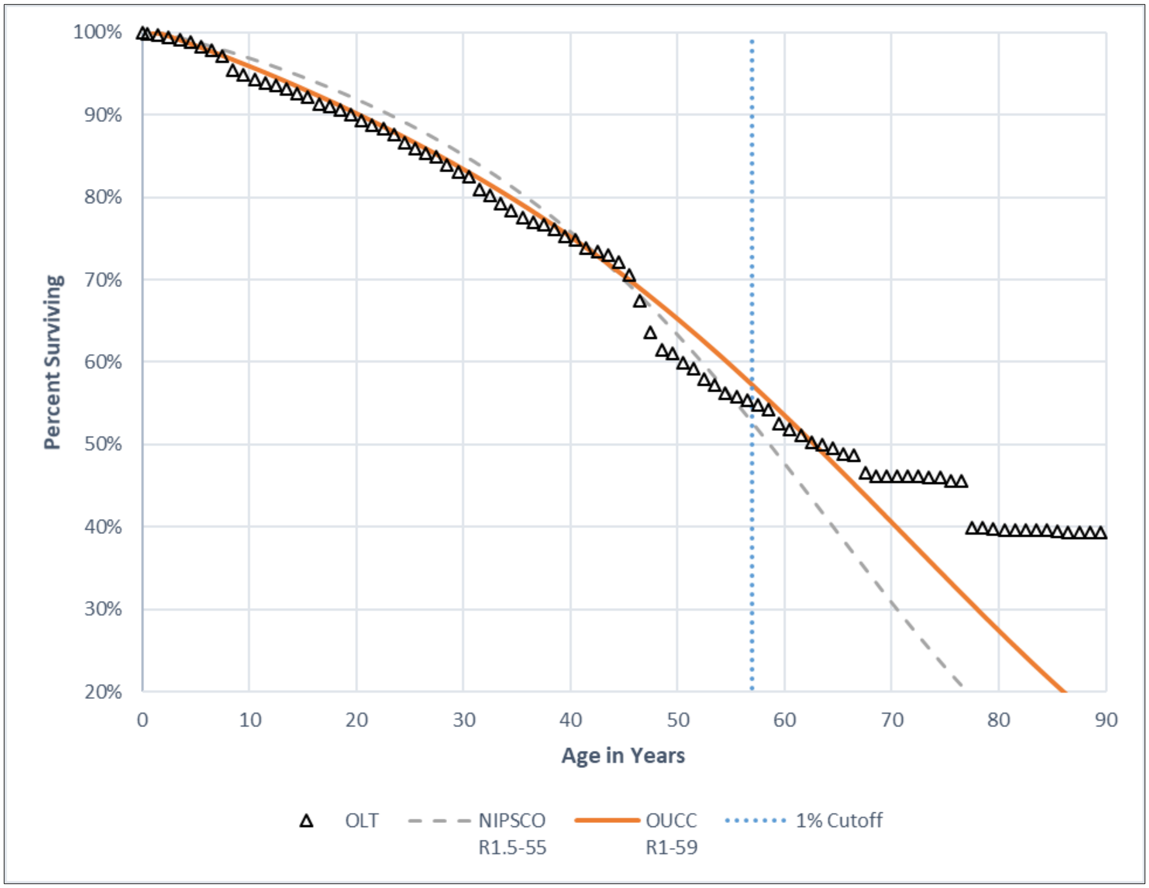
C. Account 355 – Poles and Fixtures

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

A. As with the previous account, the OLT curve for Account 355 is relatively well-suited for conventional Iowa curve fitting techniques, though it is a less complete curve. Mr. Spanos selected the R1.5-55 curve for this account and I selected the R1-59 curve. These curves and the OLT curve are shown in the following graph.

[28] Attachment DJG-28.

Figure 8:
Account 355 – Poles and Fixtures



From a visual inspection, both curves provide relatively good fits to the observed data for this account.

Q. Does the Iowa curve you selected for this account provide a better mathematical fit to the OLT curve?

A. Yes. When it is difficult to choose from various Iowa curves that provide good visual curve-fittings, conducting a mathematical analysis can help the analyst or regulator decide which curve to select. For this account, whether the analysis is conducted on the entire OLT curve or on the portion that excludes the tail-end 1%, the R1-59 curve I selected provides the better mathematical fit. Specifically, the total SSD for the Company's curve is 1.7684 and the total SSD for the R1-59 curve is only 0.6551, making it the better fit from a mathematical perspective.[29]

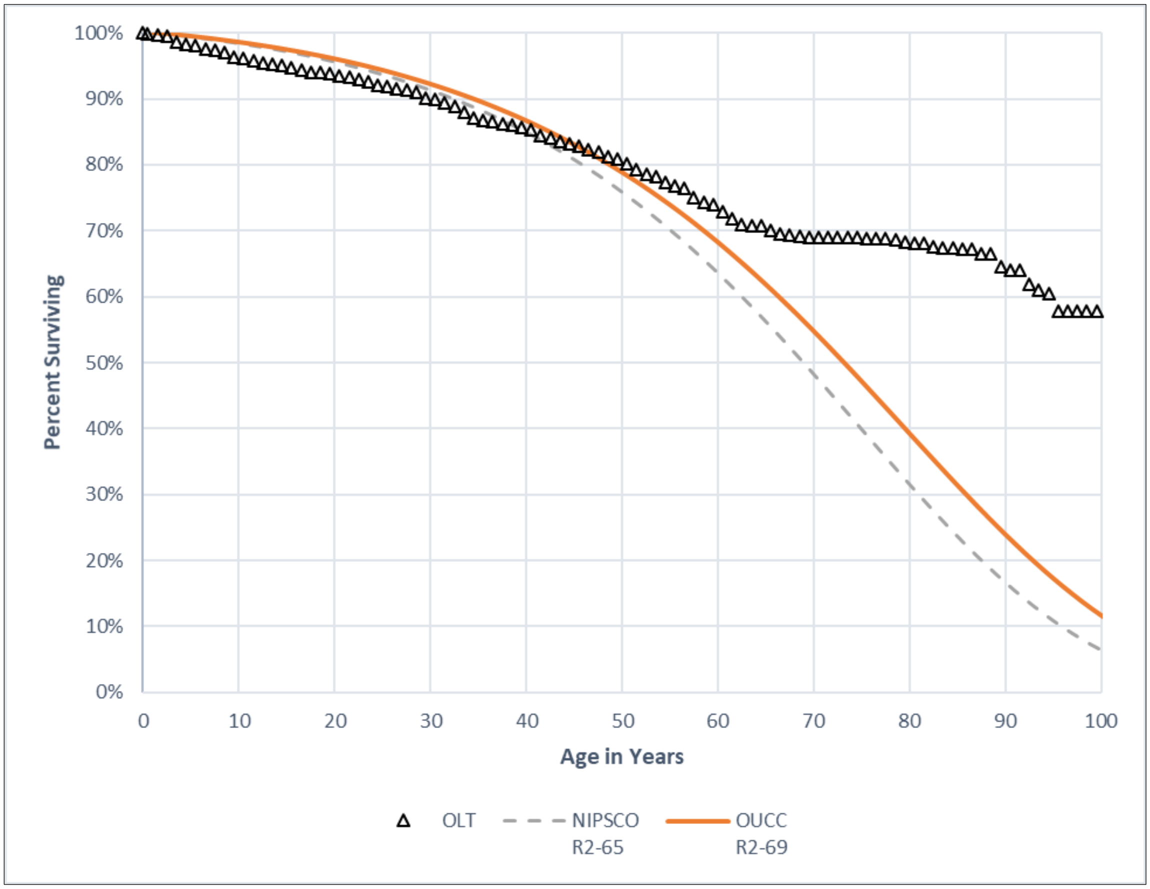
D. Account 356 – Overhead Conductors and Devices

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

A. Mr. Spanos selected the R2-65 curve for this account and I selected the R2-69 curve. The two Iowa curves and the OLT curve are shown in the graph below.

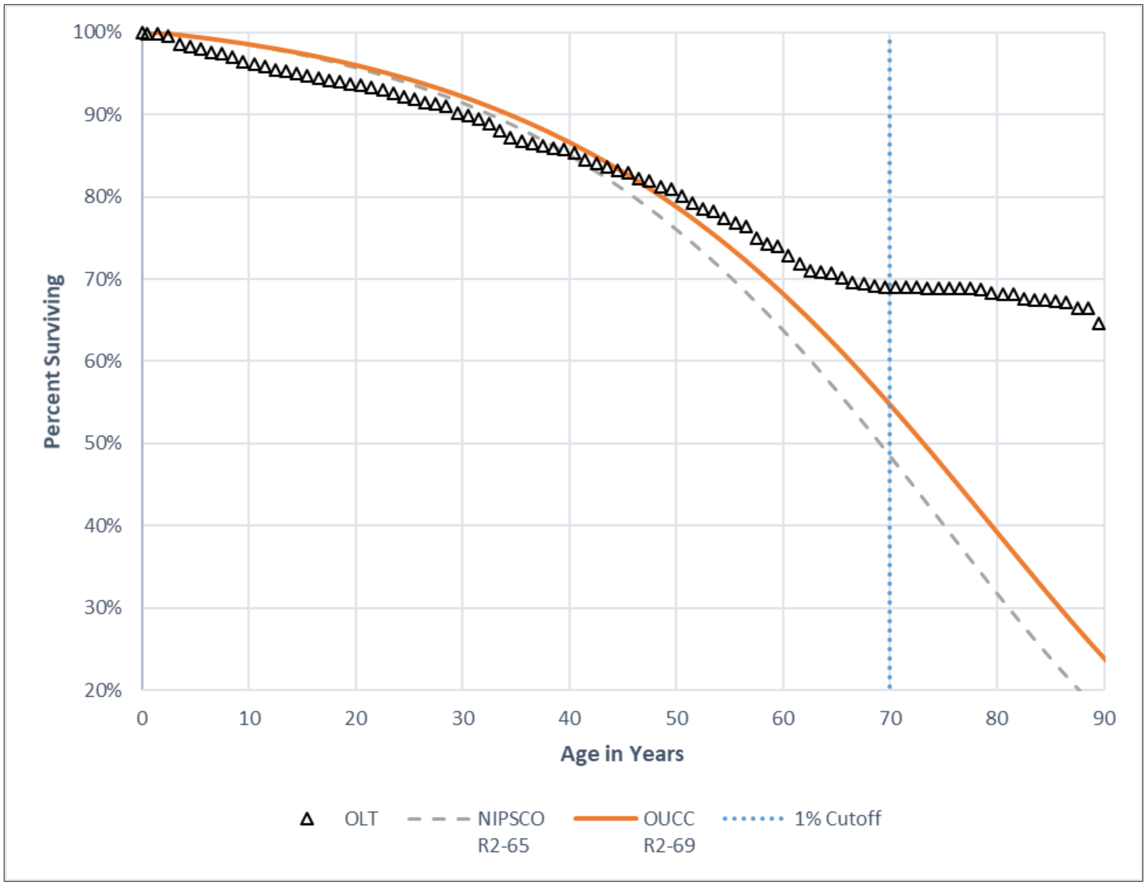
[29] Attachment DJG-29.

Figure 9:
Account 356 – Overhead Conductors and Devices



The OLT curve for this account is relatively smooth through age-interval 60, but it is also relatively incomplete. For OLT curves in this condition, it can be especially helpful to consider the 1% cutoff benchmark. If we disregard the relatively insignificant data points occurring after this cutoff, we see the most relevant data points for this account arguably stop around age-interval 70. This is helpful because if we were to attempt mathematical curve-fitting techniques on the entire OLT curve for this account, we could arrive at Iowa curves that have unreasonably long average service lives (resulting in unreasonably small depreciation rate estimates). The graph below shows the same curves with the 1% cutoff line.

Figure 10:
Account 356 – Overhead Conductors and Devices (with 1% cutoff)



Even when considering the more relevant portion of this OLT curve, the Iowa curve selected by the Company underestimates the average service life in this account.

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

A. Yes. Regardless of whether we consider the entire OLT curve, or the portion of the OLT curve without the 1% tail end, the R2-69 curve I selected provides a better mathematical fit under both scenarios, and thus results in a more reasonable service life estimate and depreciation rate for this account. The SSD for NIPSCO's curve is 7.4288, while the SSD for the R2-69 curve I selected is only 5.3998, which means it is mathematically "closer" to the OLT curve.[30]

E. <u>Account 362 – Station Equipment</u>

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

A. As with Account 353 discussed above, the OLT curve for this account is relatively smooth and complete, which makes it ideal for conventional Iowa curve-fitting techniques. Mr. Spanos selected the S0-49 curve for this account, and I selected the L0.5-52 curve. The Iowa and OLT curves are shown in the graph below.

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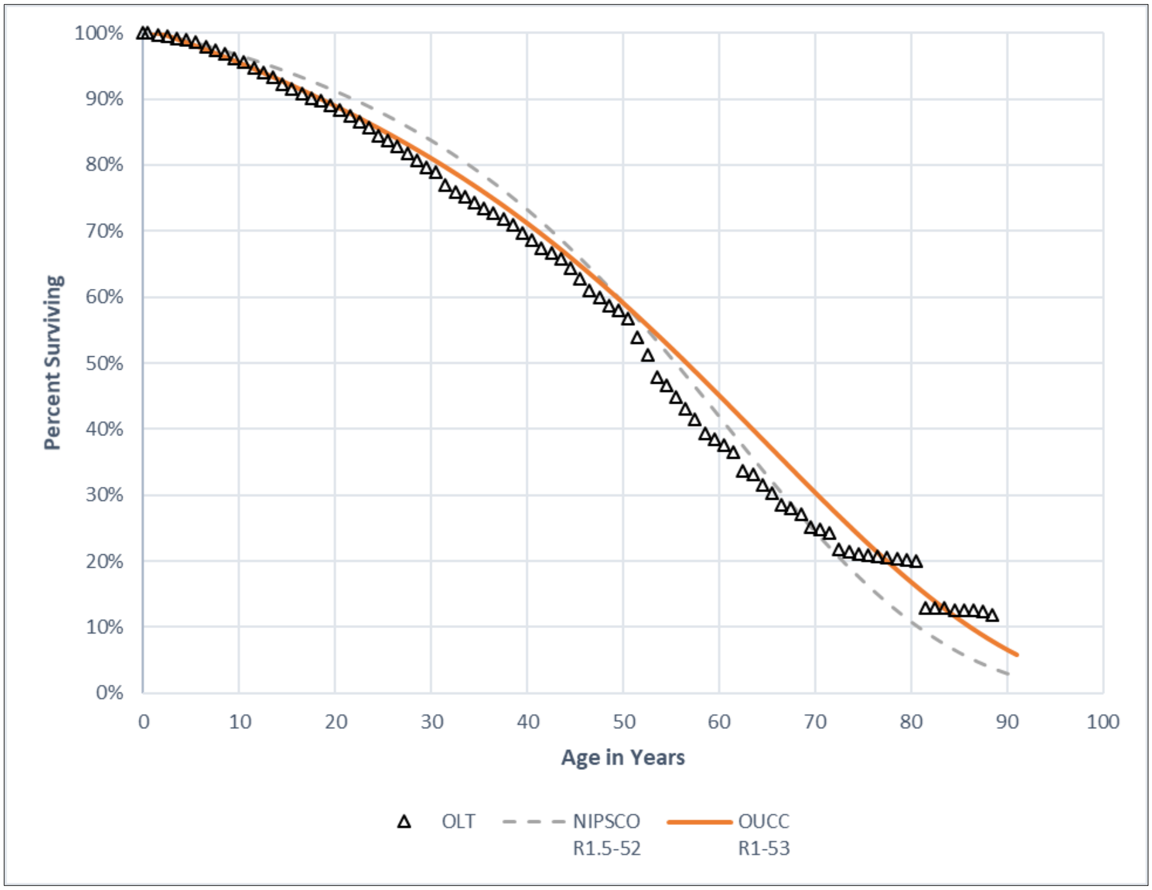
[30] Attachment DJG-30.

Figure 11:
Account 362 – Station Equipment



From a visual standpoint, both Iowa curves provide relatively good fits to the observed data. Under these scenarios, I think it is preferable to use mathematical curve-fitting to help determine the better Iowa curve to apply to this account.

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

A. Yes. The SSD for NIPSCO's curve is 0.2183 and the SSD for the L0.5-52 curve I selected is only 0.0315.[31] While it could be said that both of these Iowa curves fall within the "range of reasonableness" for this account, I think the Commission should nonetheless choose the Iowa curve that provides the more reasonable fit given the evidence provided. The better choice is the R1-53 curve for this account.

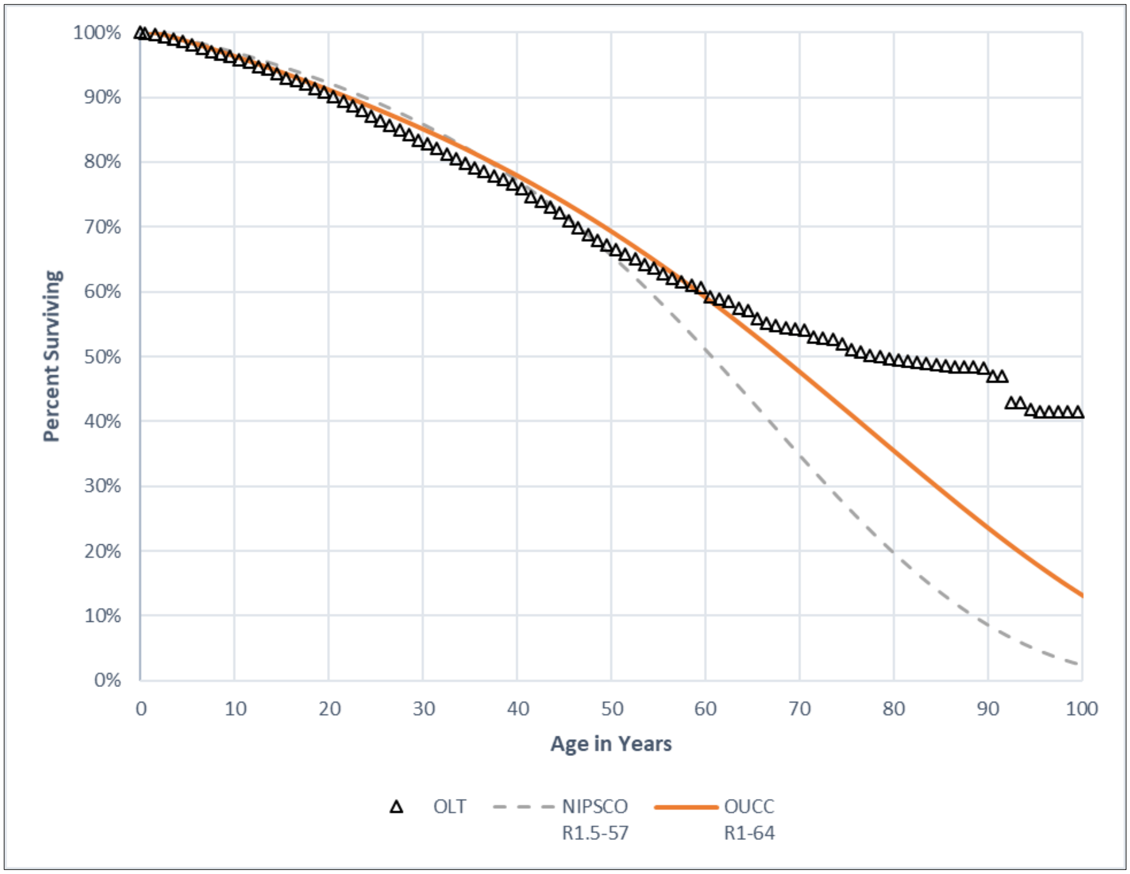
F. <u>Account 365 – Overhead Conductors and Devices</u>

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

A. Mr. Spanos selected the R1.5-57 curve for this account and I selected the R1-64 curve. Both curves are shown in the graph below.

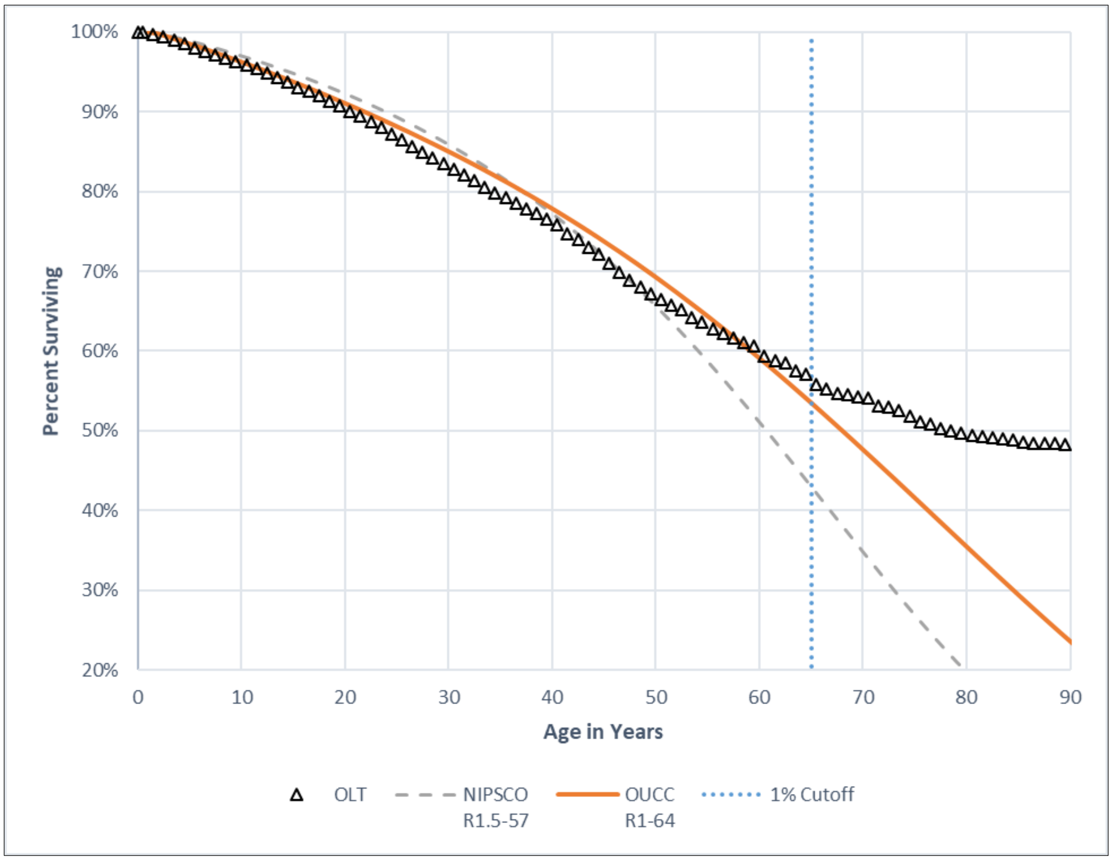
[31] Attachment DJG-31.

Figure 12:
Account 365 – Overhead Conductors and Devices



As with Account 356 discussed above, the OLT curve for this account is relatively smooth through age-interval 60 at which point it flattens out. For OLT curves in this condition, it can be especially helpful to consider the 1% cutoff benchmark. If we disregard the relatively insignificant data points occurring after this cutoff, we see the most relevant data points for this account arguably stop around age-interval 65. This is helpful because if we attempt mathematical curve-fitting techniques on the entire OLT curve for this account, we could arrive at Iowa curves that have unreasonably long average service lives (resulting in unreasonably small depreciation rate estimates). The graph below shows the same curves with the 1% cutoff line.

Figure 13:
Account 365 – Overhead Conductors and Devices (with 1% cutoff)



Even when considering the more relevant portion of this OLT curve, the Iowa curve selected by the Company underestimates the average service life in this account. Specifically, the Company's curve declines to sharply relative to the OLT curve around age-interval 50. The R1-64 curve tracks the OLT curve more accurately.

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

A. Yes. Regardless of whether we consider the entire OLT curve, or the portion of the OLT curve without the 1% tail end, the R1-64 curve I selected provides a better mathematical fit under both scenarios, and thus results in a more reasonable service life estimate and depreciation rate for this account. The SSD for NIPSCO's curve is 5.3043, while the SSD for the R1-64 curve I selected is only 2.2563.[32]

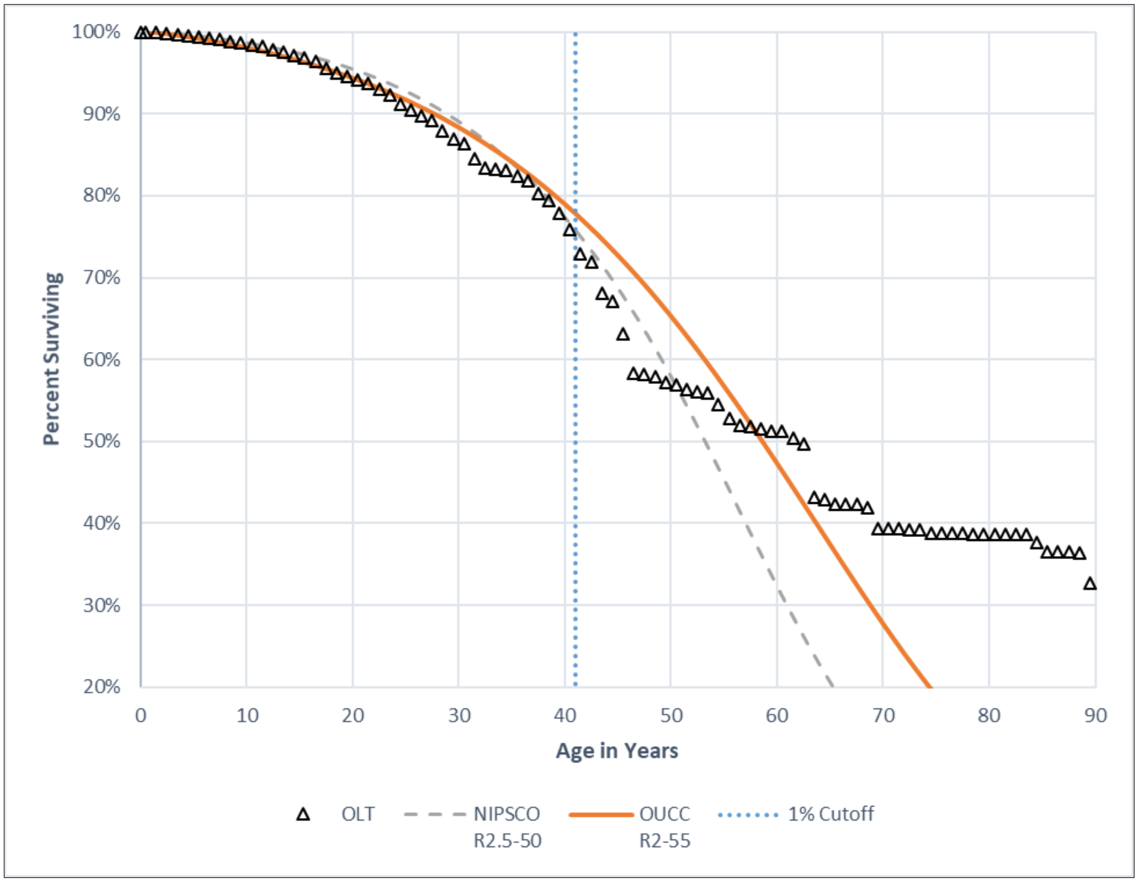
G. Account 367 – Underground Conductors and Devices

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

A. The OLT curve for this account follows a relatively smooth pattern consistent with typical survivor curve patterns until approximately age-interval 41. Not surprisingly, this is where the 1% cutoff occurs for this OLT curve. Mr. Spanos selected the R2.5-50 curve for this account, and I selected the R2-55 curve. The curves are shown in the following graph.

[32] Attachment DJG-32.

Figure 14:
Account 367 – Underground Conductors and Devices



Both Iowa curves provide relatively good fits to the OLT curve through the most relevant portions of the OLT curve.

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

A. Yes. The SSD for NIPSCO's curve is 3.4039 and the SSD for the R2-55 curve is only 1.6646, which means it is a better mathematical fit to the OLT curve.[33]

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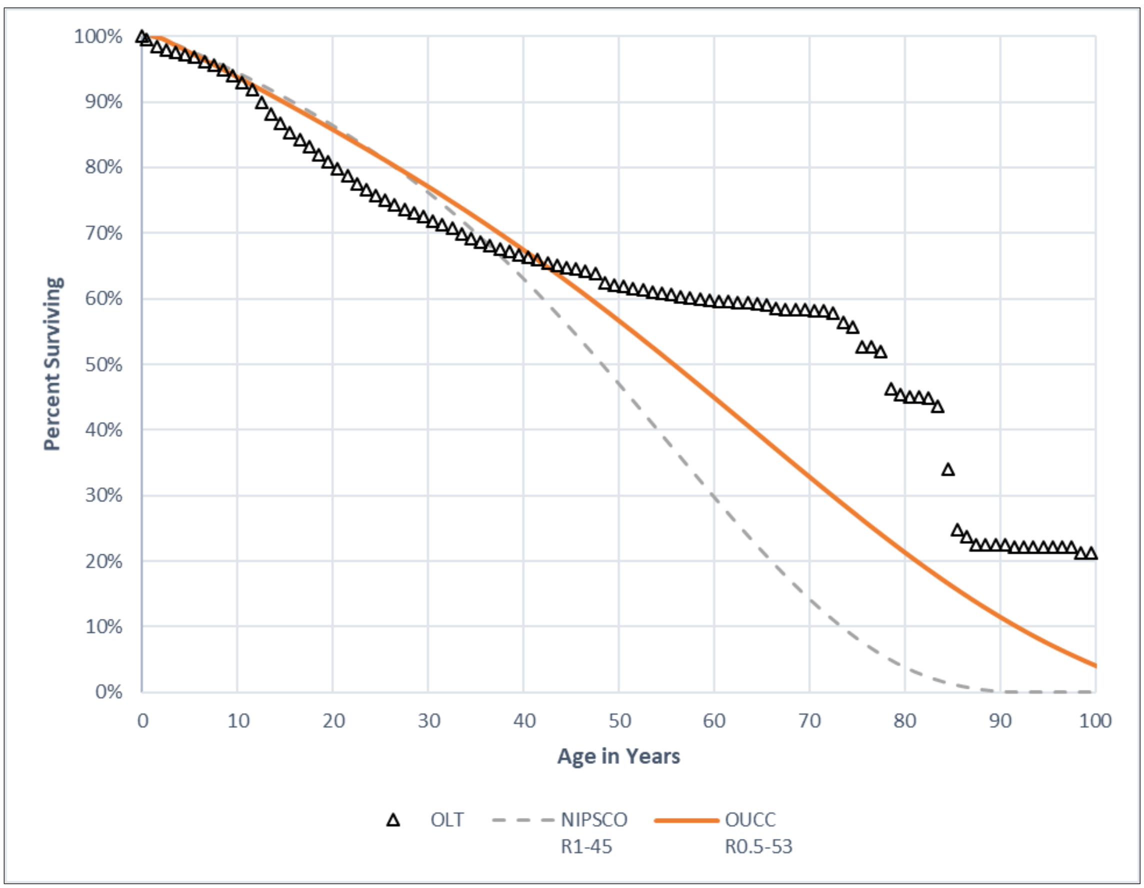
[33] Attachment DJG-33.

H. Account 369.1 – Overhead Services

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

A. The OLT curve for this account is less than ideal for Iowa curve-fitting techniques. Nonetheless, these techniques still provide an objective way to estimate the average remaining life of the assets in this account. Mr. Spanos selected the R1-45 curve for this account, and I selected the R0.5-53 curve. These curves, along with the OLT curve, are shown in the graph below.

Figure 15:
Account 369.1 – Overhead Services



Although this OLT curve has an irregular shape, the Company's curve nonetheless underestimates the average service life otherwise indicated by the OLT curve and appears to disregard relevant historical data.

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

A. Yes. The SSD for NIPSCO's curve is 6.7218 and the SSD for the R0.5-53 curve I selected is 2.6201, which means it is a better mathematical fit to the OLT curve.[34]

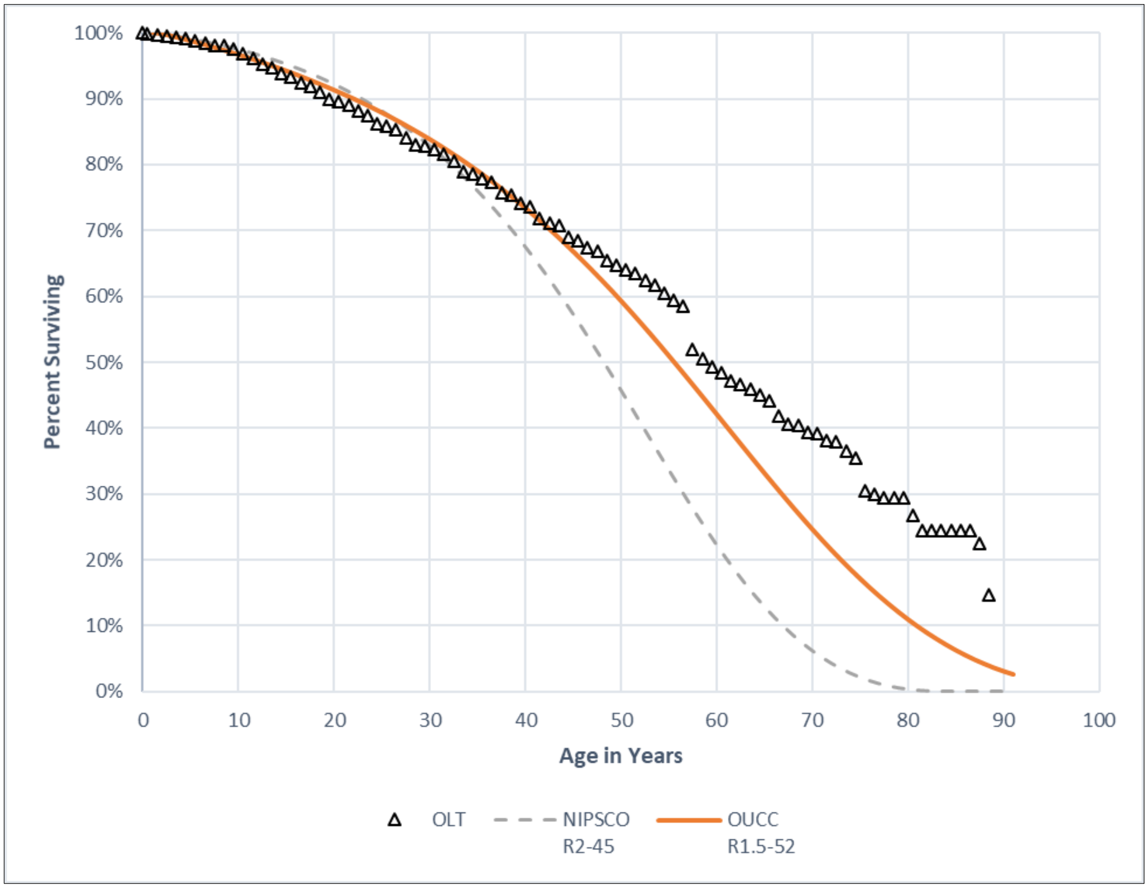
I. Account 370.10 – Customer Metering Stations

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

A. For this account, Mr. Spanos selected the R2-45 curve and I selected the R1.5-52 curve. Both curves are shown in the graph below along with the OLT curve.

[34] Attachment DJG-34.

Figure 16:
Account 370.1 – Customer Metering Stations



As with several of the accounts illustrated in this section of my testimony, the Company's curve does not provide an accurate description of historical retirement patterns that have already occurred. For example, the Company's R2-45 curve suggests when the assets in this account reach about 56 years of age, there will be only 27% surviving. However, the Company's own historical retirement data show a different reality. That is, the assets in this account have reached 56 years of age are surviving at 59%, not 27%.

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

A. Yes. Although it is clear from a visual inspection that the Iowa curve I selected for this account provides a much more accurate fit to the observed data, we can also confirm these results mathematically. Specifically, the SSD for NIPSCO's curve is 3.6586 while the SSD for the R1.5-52 curve I selected is only 0.9365, which means it is a better mathematical fit to the OLT curve and results in a more reasonable and accurate estimate of the average life and depreciation rate for this account.[35]

VII. CONCLUSION AND RECOMMENDATION

Q. Summarize the key points of your testimony.

In my testimony I present three scenarios for the Commission to consider regarding reasonable adjustments to NIPSCO's proposed depreciation rates in the 2019 Depreciation Study. The scenarios are again summarized as follows:

[35] Attachment DJG-35.

> Scenario 1 – use the ALG procedure and make adjustments to the mass property service lives and production net salvage for a total adjustment of $43 million.
>
> Scenario 2 – use the ALG procedure and accept the Company's service life and net salvage proposals for its mass property accounts for a total adjustment of $37 million.
>
> Scenario 3 – use the ELG procedure and make the same adjustments to depreciation parameters as in Scenario 1 for a total adjustment of $12 million

A. It would be preferable for the Commission to consider a scenario that includes adoption of the ALG procedure. Use of the ELG procedure alone would burden current customers with an accelerated form of cost recovery in the amount of $28 million. Moreover, the deprecation rates that should decline each year under an accurate application of the ELG procedure would not be adjusted until the next depreciation study is litigated.

Q. Does this conclude your testimony?

A. Yes.

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.[36] 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 <u>method</u> of allocation; 2) a <u>procedure</u> for applying the method of allocation to a group of property; 3) a <u>technique</u> for applying the depreciation rate; and 4) a <u>model</u> for analyzing the characteristics of vintage groups comprising a continuous property group.[37] The figure below illustrates the basic concept of a depreciation system and includes some of the available parameters.[38]

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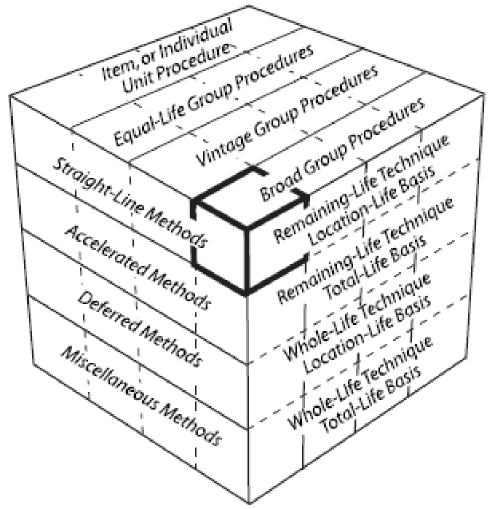
[36] Wolf *supra* n. 7, at 69-70.

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

[38] 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 17:
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.[39] 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.[40] The basic formula for the straight-line method is as follows:[41]

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[39] NARUC *supra* n. 10, at 56.

[40] *Id*.

[41] *Id*.

Equation 1:
Straight-Line Accrual

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

Gross plant is a known amount from the utility's records, while both net salvage and service life must be estimated 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.[42] 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:[43]

Equation 2:
Straight-Line Rate

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

2. Grouping Procedures

The "procedure" refers to the way the allocation method is applied through subdividing the total property into groups.[44] 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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[42] *Id*. at 57.

[43] *Id*. at 56.

[44] Wolf *supra* n. 7, 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.[45] 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.[46]

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.[47] 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.[48] Under the equal life procedure the property is divided into subgroups that each has a common life.[49]

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

[45] *Id*. at 74.

[46] NARUC *supra* n. 10, at 61-62.

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

[48] *Id*. at 75.

[49] *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.[50]

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.[51] 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 <u>current</u> depreciation parameters.[52] 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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[50] NARUC *supra* n. 10, at 63-64.

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

[52] NARUC *supra* n. 10, at 325.

in the annual accrual.[53] 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:[54]

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.[55]

4. <u>Analysis Model</u>

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.[56] 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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[53] NARUC *supra* n. 10, 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.").

[54] *Id*. at 64.

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

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

used among practitioners, the “broad group” and the “vintage group,” are two ways of viewing the life and salvage characteristics of the vintage groups that have been combined to 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.[57] 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.[58] 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.[59] They generalized the 65 curves

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

[58] *Id*. at 23.

[59] *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.[60] 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."[61] 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.[62] 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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[60] *Id.*

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

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

observations during the period 1965 – 1975 as part of his Ph.D. dissertation at Iowa State. Russo essentially repeated Winfrey's data collection, testing, and analysis methods used to develop the original Iowa curves, except that Russo studied industrial property in service several decades after Winfrey published the original Iowa curves. Russo drew three major conclusions from his research:[63]

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.[64]

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

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

[64] *Id*.

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

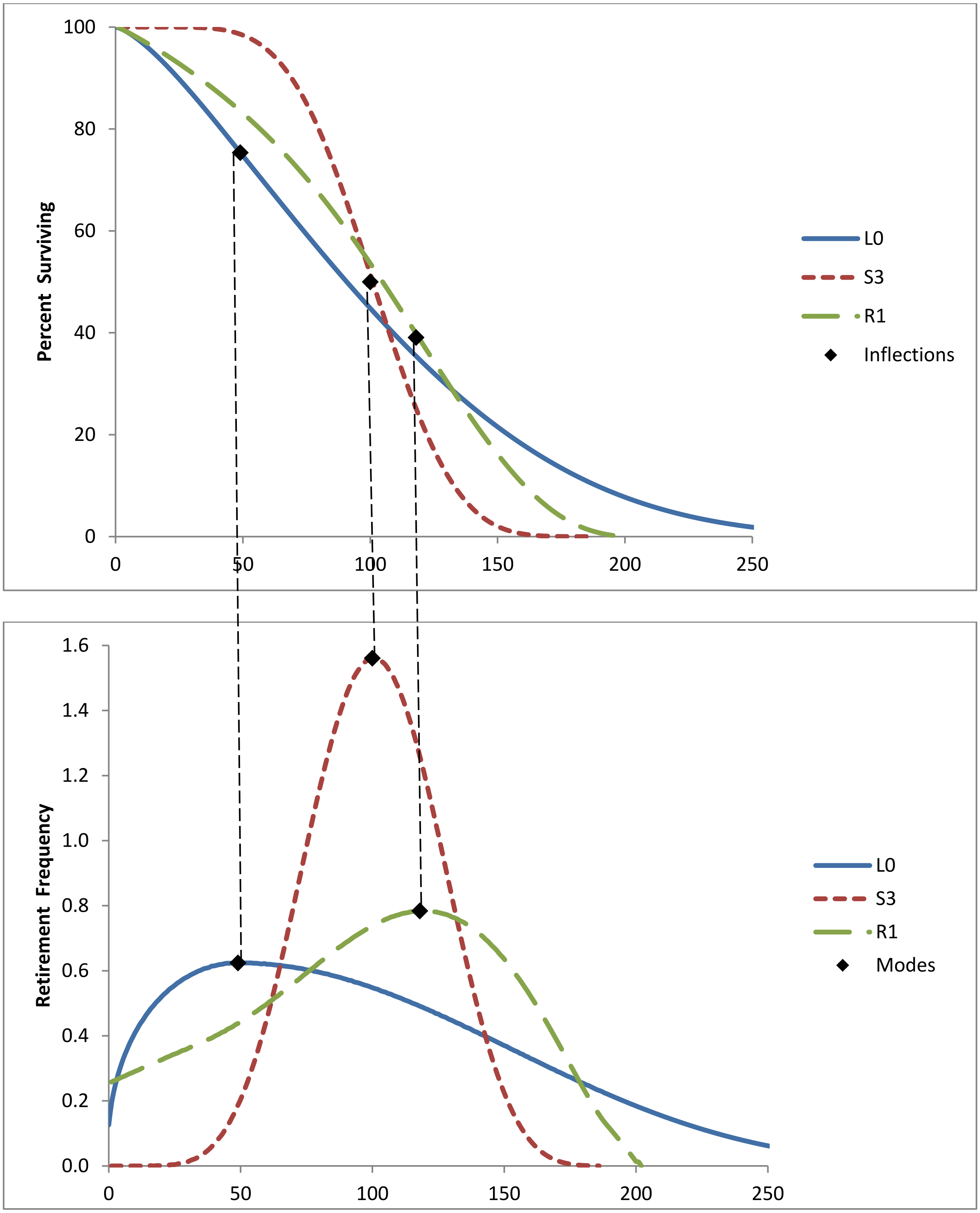
2. Classification

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

The classification of the survivor curves was made according to whether the mode of the retirement frequency curves was to the left, to the right, or coincident with average service life. There are three modal "families" of curves: six left modal curves (L0, L1, L2, L3, L4, L5); five right modal curves (R1, R2, R3, R4, R5); and seven symmetrical curves (S0, S1, S2, S3, S4, S5, S6).[65] 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.

[65] 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. 10, at 68).

Figure 18:
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."[66]

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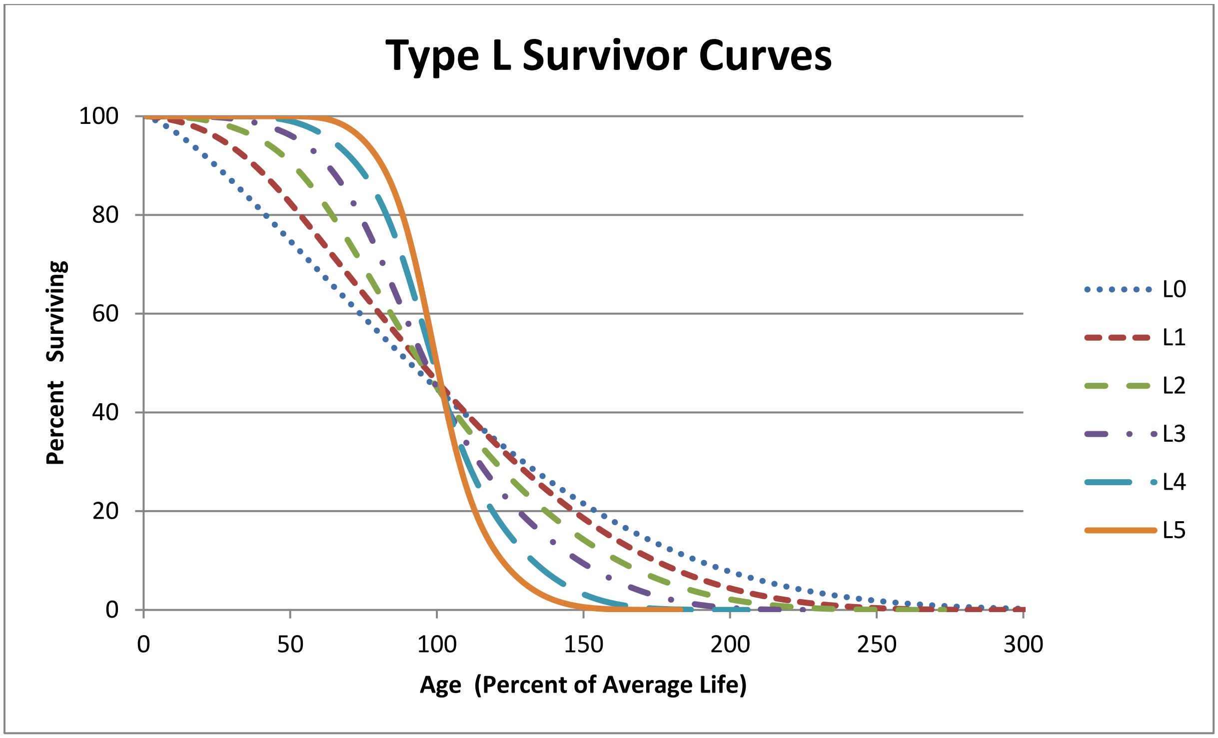
[66] Winfrey *supra* n. 75, at 60.

Figure 19:
Type L Survivor and Frequency Curves



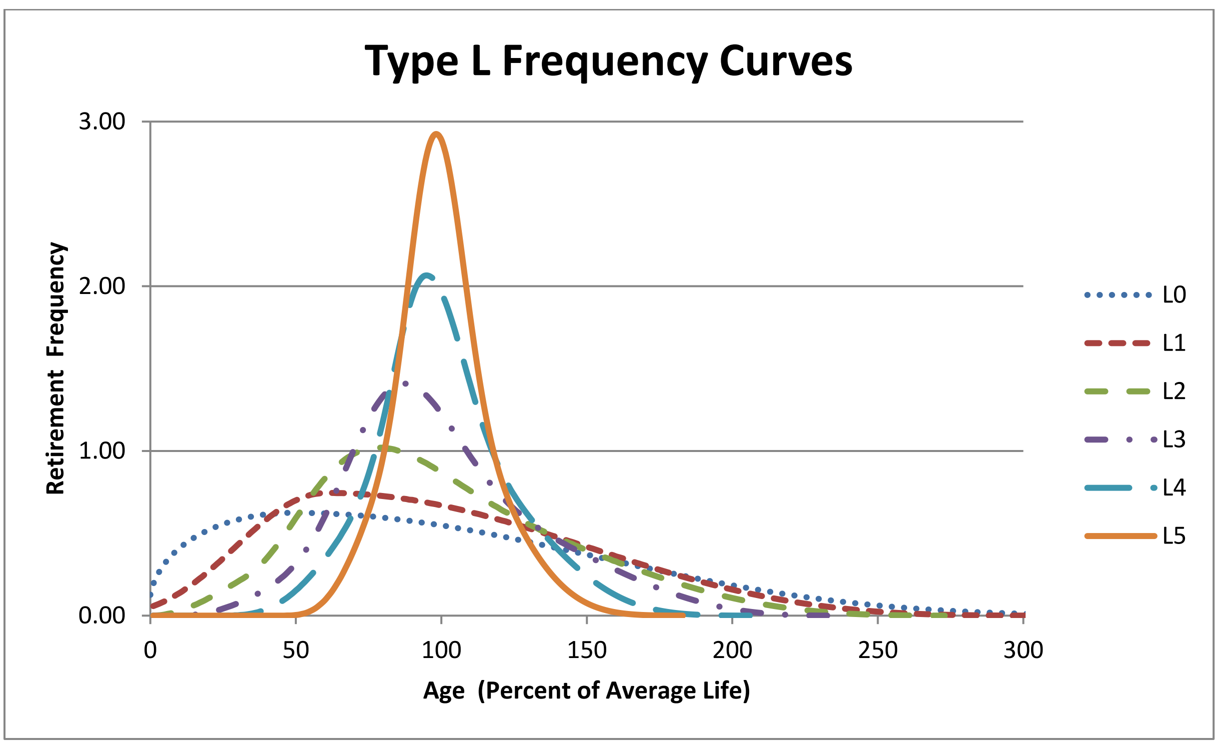
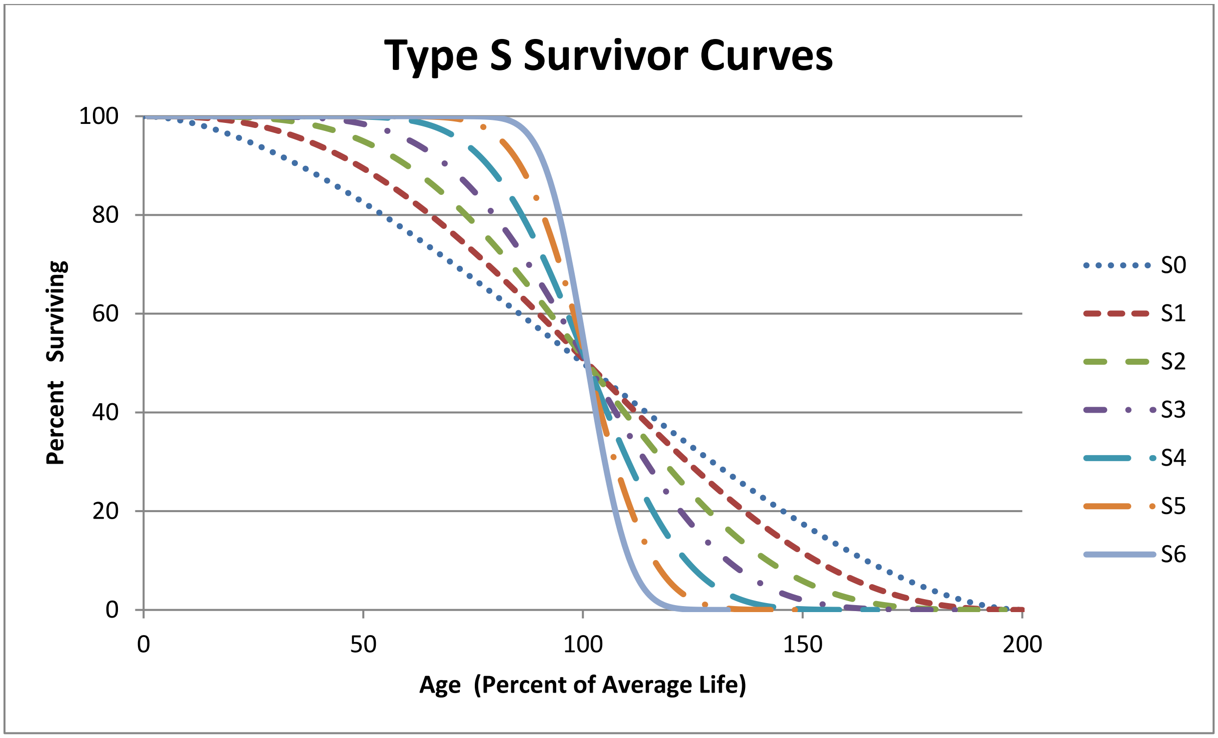


Figure 20:
Type S Survivor and Frequency Curves



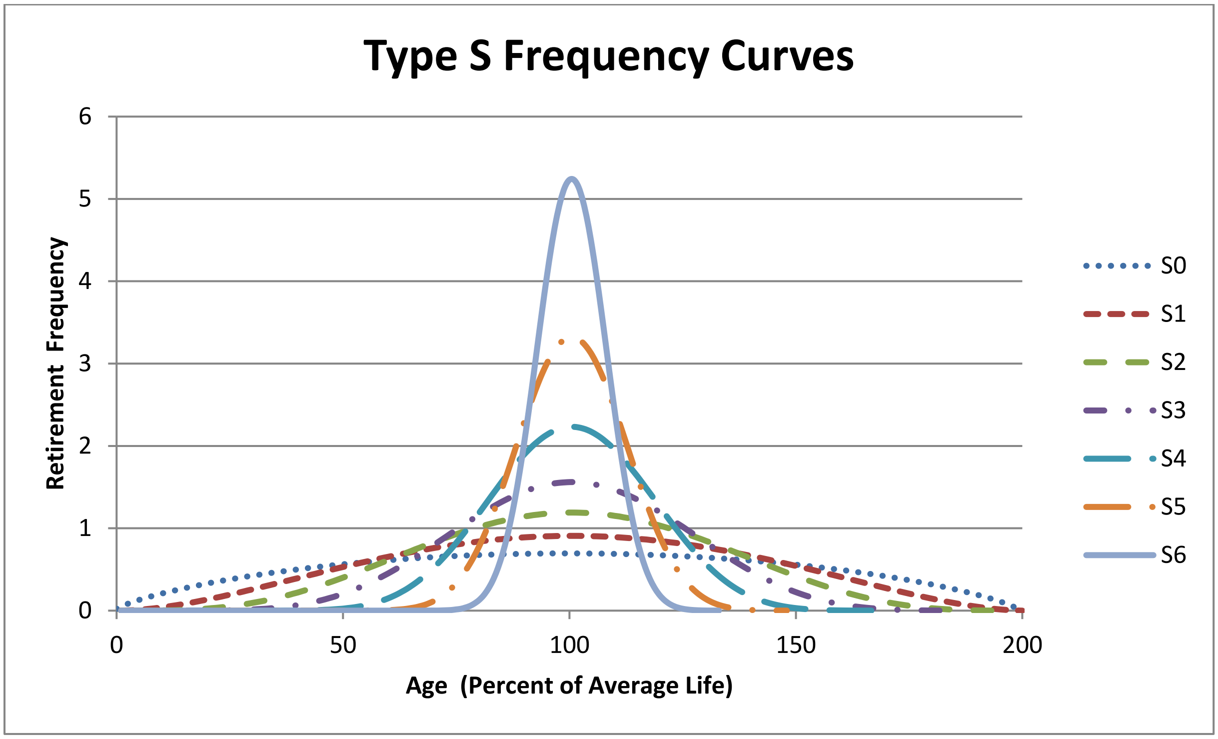
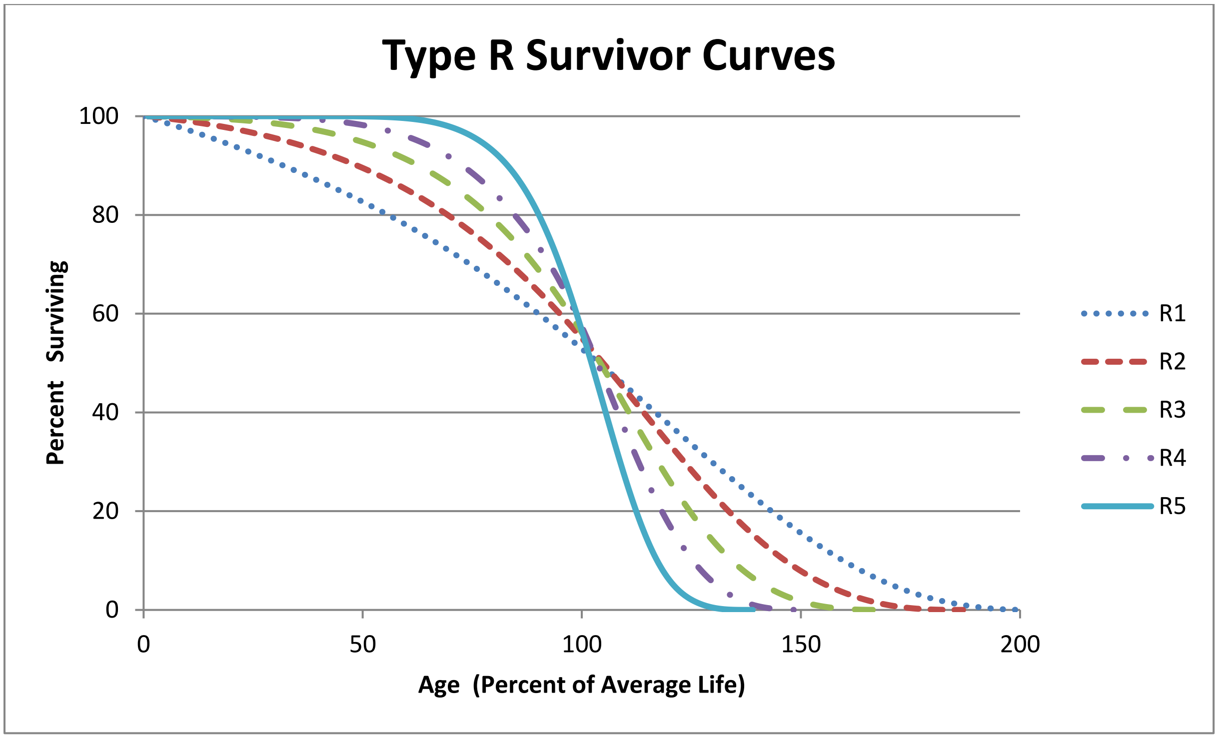
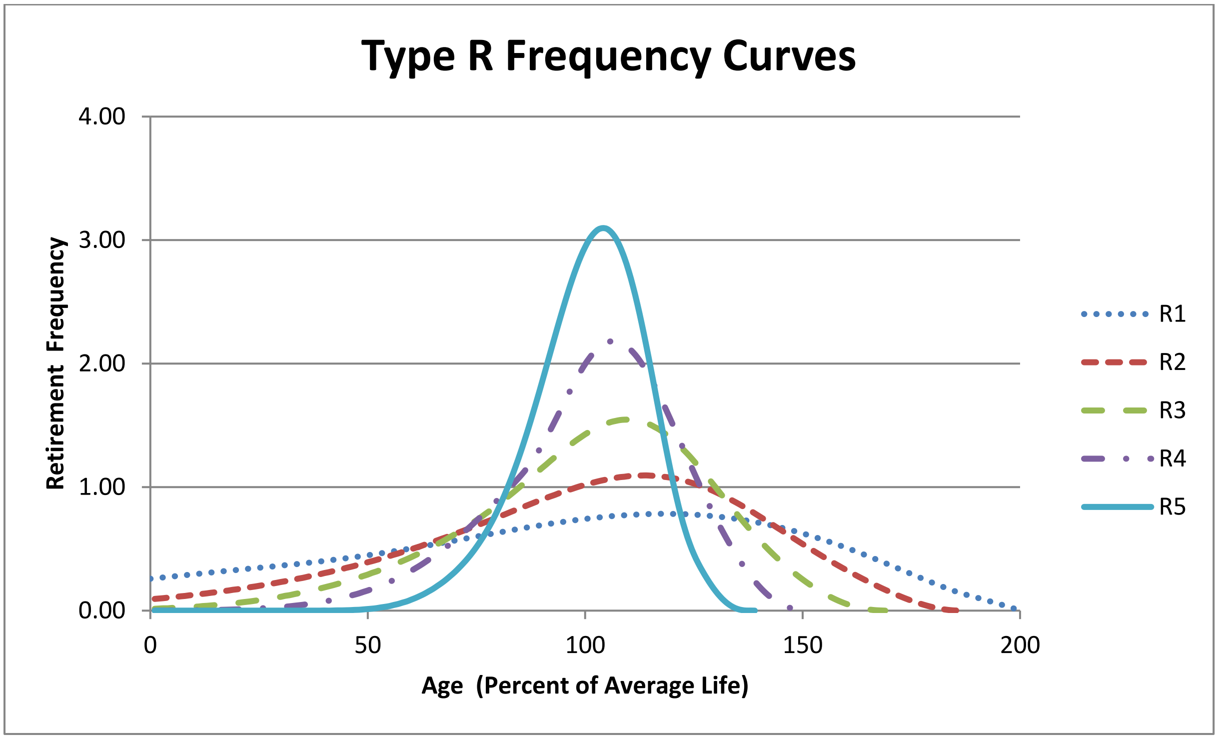


Figure 21:
Type R Survivor and Frequency Curves





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.[67]

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:[68]

Equation 4:
Average Life

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

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

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[67] 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.

[68] *See* NARUC *supra* n. 10, at 71.

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

Realized life is similar to average life, except that realized life is the average years of service experienced to date from the vintage's original installations.[69] 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.[70] 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

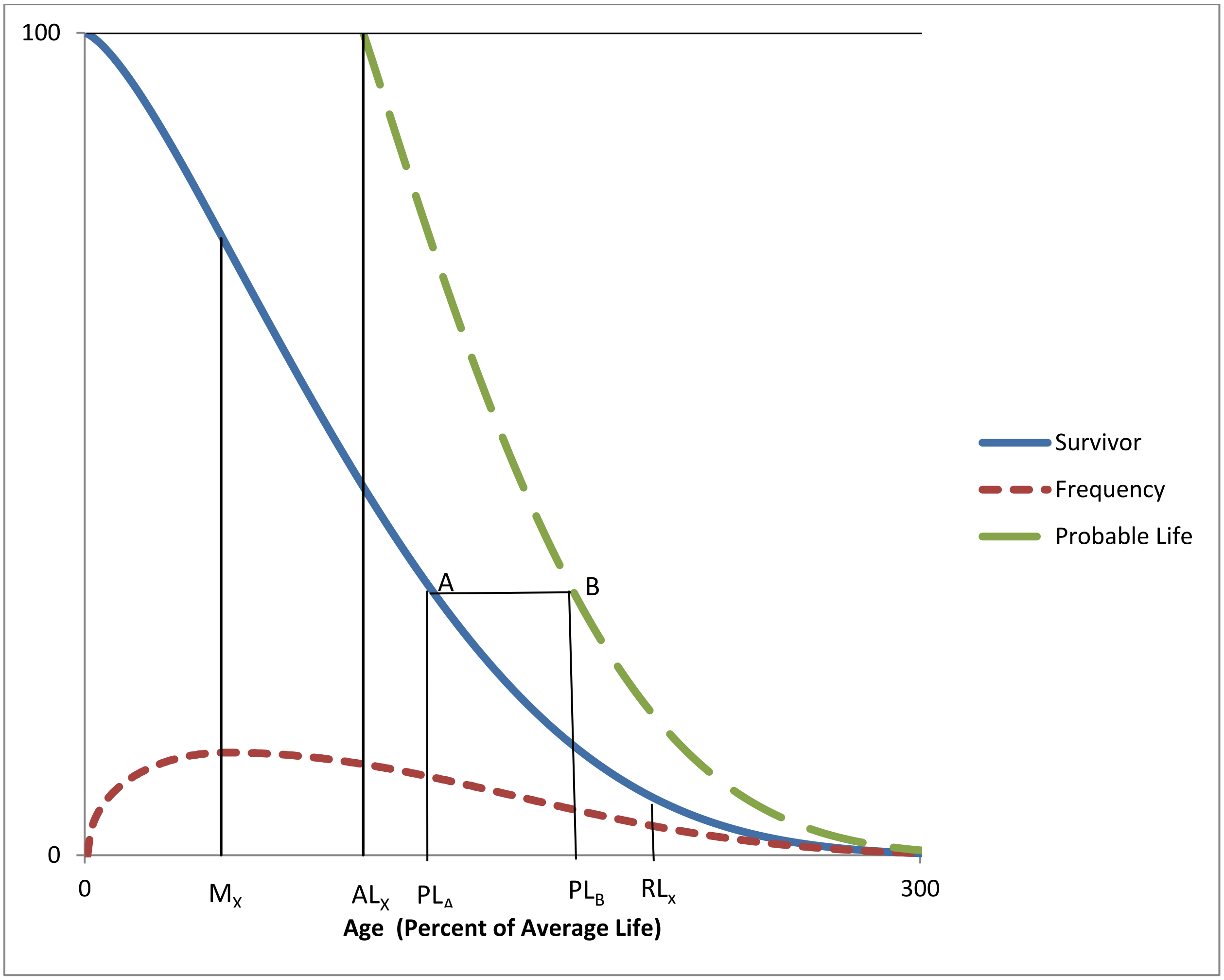
$$Average\ Remaining\ Life = \frac{Area\ Under\ Survivor\ Curve\ from\ Age\ x\ to\ Max\ Life}{S_X}$$

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

[69] *Id*. at 73.

[70] *Id*. at 74.

Figure 22:
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.[71] 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

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

the corresponding point on the survivor curve above at point “A,” then horizontally to point “B” on the probable life curve, and back down to the age corresponding to point “B.” It is no coincidence 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.[72]

Figure 23:
Forces of Retirement

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

While actuaries study historical mortality data in order to predict how long a group of people will live, depreciation analysts must look at a utility's historical data in order to estimate the average lives of property groups. A utility's historical data is often contained in the Continuing Property Records ("CPR"). Generally, a CPR should contain 1) an inventory of property record

[72] NARUC *supra* n. 10, at 14-15.

units; 2) the association of costs with such units; and 3) the dates of installation and removal of plant. Since actuarial analysis includes the examination of historical data to forecast future retirements, the historical data used in the analysis should not contain events that are anomalous or unlikely to recur.[73] 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.[74] 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 matrix is the exposure matrix, which shows the exposures

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

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

at the beginning of each year.[75] 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 24:
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	

[75] 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 25:
Retirement Matrix

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

These matrices help visualize how exposure and retirement data are calculated for each age interval. An age interval is typically one year. A common convention is to assume that any unit installed during the year is installed in the middle of the calendar year (i.e., July 1st). This convention is called the "half-year convention" and effectively assumes that all units are installed uniformly during the year.[76] 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).

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

The same calculation is applied to each number in the column. The amounts retired during the year in the retirements matrix affect the exposures at the beginning of each year in the exposures matrix. For example, the amount exposed to retirement in 2008 from the 2003 vintage is $261,000. The amount retired during 2008 from the 2003 vintage is $16,000. Thus, the amount exposed to retirement 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 26:
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			

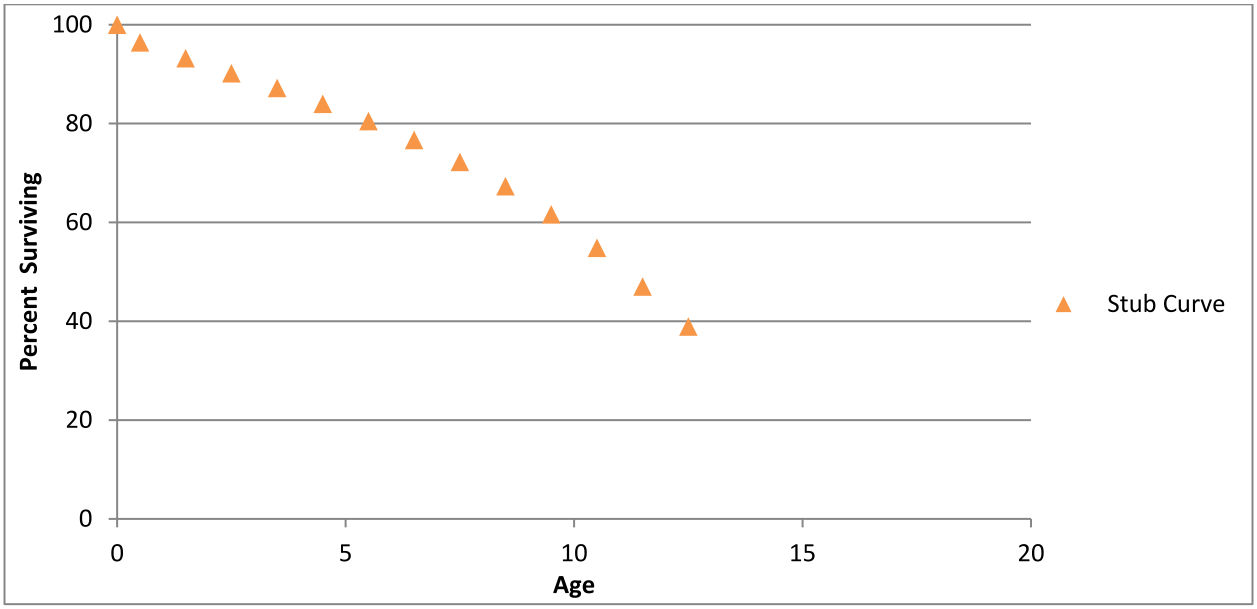
Column F on the right shows the percentages surviving at the beginning of each age interval. This column starts at 100% surviving. Each consecutive number below is calculated by multiplying the percent surviving from the previous age interval by the corresponding survivor ratio for that age interval. 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)[77].

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

[77] 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 27:
Original "Stub" Survivor Curve



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

Banding

The forces of retirement and characteristics of industrial property are constantly changing. A depreciation analyst may examine the magnitude of these changes. Analysts often use a technique called "banding" to assist with this process. Banding refers to the merging of several years of data into a single data set for further analysis, and it is a common technique associated with the retirement rate method.[78] 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.[79]

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.

[78] NARUC *supra* n. 10, at 113.

[79] *Id*.

Figure 28:
Placement Bands

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

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

Analysts often use placement bands for comparing the survivor characteristics of properties with different physical characteristics.[80] 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

[80] Wolf *supra* n. 7, 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.[81]

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.

[81] NARUC *supra* n. 10, at 114.

Figure 29:
Experience Bands

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

The shaded cells within the experience band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same experience band would be used for the retirement matrix covering the same experience years of 2011 – 2013. This of course would result in a different OLT and original stub survivor than if the band had not been used. Analysts often use experience bands to isolate and analyze the effects of an operating environment over time.[82] 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

[82] *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.

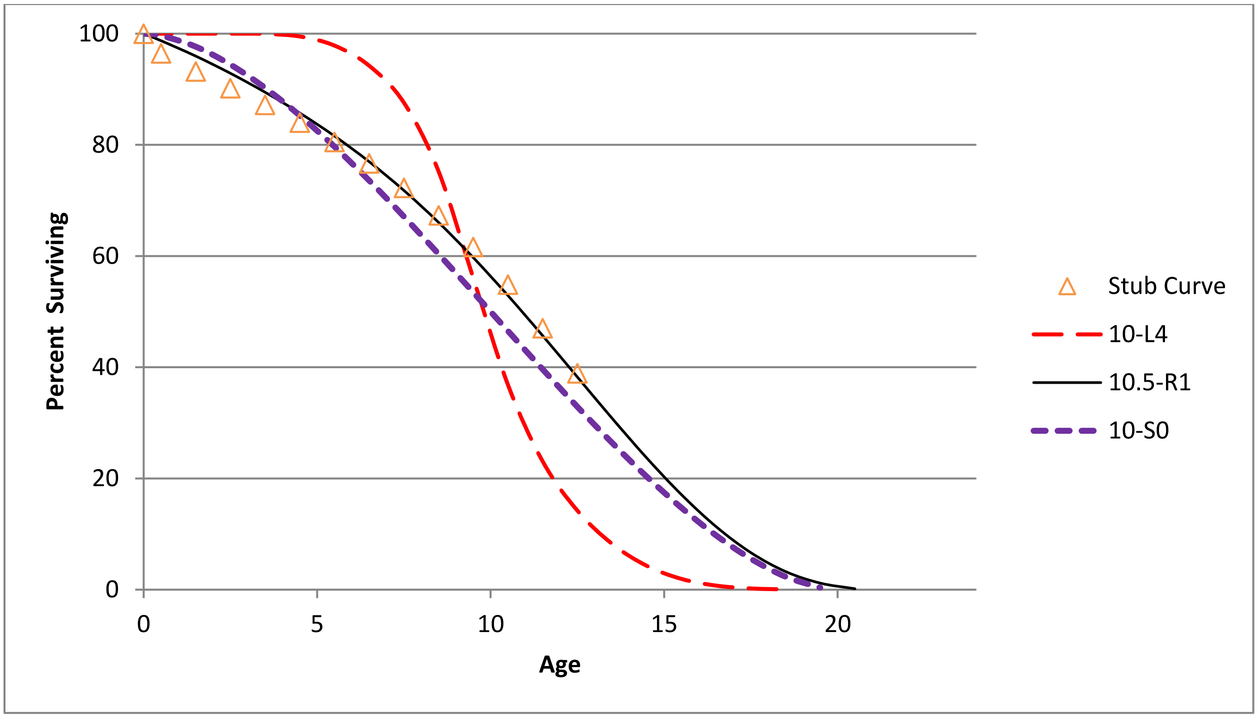
Curve Fitting

Depreciation analysts typically use the survivor curve rather than the frequency curve to fit the observed stub curves. The most commonly used generalized survivor curves 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."[83]

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.

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

Figure 30:
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.[84]

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."[85]

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.

---

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

[85] *Id*. at 48.

Figure 31:
Mathematical Fitting

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

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EDUCATION

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

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

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

PROFESSIONAL DESIGNATIONS

Society of Depreciation Professionals
Certified Depreciation Professional (CDP)

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

The Mediation Institute
Certified Civil / Commercial & Employment Mediator

WORK EXPERIENCE

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

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

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

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

TEACHING EXPERIENCE

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

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

PUBLICATIONS

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

VOLUNTEER EXPERIENCE

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

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

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

PROFESSIONAL ASSOCIATIONS

Oklahoma Bar Association — 2007 – Present

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

Society of Utility Regulatory Financial Analysts — 2014 – Present

SELECTED CONTINUING PROFESSIONAL EDUCATION

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

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

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

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

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

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

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

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lifes, net salvage	Indiana Office of Consumer Counselor
Public Utility Commission of Texas	Entergy Texas, Inc.	PUC 48371	Depreciation rates, decommissioning costs	Texas Municipal Group
Washington Utilities & Transportation Commission	Avista Corporation	UE-180167	Depreciation rates, service lives, net salvage	Washington Office of Attorney General
New Mexico Public Regulation Commission	Southwestern Public Service Company	17-00255-UT	Cost of capital and authorized rate of return	HollyFrontier Navajo Refining; Occidental Permian
Public Utility Commission of Texas	Southwestern Public Service Company	PUC 47527	Depreciation rates, plant service lives	Alliance of Xcel Municipalities
Public Service Commission of the State of Montana	Montana-Dakota Utilities Co.	D2017.9.79	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Florida Public Service Commission	Florida City Gas	20170179-GU	Cost of capital, depreciation rates	Florida Office of Public Counsel
Washington Utilities & Transportation Commission	Avista Corporation	UE-170485	Cost of capital and authorized rate of return	Washington Office of Attorney General
Wyoming Public Service Commission	Powder River Energy Corporation	10014-182-CA-17	Credit analysis, cost of capital	Private customer
Oklahoma Corporation Commission	Public Service Co. of Oklahoma	PUD 201700151	Depreciation, terminal salvage, risk analysis	Oklahoma Industrial Energy Consumers
Public Utility Commission of Texas	Oncor Electric Delivery Company	PUC 46957	Depreciation rates, simulated analysis	Alliance of Oncor Cities
Nevada Public Utilities Commission	Nevada Power Company	17-06004	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	El Paso Electric Company	PUC 46831	Depreciation rates, interim retirements	City of El Paso
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-24	Accelerated depreciation of North Valmy plant	Micron Technology, Inc.
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-23	Depreciation rates, service lives, net salvage	Micron Technology, Inc.
Public Utility Commission of Texas	Southwestern Electric Power Company	PUC 46449	Depreciation rates, decommissioning costs	Cities Advocating Reasonable Deregulation

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Massachusetts Department of Public Utilities	Eversource Energy	D.P.U. 17-05	Cost of capital, capital structure, and rate of return	Sunrun Inc.; Energy Freedom Coalition of America
Railroad Commission of Texas	Atmos Pipeline - Texas	GUD 10580	Depreciation rates, grouping procedure	City of Dallas
Public Utility Commission of Texas	Sharyland Utility Co.	PUC 45414	Depreciation rates, simulated analysis	City of Mission
Oklahoma Corporation Commission	Empire District Electric Co.	PUD 201600468	Cost of capital, depreciation rates	Oklahoma Industrial Energy Consumers
Railroad Commission of Texas	CenterPoint Energy Texas Gas	GUD 10567	Depreciation rates, simulated plant analysis	Texas Coast Utilities Coalition
Arkansas Public Service Commission	Oklahoma Gas & Electric Co.	160-159-GU	Cost of capital, depreciation rates, terminal salvage	Arkansas River Valley Energy Consumers; Wal-Mart
Florida Public Service Commission	Peoples Gas	160-159-GU	Depreciation rates, service lives, net salvage	Florida Office of Public Counsel
Arizona Corporation Commission	Arizona Public Service Co.	E-01345A-16-0036	Cost of capital, depreciation rates, terminal salvage	Energy Freedom Coalition of America
Nevada Public Utilities Commission	Sierra Pacific Power Co.	16-06008	Depreciation rates, net salvage, theoretical reserve	Northern Nevada Utility Customers
Oklahoma Corporation Commission	Oklahoma Gas & Electric Co.	PUD 201500273	Cost of capital, depreciation rates, terminal salvage	Public Utility Division
Oklahoma Corporation Commission	Public Service Co. of Oklahoma	PUD 201500208	Cost of capital, depreciation rates, terminal salvage	Public Utility Division
Oklahoma Corporation Commission	Oklahoma Natural Gas Co.	PUD 201500213	Cost of capital, depreciation rates, net salvage	Public Utility Division

CAUSE NO. 45159

ATTACHMENTS OF DAVID J. GARRETT

DJG-2 THROUGH 35

EXCEL SPREADSHEETS

Cause No. 45159
Northern Indiana Public Service Company LLC's
Objections and Responses to
Indiana Office of Utility Consumer Counselor's Set No. 21

OUCC Request 21-001:

Regarding the 2019 depreciation study (Petitioner's Exhibit No. 13, Attachment 13-C), at Table 1, please answer the following questions:

a. Please provide a schedule showing how the original cost (column 4) and the book depreciation reserve (column 5) were calculated.

b. Regarding Mr. Spanos's direct testimony regarding the Bailly Generating Station, p. 16, lines 3-5 ("I have assigned sufficient depreciation reserve to each of these units to account for the level of recovery to be fully accrued for these units by December 31, 2019"), please provide a schedule showing how any plant investments in Bailly were included in the 2019 projected book reserve amounts.

c. Please provide a revised Table 1 which projects 2019 book reserve balances excluding any plant investments in Bailly from the book depreciation reserve calculations.

Objections:

Response:

a) The original cost (column 4) and the book depreciation reserve (column 5) were calculated based on forecasted data and depreciation accrual rates. The amounts were presented in Table 2 and Table 3 of Exhibit No. 13, Attachment 13-C.

b) The amount of the book depreciation reserve for Bailly Generating Plant was segregated from the Table 3 calculations based on the specific life parameters in place for this case. Table 1 shows the book depreciation reserve for Bailly to be $636,016,364 prior to retirement. This amount includes $41,401.86 for additions to Bailly from 2017 through retirement.

c) The total plant investment for Bailly by account had the reserve reclassified to other units as set forth in OUCC Request 21-001 Attachment A.

NORTHERN INDIANA PUBLIC SERVICE COMPANY

RESERVE RECLASSIFICATIONS RELATED TO BAILLY GENERATING STATION RETIREMENT

		2018 AND 2019	
	ACCOUNT	INITIAL RETIREMENT REALLOCATED RESERVE	SECONDARY RETIREMENT REALLOCATED RESERVE
311.00	STRUCTURES AND IMPROVEMENTS	$ 9,965,373	$ (1,721,520)
312.10	BOILER PLANT EQUIPMENT	194,087,636	(20,306,354)
312.20	BOILER PLANT - MOBILE FUEL HANDLING AND STORAGE	1,431,515	(278,818)
312.30	BOILER PLANT - UNIT TRAIN COAL CARS	-	-
312.40	BOILER PLANT - SO2 PLANT EQUIPMENT	58,456	(4,361)
312.50	BOILER PLANT - COAL PILE BASE	-	-
314.00	TURBOGENERATOR UNITS	59,435,070	(5,733,118)
315.00	ACCESSORY ELECTRIC EQUIPMENT	5,722,170	(663,610)
316.00	MISCELLANEOUS POWER PLANT EQUIPMENT	10,486,804	(558,432)
	TOTAL	**$ 281,187,024**	**$ (29,266,213)**

AFFIRMATION

I affirm, under the penalties for perjury, that the foregoing representations are true.

Indiana Office of Utility Consumer Counselor
Cause No. 45159
NIPSCO

February 13, 2019
Date

CERTIFICATE OF SERVICE

This is to certify that a copy of the ***INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR'S TESTIMONY OF DAVID J. GARRETT - PUBLIC'S EXHIBIT NO. 5*** has been served upon the following parties of record in the captioned proceeding by electronic service on February 13, 2019.

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