BEFORE THE

GEORGIA PUBLIC SERVICE COMMISSION

IN RE:	**GEORGIA POWER COMPANY'S 2022 RATE CASE**	**)** **)**	**DOCKET NO. 44280**

DIRECT TESTIMONY

AND EXHIBITS

OF

LANCE KAUFMAN

ON BEHALF OF THE
GEORGIA PUBLIC SERVICE COMMISSION
PUBLIC INTEREST ADVOCACY STAFF

OCTOBER 20, 2022

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I. INTRODUCTION AND SUMMARY

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. My name is Lance D. Kaufman. I am a consultant providing expert testimony before state public utility commissions in the Northwest, Southwest and Intermountain West and Georgia.

Q. PLEASE IDENTIFY THE PARTY ON WHOSE BEHALF YOU ARE TESTIFYING.

A. I am testifying on behalf of the Georgia Public Service Commission Public Interest Advocacy Staff ("Staff").

Q. PLEASE SUMMARISE YOUR BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I have a Ph.D. in Economics from the University of Oregon with field work in industrial organization and econometrics. I have worked in the utility industry for 10 years performing analysis and providing testimony on depreciation, cost of capital, rate spread and rate design, net power costs, cost allocations, decoupling mechanisms, load forecasting, and resource planning. I am a Certified Depreciation Professional. My Curriculum Vitae is provided in Exhibit LK-1.

Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS.

A. I make the following recommendations:

1. Use the 2022 IRP economic lives of 2054 and 2058 as the terminal retirement dates for Hatch Units 1 and 2 respectively.
2. Remove the 25 percent contingency adder from the terminal net salvage of coal and gas production facilities.
3. Require the Company to file a decommissioning study of solar assets as part of its next rate case.

4. Calculate remaining lives using the survival curves identified in Exhibit LK-2 pages 20 through 22.

II. OVERVIEW OF DEPRECIATION RATES AND EXPENSE

Q. WHAT IS DEPRECIATION EXPENSE?

A. Depreciation is an expense that represents recovery of the Company's capital investment over the expected life of the investment. Depreciation expense also accounts for the expected cost of removal (COR) and salvage value over the expected life of the investment.

Q. HOW DOES RECOVERY OF INVESTMENT DIFFER FROM RETURN ON INVESTMENT?

A. Recovery of investment is the recovery of the original investment, while return on investment represents the financing cost on the asset. Assets are financed with a combination of debt and equity.

Q. HOW IS DEPRECIATION EXPENSE CALCULATED?

A. Depreciation expense is calculated by multiplying the gross plant balance in each Federal Energy Regulatory Commission ("FERC") account or subaccount by a depreciation rate specific to that account or subaccount. Depreciation rates are approved by the Commission in each general rate case and typically are not changed between rate cases. Depreciation rate recommendations made to the Commission are usually supported by a depreciation study.

Q. WHAT ARE GEORGIA POWER COMPANY'S RECOMMENDATIONS FOR DEPRECIATION RATES AND WHAT ARE THEY BASED ON?

A. Georgia Power Company's (Company or Georgia Power) proposed depreciation rates are contained in Appendix Exhibit 2 of the Company's filing. This appendix is a depreciation study performed on behalf of Georgia Power by the Alliance Consulting Group ("Alliance

Study").[1] The Alliance Study includes a general discussion of depreciation at pages 6 through 20. I agree with this general discussion and refer the Commission to it for detail on how depreciation rates are calculated. However, I disagree with certain parameters and findings in the Alliance Study related to specific assets and plant accounts. In this testimony I identify the parameters that I disagree with, recommend alternate parameters, and provide the rates resulting from these alternate parameters.

Q. WHAT GENERAL ISSUES DO YOU RAISE IN THIS TESTIMONY?

A. I address the terminal retirement date for Hatch plant, the decommissioning costs for coal and gas plants, and the survivor curves used to model future retirements.

Q. HOW SHOULD THE COMMISSION EVALUATE AND RESOLVE THE DISPUTED ISSUES THAT YOU RAISE?

A. The Commission should weigh the evidence in the record that is specific to each plant or account and make a conclusion about the expected retirement outcomes based on that evidence.

Q. HOW DOES CHANGING A DEPRECIATION RATE IMPACT BOTH THE COMPANY AND CUSTOMERS?

A. The primary function of depreciation is to allocate costs to customers across time over the service life of the asset. Thus, an increase or decrease in depreciation rates does not have a direct impact on the total amount collected from customers or returned to the Company over time. The primary impact from changing a depreciation rate is the year in which the capital is

[1] The Company's filed case deviates from the Alliance Study for the following plants: Bowen 1 and 2 coal units and Ft. Benning and Ft. Gordon solar facilities. The Alliance Study was produced prior to the Commission's order in the 2022 IRP denying the early retirement of Bowen Units 1 and 2. The Company's filed case contains rates for Bowen Units 1 and 2 that adopt the same interim retirement characteristics but extend the terminal retirement date to December 31, 2030. The Company's filing also contained formula errors affecting the depreciation expense calculations for Ft. Benning and Ft. Gordon solar facilities. I understand the Alliance Study contains the correct rates for these facilities and Company has or expects to submit a correction related to this.

fully recovered. A lower depreciation rate shifts the recovery of invested capital from the current time period to a future time period. A higher depreciation rate shifts the recovery of invested capital from a future time period to a current time period.

Q. WHY DO YOUR RECOMMENDATIONS FOCUS ON THE EXPECTED RETIREMENT OUTCOMES?

A. A commonly accepted premise of fairness is that those who benefit from a cost should bear the cost. This concept is applied when using cost of service studies to support the allocation of costs across customers. The same concept is used to support the recovery of capital across time. Customers benefit from utility plant only as long as the plant is in service. Thus, the recovery of the investment in plant should be spread across time that plant is expected to be in service. Depreciation rates calculated based on expected retirement outcomes accomplish this goal.

Q. IS IT SOUND POLICY TO COLLECT EXTRA EXPENSE IN ORDER TO ESTABLISH A BUFFER FOR UNEXPECTED RETIREMENTS OR COST OF REMOVAL?

A. No, this is not sound policy for several reasons. Expected outcomes are outcomes that represent what is expected on average. While retirements occasionally exceed or fall short of expectations, these shortfalls and excesses are expected to balance out. One property of a depreciation system is that it typically provides a mechanism for these shortfalls and excesses to accumulate and offset over time. Both the Alliance Study and my analysis adopt the Average Remaining Life Procedure. This procedure spreads excess and deficient depreciation reserves across the remaining lives of assets. In addition to the remaining life procedure, reserve transfers and regulatory asset accounting can be used to mitigate and address temporary excesses or shortfalls.

Because the expected outcome represents the outcome that is most likely to happen, collecting extra depreciation expense to establish a buffer beyond the expected outcome will over-allocate costs to current customers. This is unfair to current customers.

Q. THE ALLIANCE STUDY NOTES THAT INFORMED JUDGMENT PLAYS A ROLE IN STUDYING DEPRECIATION. HOW DO YOU RECOMMEND INFORMED JUDGMENT BE APPLIED?

A. The National Association of Regulatory Utility Commissioners ("NARUC") publication "Public Utility Depreciation Practices" offers the following guidance on the use of informed judgment:

> The use of informed judgment can be a major factor in forecasting. A logical process of examining and prioritizing the usefulness of information must be employed, since there are many sources of data that must be considered and weighed by importance. For example, the following forces of retirement need to be considered: Do the past and current service life dispersions represent the future? Will scrap prices rise or fall? What will be the impact of future technological obsolescence? Will the company be in existence in the future? The analyst must rank the factors and decide the relative weight to apply to each. The final estimate might not resemble any one of the specific factors; however, the result would be a decision based upon a combination of the components.

The NARUC manual highlights that informed judgment is a logical process that employs specific information and factors. This is important because it means that, when informed judgment is applied, the information considered and the logic that was applied should be identifiable. In this testimony, when I apply informed judgment, I identify the factors that I considered and the logic that I apply in order to aid the Commission in determining whether my judgment is reasonable.

Q. WHAT GUIDANCE CAN AID THE COMMISSION IN WEIGHING THE MERITS OF THE INFORMED JUDGMENT THAT YOU APPLY AND THAT OF THE COMPANY?

A. I recommend the Commission apply the results of academic research into the reliability of judgmental forecasts. This research offers five principles for reliable judgmental forecasting:

1. Organize and present information in a form that clearly emphasizes relevant information.
2. Limit the amount of information used in judgmental forecasting. Use a small number of particularly important cues.
3. Use mechanical methods to process information.
4. Combine several forecasts.
5. Require justification of forecasts.[2]

I applied these principles in developing the recommendations in my testimony. However, I recommend the Commission place particular emphasis on the final principle of justification of forecasts. This principle is important to follow in a regulatory setting.

Q. HOW ARE DEPRECIATION RATES CALCULATED?

A. The depreciation expense for an account is an amount that, if collected over the average remaining life for the assents in the account and combined with current accumulated depreciation, will be equal to the amount that needs to be recovered, or the original investment in the assets less expected net salvage. Annual depreciation expense, or accrual, is expressed as a formula below.

[2] Stewart, T. R. (2001). Improving reliability of judgmental forecasts. In J. S. Armstrong (Ed.), Principles of Forecasting: A Handbook for Researchers and Practitioners (pp. 81-106): Kluwer Academic Publishers.

$$Annual\ Depreciation\ Expense = \frac{Plant\ in\ Service - Total\ Net\ Salvage - Reserve}{Average\ Remaining\ Service\ Life}$$

The depreciation accrual rate is a rate that, when multiplied by the total investment or plant balance, will return the depreciation expense. This is expressed as a formula below.

$$Depreciation\ Accrual\ Rate = \frac{Annual\ Depreciation\ Amount}{Plant\ in\ Service}$$

Exhibit LK-2 contains the calculation of depreciation rates based on my recommendations. Working backwards through the calculations on Exhibit LK-2 page 1, the Accrual Rate-Staff Proposed (depreciation rate) column is the Annual Depreciation Amount divided by the Plant in Service. Thus, when the depreciation rate is multiplied by the Plant in Service it will result in the Annual Depreciation Amount. The Annual Depreciation Amount is the Amount to Be Recovered divided by the Remaining Life. The Amount to Be Recovered is the Plant in Service minus Net Salvage Amount minus Allocated Depreciation, and the Net Salvage Amount is the Amount to Be Recovered multiplied by the Net Salvage %.

Thus, the depreciation rate requires four inputs, Plant In Service, Allocated Depreciation (or Reserve), Net Salvage %, and Remaining Life, and the depreciation rate is calculated with the following formula:

$$Depreciation\ Accrual\ Rate = \frac{Plant\ in\ Service * (1 + Net\ Salvage\ Rate) - Reserve}{Plant\ in\ Service * Remaining\ Life}$$

Plant in Service and Reserve are typically undisputed values that are adopted from the utility's accounting records.[3] The primary focus of a depreciation study is the calculation of the net salvage rate and remaining life.

[3] Occasionally Plant in Service or Reserve are disputed, but I do not dispute these amounts in this testimony.

Q. HOW DO THE ISSUES YOU MENTIONED EARLIER REGARDING TERMINAL RETIREMENT DATE, DECOMMISSIONING COSTS, AND SURVIVOR CURVES RELATE TO THE NET SALVAGE RATE AND REMAINING LIFE?

A. The terminal retirement date affects the remaining life calculation for assets where an entire group of assets is scheduled to be retired collectively, such as generating units. The decommissioning cost is an input into the net salvage rate for assets that are decommissioned as part of terminal retirement. The survivor curves are statistical distributions that are used to calculate the remaining lives of assets.

III. TERMINAL RETIREMENT DATES

Q. WHAT TERMINAL RETIREMENT DATES ARE PROPOSED BY THE COMPANY FOR HATCH NUCLEAR PLANT DEPRECIATION RATES?

A. The Company uses a terminal retirement date of 2038 for Hatch Common and Hatch Unit 2, and a terminal retirement date of 2034 for Hatch Unit 1 when calculating depreciation rates.[4]

Q. WHAT ARE THE COMPANY'S EXPECTED TERMINAL RETIREMENT DATES FOR THE HATCH PLANT?

A. The Company currently expects to retire Hatch Unit 1 in 2054 and Unit 2 in 2058. In Docket No. 44160 the Company requested and received Commission approval for the capital and O&M costs that the Company will incur for the subsequent license renewal for Plant Hatch Units 1 and 2.[5] The Company expects to submit an application for, and receive approval of, a license extension of this plant.[6]

[4] Appendix Exhibit 2 pages 117 and 118.
[5] Company Direct Hearing Transcript Day 1 page 329.
[6] Georgia Power Response to Staff Data Request STF-AI-1-34.

Q. HOW HAS THE COMMISSION TREATED DEPRECIATION LIVES FOR NUCLEAR PLANTS PRIOR TO FINAL NUCLEAR REGULATORY COMMISSION ("NRC") APPROVAL FOR PAST LICENCE EXTENSIONS?

A. The Commission has granted extended depreciable lives prior to final approval in the past. In the Company's 2007 rate case docket, Docket No. 25060, the depreciable life for the currently operating Plant Vogtle Nuclear Units 1 and 2 was extended prior to NRC approval of the corresponding license extensions.

Q. DOES THE COMPANY AGREE THAT THE COMMISSION'S TREATMENT OF VOGTLE'S DEPRECIABLE LIFE CAN REASONABLY BE APPLIED TO HATCH?

A. The Company has agreed that if the facts and circumstances for the Hatch plant are similar to those of Vogtle, it is reasonable to apply a similar treatment of depreciable life to the Hatch plant.[7]

Q. ARE THE FACTS AND CIRCUMSTANCES OF HATCH SIMMILAR TO VOTGLE?

A. Yes. While there are some differences between these two plants, these differences are immaterial in the context of setting depreciation rates. Depreciation rates reflect expectations about future plant retirements. While there is a small chance that the Hatch plant will not have its license extended, the expected outcome is a life extension, and thus depreciation rates should reflect this.

Q. WHAT IS THE BASIS FOR YOUR JUDGMENT THAT THE EXPECTED OUTCOME FOR THE HATCH PLANT IS RETIREMENT IN 2054 AND 2058?

A. I considered that the Company currently expects to apply for and receive a license extension for such dates. Based on the information provided by the Company, it appears highly likely that the extension will occur. There is a small but unquantified chance that the Company does

[7] Company Direct Hearing Transcript Day 1 page 332.

not receive the license or finds it economical to retire early despite the license extension. However, given the current national concerns regarding fuel security, energy diversity, and greenhouse gas emissions, this seems unlikely. There is also a small chance that the Company extends the life beyond 2058. I concluded that impact of these alternate outcomes offset each other, and a reasonable expectation is to rely on the expected outcome of retirement in 2054 and 2058.

Q. WHAT IS THE IMPACT OF YOUR RECOMMENDATION?

A. Exhibit LK-2 pages 1 through 15 provides a comparison of my recommended rates with the Company's filed depreciation study. My recommendation reduces depreciation expense under December 31, 2020 plant balance by approximately $128 million per year.[8] The impact of my recommendations within the overall context of Staff's case is provided in the Direct Testimony and Exhibits of Ralph Smith and Robert Trokey.

[8] Calculated as the difference between the Alliance Study composite depreciation rate and the Staff composite depreciation rate of -0.371% times the December 31, 2021 plant balance of $34,499,288,719. *See* Exhibit LK-2 page 15. I understand that the Company's filing may differ from the Alliance Study with respect to Bowen Units 1 and 2 and other minor changes.

IV. DECOMMISSIONING COSTS

Q. WHAT TREATMENT HAS THE COMPANY REQUESTED FOR GENERATION PLANT DECOMMISSIONING COSTS?

A. The Company has requested that the results of its most recent decommissioning study be implemented when calculating depreciation rates.

Q. WHAT IS YOUR RESPONSE TO THE COMPANY'S RECOMMENDATION?

A. The Company's study appears reasonable for hydro generation. However, decommissioning expense for coal and gas plants appear overstated while decommissioning expense for solar plants appear understated. I recommend that the contingency component of coal and gas plants be removed from depreciation rates and that the Company be required to submit a revised study of solar decommissioning costs in its next general rate case.

a. Coal Plants

Q. WHY HAVE YOU CONCLUDED THAT THE DECOMMISSIONING EXPENSE FOR COAL AND GAS PLANTS IS OVERSTATED?

A. The Company has finished decommissioning or is in the process of decommissioning 11 coal plants.[9] The actual expenses incurred for decommissioning these plants provides a base line of actual decommissioning costs against which the Company's decommissioning study can be evaluated. Of these plants, two plants, McDonough-Atkinson and Branch, have completed decommissioning and have similar size characteristics to the Company's four remaining coal plants.[10]

[9] Response to Staff DR STF-AI-1-15 Attachment A.

[10] Yates is a coal plant that has been converted to gas fire. I analyze Yates with other coal plants because the primary structures to be demolished are likely more similar to coal plants than gas plants.

Q. WHAT ARE THE CHARACTERISTICS OF THE COMPANY'S REMAINING COAL PLANTS?

A. The table below summarizes the capacity of the Company's remaining coal or converted coal plants.

Table 1

Plant	MW	Units	MW per Unit
Bowen	3,376	4	844
Scherer	3,720	4	930
Wansley	1,840	2	920
Yates	700	2	350

Three plants consist of multiple large, nearly gigawatt-sized units, while Yates consists of two midsized 350 megawatt (MW) units. All four units are situated in geographically accessible locations without apparent decommissioning complications. The Company's decommissioning study does not note any specific circumstances for these plants that would cause decommissioning to be more complex or costly than normal.

Q. WHAT ARE THE CHARACTERISTICS OF THE DECOMMISSIONED PLANTS THAT ARE COMPARABLE TO REMAINING PLANTS?

A. The table below summarizes the size and decommissioning costs for comparable decommissioned plants.[11] The Branch plant is most similar to the remaining plants in size and scope.

Table 2

			WM	Decomm. Cost	
Plant	MW	Units	per Unit	Total	Per MW
Total McDonough-Atkinson Steam	490	2	245	$10,718,205	$21,874
Total Branch Steam	1540	4	385	$29,546,844	$19,186

[11] The Company's discovery response, prior decommissioning study, and website all disagree on the capacity of the Branch plant. This table uses the capacity reported on the company's website.

Q. HOW DID THE DECOMMISSIONING COST FOR MCDONOUGH-ATCKINSON AND BRANCH PLANTS COMPARE TO THE FORECASTED COSTS?

A. No decommissioning study was available for the McDonough-Atkinson plant.[12] The Actual decommissioning cost of the Branch plant was half of the amount forecasted in the decommissioning study.[13]

Q. HOW DOES THE COMPANY'S FORECASTED DECOMMISSIONING COSTS OF COAL PLANTS COMPARE TO ACTUAL COSTS FOR COMPARABLE PLANTS?

A. The Company's forecasted cost for decommissioning the remaining steam plants is provided in the Table 3 below.[14] Note that on a $ per MW basis, the forecasted decommissioning costs exceed actual decommissioning costs in Table 4.

Table 3

Plant	MW	Total Cost	$/MW
Bowen	3,376	$92,081,875	$27,275
Scherer	3,720	$106,546,060	$28,641
Wansley	1,840	$56,218,640	$30,554
Yates	700	$18,351,977	$26,217
All Plants	9,636	273,198,552	$28,352

Q. WHAT ACCOUNTS FOR THE DIFFERENCE BETWEEN ACTUAL AND FORECASTED COAL PLANT DECOMMISSIONING COSTS?

A. The decommissioning study includes a 25 percent contingency adder for each plant. When the costs in Table 3 are adjusted to remove the contingency component forecasted costs are consistent with actual costs, as shown in Table 4 below.

[12] Response to Staff DR STF-AI-1-15.

[13] Response to Staff DR STF-AI-1-15 Attachment J Trade Secret page 3.

[14] Appendix Exhibit 2 pages 166 and 167.

Table 4

Plant	MW	Company Cost	Contingency	Adjusted Cost	$/MW
Bowen	3,376	$92,081,875	$18,416,375	$73,665,500	$21,820
Scherer	3,720	$106,546,060	$21,309,212	$85,236,848	$22,913
Wansley	1,840	$56,218,640	$11,243,728	$44,974,912	$24,443
Yates	700	$18,351,977	$3,670,395	$14,681,582	$20,974
All Plants	9,636	$273,198,552	$54,639,710	$218,558,842	$22,681

Q. SHOULD CONTINGENCY COSTS BE INCLUDED IN DEPRECIATION RATES?

A. No, depreciation rates should reflect expected outcomes rather than unexpected outcomes. Contingency costs are costs that are intended to account for unexpected outcomes.

Q. WHAT IS YOUR RECOMMENDATION REGARDING COAL PLANT DECOMMISSIONING?

A. I recommend that contingency cost be removed from the coal plant terminal retirement cost forecast.

Q. WHAT IS THE BASIS FOR YOUR JUDGMENT THAT CONTINGENCY COSTS SHOULD BE REMOVED FROM DEPRECIATION RATES?

A. I considered that the Company's historic decommissioning cost per MW is substantially lower than the forecasted costs, the Company's history of over forecasting coal plant decommissioning cost, and that contingency costs represent costs that are not expected to occur.

b. Gas Plants

Q. WHY HAVE YOU CONCLUDED THAT GAS PLANT DECOMMISSIONING COSTS ARE OVERSTATED?

A. This conclusion is based on a similar rationale as coal plants. Specifically, historic experience does not support the utility's decommissioning study and contingency fees are inappropriate to include when calculating depreciation rates.

Q. HOW DO HISTORIC GAS PLANT RETIREMENT COSTS COMPARE TO THE COMPANY'S FORECAST?

A. The table below summarizes historic gas plant retirement costs. The total retirement costs are presented with and without three potentially abnormal costs.

Table 5

Plant Retired	MW	Plant In Service	COR	Salvage	Net Salvage	Net Salvage Per MW
Arkwright	30.58	$ 4,830	$ 61	$ (190)	$ (129)	$ (4.22)
Atkinson	78.72	6,937	245	(810)	$ (565)	$ (7.18)
Boulevard Units 2 & 3	39.40	942	533	(72)	$ 461	$ 11.70
Bowen Unit 6	39.40	3,614	403	72	$ 476	$ 12.07
Intercession City	57.00	12,553	-	(8,139)	$ (8,139)	$ (142.79)
Kraft	22.00	2,886	32	(10)	$ 23	$ 1.02
McManus Diesel	61.00	626	-	-	$ -	$ -
Mitchell Units 4A, 4B, & 4C	39.40	12,373	2	(990)	$ (987)	$ (25.06)
All Plants	367.50	44,761	1,276	(10,138)	(8,862)	$ (24.11)
All Except Intercession	310.50	32,208	1,276	(1,999)	(723)	$ (2.33)

Q. WHAT HAS THE COMPANY FORECASTED FOR THE COST TO RETIRE THE REMAINING GAS PLANTS?

A. The table below summarizes the decommissioning costs included in the Company's study.

Table 6

Plant	Total Cost	MW	$ per MW
Boulevard	$ 6,881	19	$ 2,382
McDonough	14,181,833	2,772	5,116
McIntosh CC	8,695,953	1,360	6,395
McIntosh CTs	3,879,000	756	5,131
McManus	2,344,557	499	4,702
Robins	1,483,423	186	7,975
Wansley	4,287,715	32	133,574
Wilson	1,509,586	353	4,271

The proposed cost per MW for future gas plant retirements far exceeds the historic cost per MW. In fact, historic costs show that salvage value has on average exceeded cost of removal. Georgia Power's decommissioning study includes a 25 percent contingency. This contingency

does not reflect expected decommissioning costs, and thus is inappropriate to include in depreciation rates.

Q. WHAT IS YOUR RECOMMENDATION REGARDING DECOMMISSIONING OF GAS PLANTS?

A. I recommend the costs associated with the 25% contingency factor be removed from the decommissioning expense used to calculate depreciation rates for gas plants.

c. Nuclear Plant

Q. PLEASE SUMMARIZE YOUR ANALSYS OF NUCLEAR PLANT DECOMMISSIONING COSTS.

A. Nuclear decommissioning and decommissioning funding are regulated by the Nuclear Regulatory Commission. Georgia Power collects decommissioning funds from rate payers to fund nuclear decommissioning and contributes these funds to a trust. Georgia Power has represented that its nuclear plant decommissioning trust is fully funded and does not require additional contributions. No funds are requested in this rate case related to nuclear plant decommissioning. I recommend the Commission accept the Company's filed nuclear plant decommissioning expense included in rates.

d. Hydro Plant

Q. PLEASE SUMMARIZE YOUR ANALYSIS OF HYDRO PLANT DECOMMISSIONING COSTS.

A. Georgia Power has a limited history of hydro generation plant decommissioning, with only two decommissioned facilities. Georgia Power's hydro decommissioning study does not appear to include contingency costs. I recommend the Commission accept the Company's filed hydro plant decommissioning related depreciation expense included in rates.

e. Solar Plant

Q. PLEASE SUMMARIZE YOUR ANALYSIS OF SOLAR PLANT DECOMMISSIONING COSTS.

A. The Company has assumed no net decommissioning costs for its solar facilities. This assumption is not realistic as solar facilities are expected to have decommissioning costs. One solar developer has estimated solar decommissioning costs to range from $25,000 to $50,000 per MW.[15] However, these estimates are not specific to the Company's facilities. Although there is no basis for the Company's assumption of no cost, I do not recommend an alternate rate because a formal study of the Company's specific costs has not been performed. I recommend the Commission approve the Company's proposed solar decommissioning expense, but also direct the Company to sponsor a solar decommissioning study of Company owned solar facilities and to incorporate these costs into its next depreciation study.

V. REMAINING LIVES

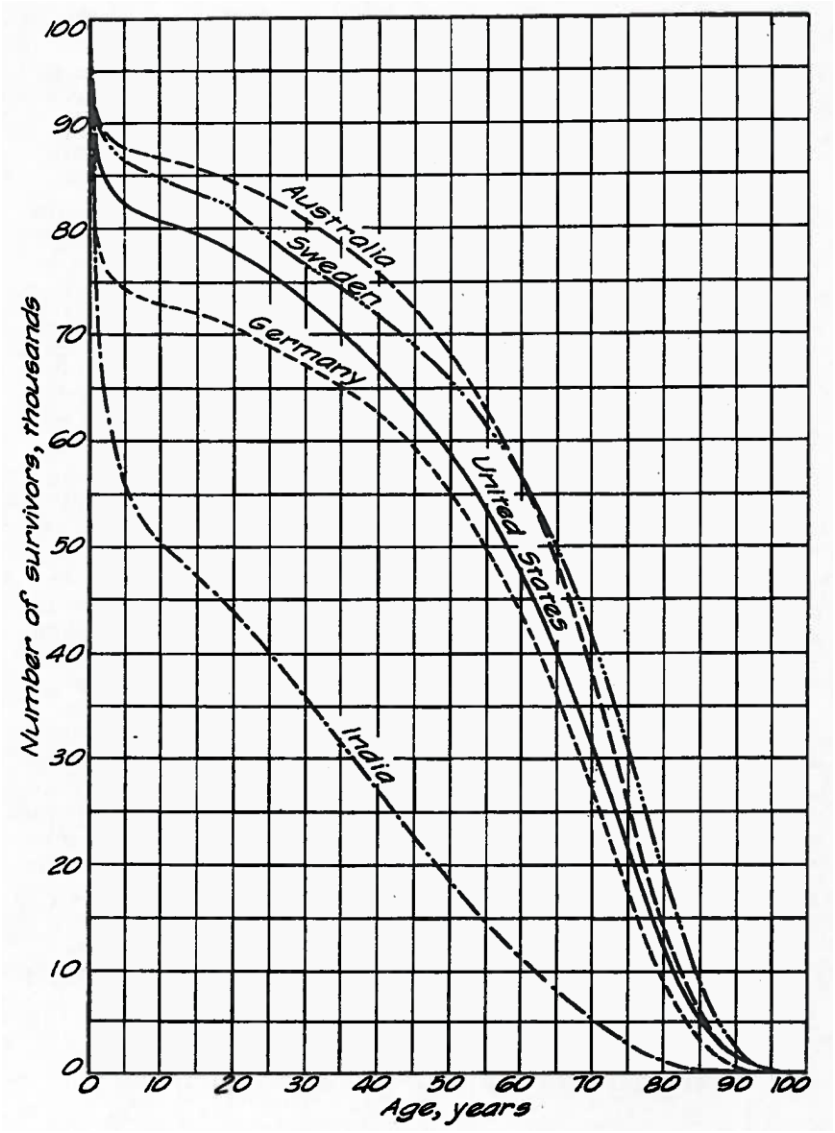
Q. HOW IS AN ACCOUNT'S EXPECTED REMAINING LIFE CALCULATED?

A. Remaining life is determined by modeling when each asset in an account is expected to retire. Like humans, not all assets retire at the same age. The average age of human retirement in the United States is currently 61 years old, but some retire before or after that age. . Retirements of both people and assets follow a statistical distribution, and the shape of that distribution determines the average age of retirement. The figures below illustrate examples of different

[15] Calculated from https://solunesco.com/2018/09/10/decommissioning-of-solar-sites-a-key-consideration-of-the-project/

distributions, expressed as percent surviving.[16] This figure expresses distributions as proportion surviving. In depreciation studies, retirement distributions are typically represented in this format and referred to as survivor curves.

Figure 1



[16] These distributions represent human mortality distributions from 1921, as presented in Robley Winfrey, (1935) Bulletin 125, Iowa Engineering Experiment Station page 16. Available at https://hdl.handle.net/2027/mdp.35128000776532.

Remaining life is the difference between current age and retirement age. For any given retirement distribution, remaining life is a function of current age. In the simplest example, suppose every person retires at age 61, and no person retires early or late. Under this distribution remaining life follows the function:

$$Remaining\ Life = 61 - Current\ Age$$

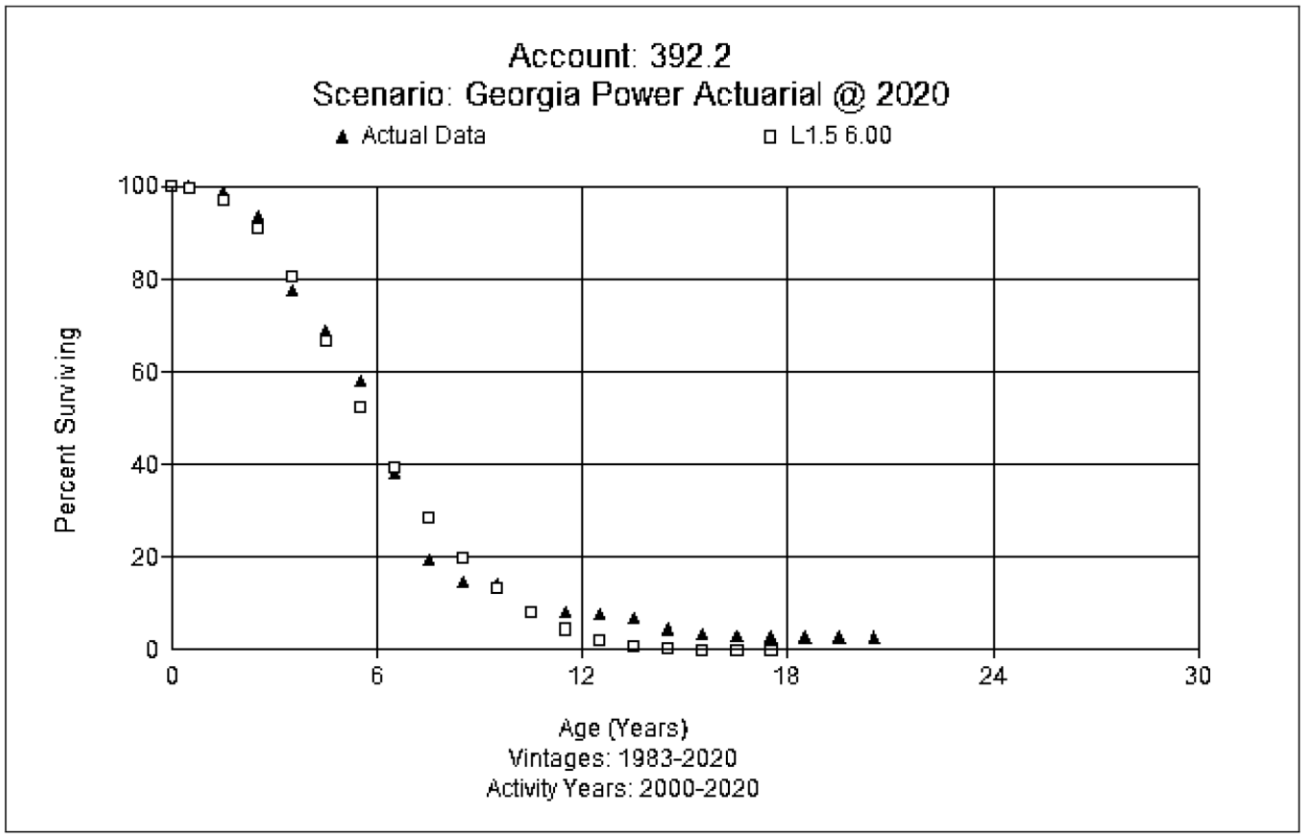
Different retirement distributions have different remaining life functions; however, each retirement distribution corresponds to a single remaining life function. Remaining life is thus dependent on the expected distribution of future retirements.

Q. HOW IS THE DISTRIBUTION OF FUTURE RETIREMENTS DETERMINED?

A. The distribution of retirements is typically expressed as a distribution shape, an average age, and for some accounts a terminal retirement date. The Alliance Study estimates distribution shape and average age by visually matching historical retirements to various standardized survival curves.[17] For example, for the account 392.21 Light Trucks the Alliance Study recommends the use of the L1.5 shaped Iowa curve and an average life of 6 years. This distribution produces a reasonable visual fit of the historic data, as seen below.

[17] Alliance Study page 17. For some accounts the Alliance study uses an alternate method called the "Simulated Plant Record Procedure". I do not dispute the Alliance results that rely on this procedure, and thus focus on the survival curve fitting procedure.

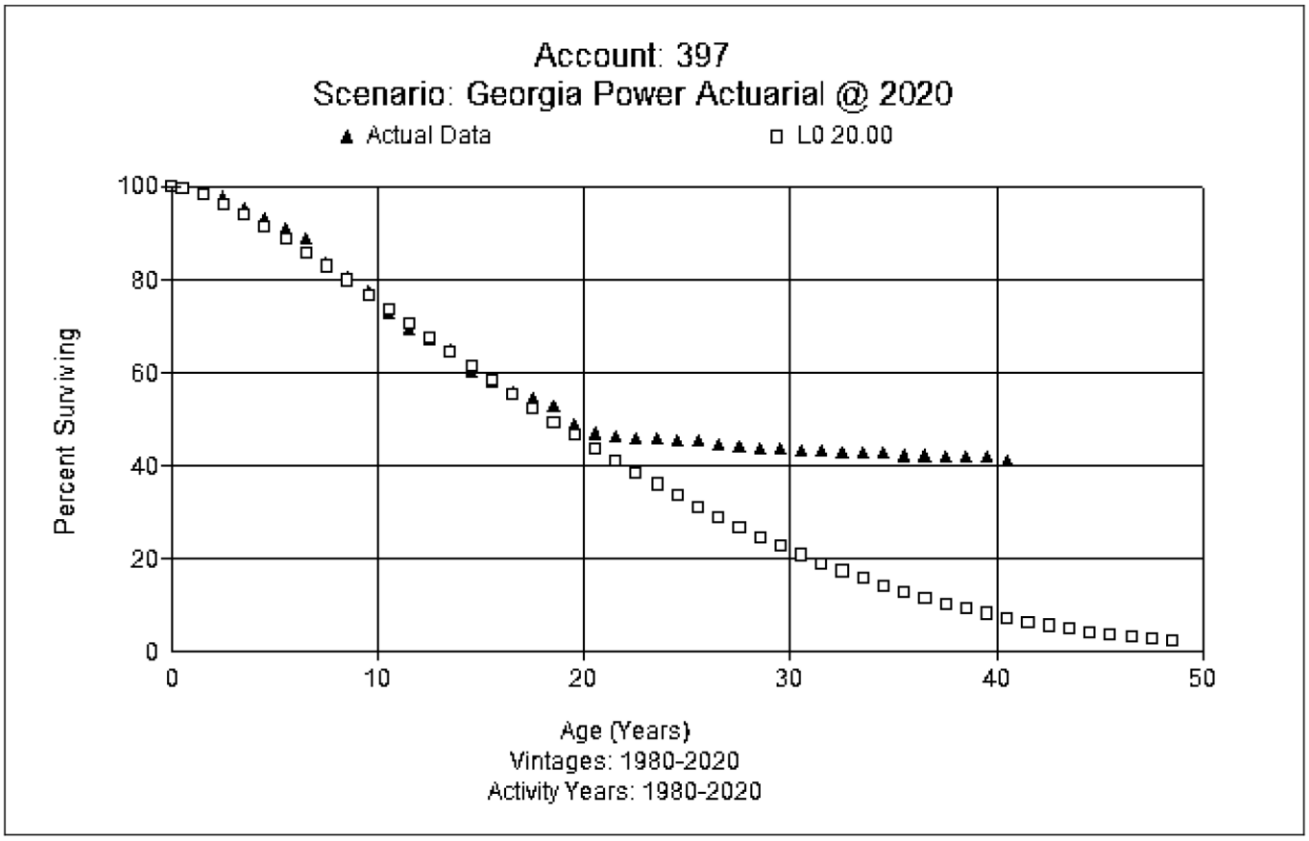
Figure 2: Company Proposed Survivor Curve for Account 392.2



The Alliance Study also notes that judgment was applied in modeling survivor curves.[18] For some specific curves the Alliance Study's recommended fit is, even on a visual basis, poor. I understand that for these curves the Alliance Study may be relying on the application of judgment to substantiate deviating from historic data. An example of a poor visual fit is provided below.

[18] Alliance Study page 19.

Figure 3: Company Proposed Survivor Curve for Account 397



I have alternate recommendations for some accounts where the Alliance Study recommends a curve that visually deviates from historic data. These alternate recommendations are based in part on a difference in judgment. The Alliance Study provides the following information regarding judgment:

> Where there are multiple factors, activities, actions, property characteristics, statistical inconsistencies, property mix in accounts, or a multitude of other considerations that affect the analysis (potentially in various directions), judgment is used to take all of these considerations and synthesize them into a general direction or understanding of the characteristics of the property. Individually, no one consideration in these cases may have a substantial impact on the analysis, but overall, the collective effect of these considerations may shed light on the use and characteristics of assets.

The Alliance Study's description of the use of judgment is problematic because it includes a long menu of factors and involves an ill-defined process of synthesis and is not transparent. This contradicts the principles of judgmental forecasting that fewer factors be considered and that forecasts be justified.[19] The Alliance Study's approach to judgment also conflicts with the NARUC depreciation guidance that judgment involve giving specific weight to specific factors.

Q. WHAT ACCOUNTS DO YOU MAKE ALTERNATE RECOMMENDATIONS FOR?

A. I have alternate recommendations for the distributional shape and average life for the following accounts, grouped by type of asset rather than function:

1. Easements
2. Structures and Improvements
3. Miscellaneous

a. <u>Easements</u>

Q. WHAT ARE THE CHARACTERISTICS OF EASEMENTS THAT AFFECTED YOUR JUDGMENT?

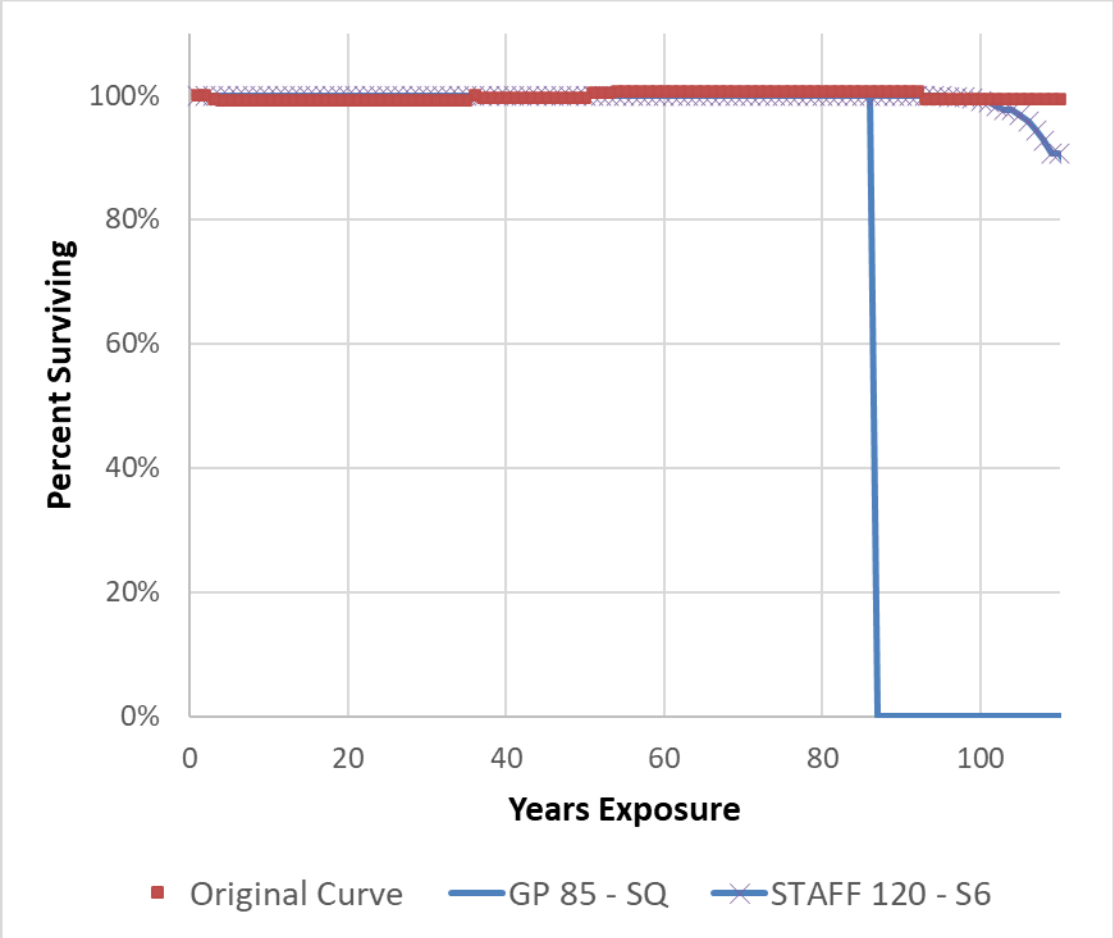
A. Easements are not physical assets that degrade and fail over time. The Company's easements have a theoretically unlimited life, but individual easements may be vacated if the Company no longer uses the easement. Thus, if an easement is never vacated, the easement will never be retired.

[19] Stewart, T. R. (2001). Improving reliability of judgmental forecasts. In J. S. Armstrong (Ed.), Principles of Forecasting: A Handbook for Researchers and Practitioners (pp. 81-106): Kluwer Academic Publishers.

Q. WHAT IS YOUR RECOMMENDATION FOR ACCOUNT 350 TRANSMISSION EASEMENTS AND HOW DOES IT COMPARE TO THE COMPANY'S RECOMMENDATION

A. The figure below illustrates both Georgia Power and Staff's proposed distributions for Account 350 Transmission Easements.

Figure 4: Account 350 Transmission Easements



The Original Curve reflects the historic data. The solid blue line reflects the Company's proposed square (SQ) survival curve with an average life of 85 years.[20] The blue line with x represents the Staff proposal of an S6 curve and an average life of 120 years. The Company's

[20] Alliance Study page 63.

recommendation provides a poor visual fit after age 85 because the original survivor curve remains at 100 percent while the Company's proposed survivor curve drops to zero percent, resulting in 100 percent error in every age after 85 years.

The Company offers the following rationale for these parameters: "Since the longest life in this functional group is 85 years, this study recommends retaining an 85-year life and SQ dispersion for this account." While not explicitly stated, the underlying assumption is that all transmission easements will survive for the expected average life of the longest lived transmission asset (in this case transmission structures and improvements), and that all easements will be abandoned the year following the average life.

The unreasonableness of this assumption is demonstrated by the Company's grid investment program. As transmission assets are retired in the grid investment program, rather than vacating the corresponding easements, the Company is rebuilding transmission assets, thus extending the expected use of the transmission easements. There is no technology currently being contemplated that would lead to the wholesale abandonment of the Company's easements. While it is possible that the Company occasionally abandons transmission easements in the future, I expect that the majority of the Company's easements will be retained as transmission lines are rebuilt rather than retired and vacated. While technological change could bring about a systematic retirement of transmission lines, no such change is likely to occur in the near future.

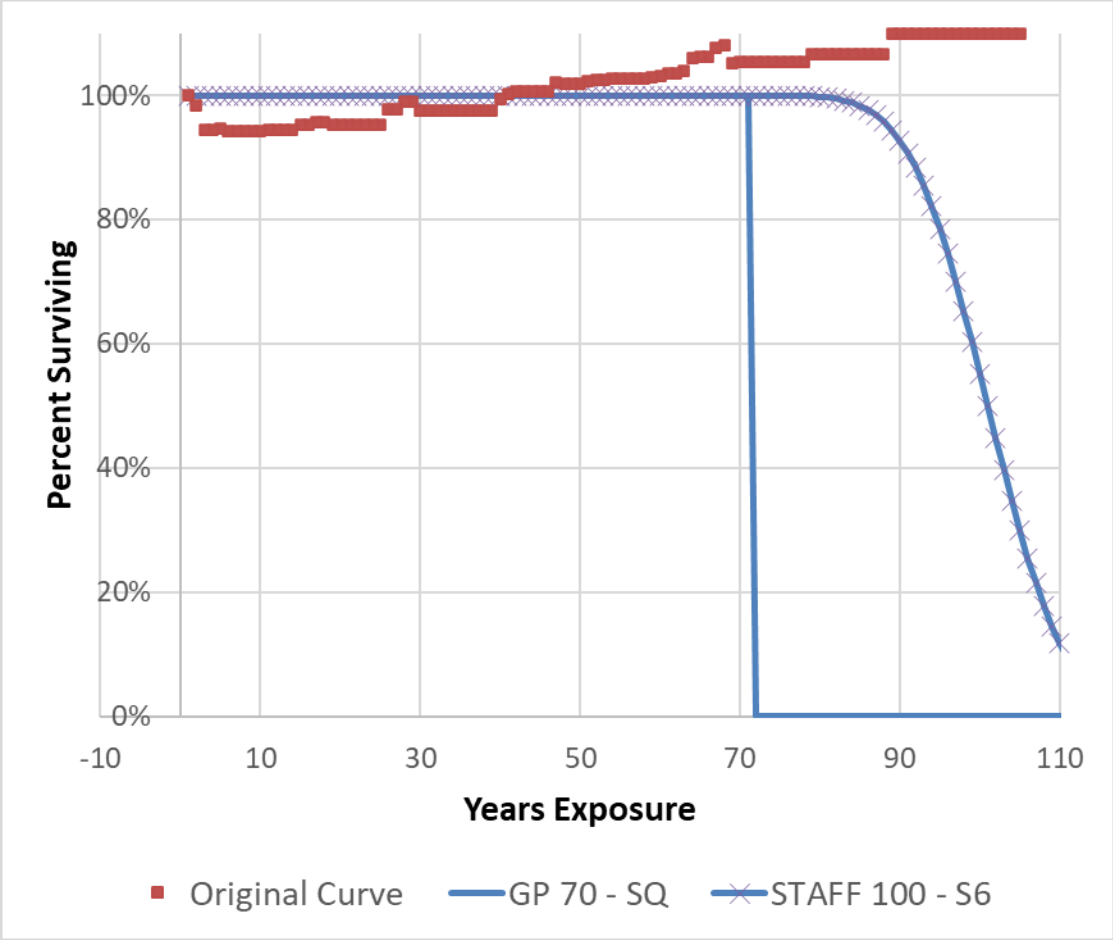
The historic data indicates 100 percent survival for throughout the entire age range, which is nearly 110 years. Thus, it is reasonable to expect that the actual average life will exceed 110 years by some amount. A square curve is an unreasonable shape for this asset because it is extremely unlikely that all transmission easements will be retired at a fixed age.

Every retirement curve, other than a square curve, that fits the historic data predicts life in excess of 140 years. I recommend adopting the 120-S6 curve because this curve is consistent with historical data and the Company's reinvestment in aging transmission but does not assume substantial life beyond the observed data. This recommendation also gives some weight to the Company's forecast of an 85-year average life by shortening the life indicated by historical data, which suggests an average life of at least 140 years.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 360 DISTRIBUTION EASEMENTS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 5: Account 360 Distribution Easements



As with the transmission easement account the Company proposes a square curve but with a shorter average life of 70 years. The Company's proposed curve is a poor visual fit of the data after the age of 70. The Company makes this proposal "Based on lives for many assets in this function."[21] The rationale for the Company's recommendation in this account suffers from the same flaws as transmission easements. Specifically, it is unlikely for distribution easements to be vacated after the retirement of the distribution assets associated with the easements. It is

[21] Alliance Study page 77.

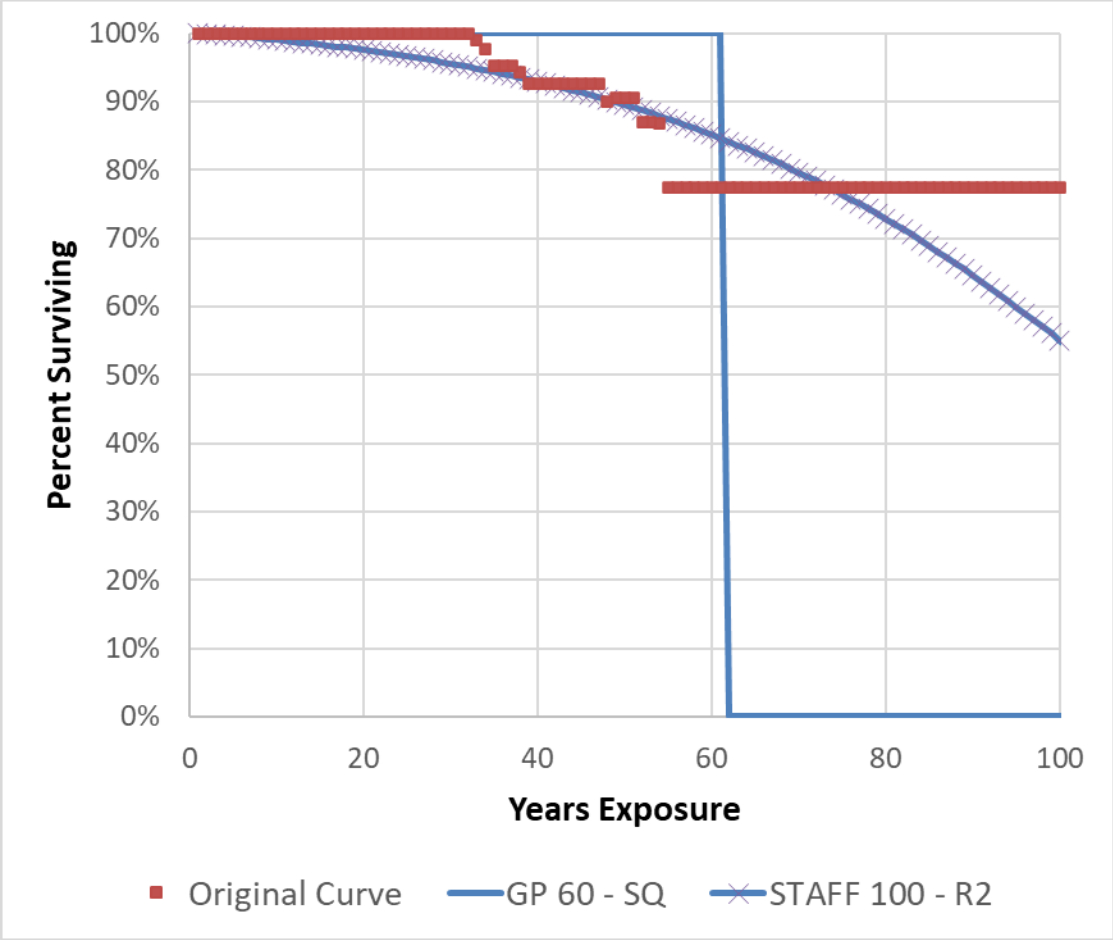
more reasonable to expect that the Company replaces retired distribution assets, extending the life of the distribution easement.

I recommend the 100-S6 curve be used for this account for similar reasons as Account 350. I recommend a lower average life for the distribution easement relative to transmission because my recommendation includes consideration of the Company's forecast, and because the historic data includes some retirements.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 389 GENERAL PLANT EASEMENTS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 6: Account 389 General Plant Easements



The Company recommends an SQ curve with a 60-year average life. The Company's proposed curve is a poor fit of the data after age 30. The Company's recommendation for this curve is different than its recommendation for the other easement accounts. The Alliance Study states "Since most of the assets in this account have retained the existing life, this study recommends retention of the existing 60-year life with an SQ dispersion."[22] The Company's justification appears to be circular, as the reason that the assets have retained the existing life is that the study recommends retention of the existing life.

[22] Alliance Study page 97.

Unlike transmission and distribution easements, the Company's data shows material retirements of general plant easements. I recommend the use of an R2 curve with a 100-year average life. This results in a curve that visually fits the data when less weight is placed on the oldest historical retirements. My recommendation is based primarily on the Company's historical retirements.

b. Structures and Improvements

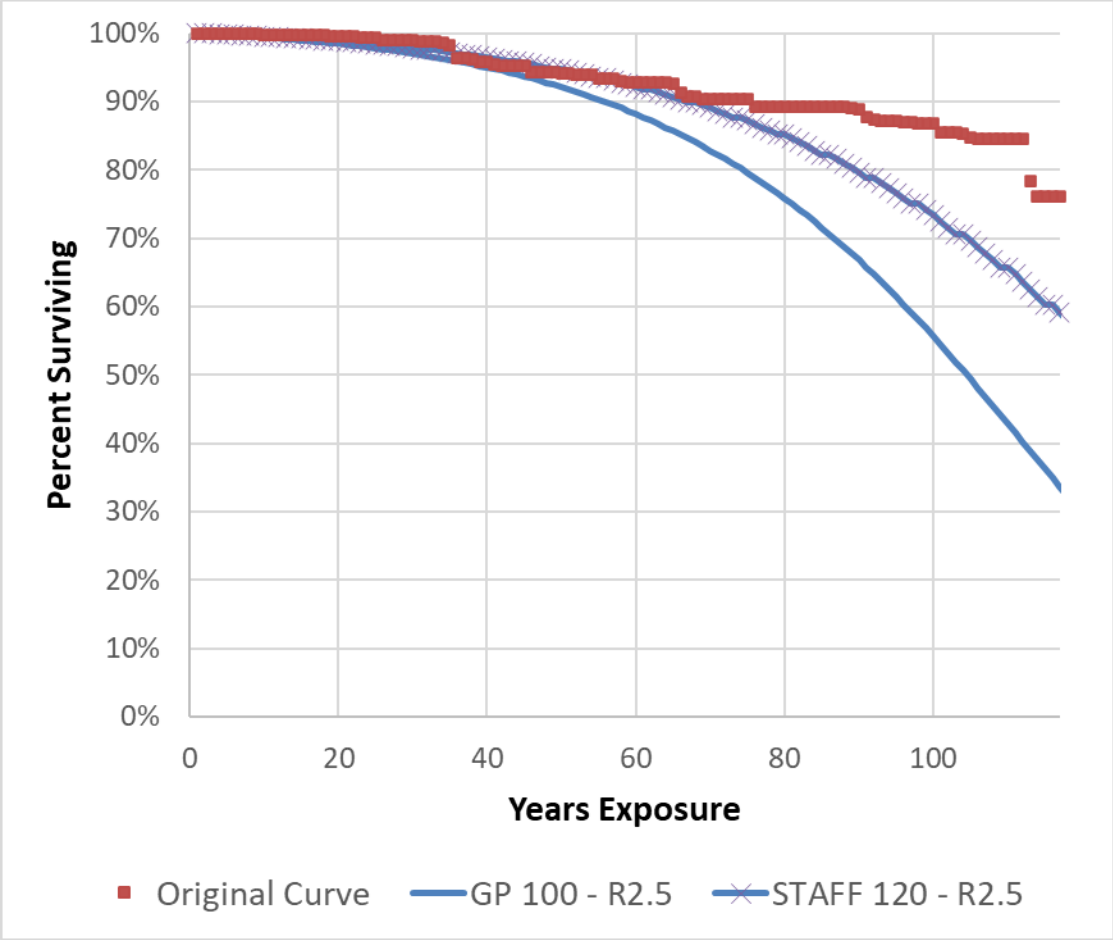
Q. WHAT COMMON FACTORS AFFECT YOUR ANALYSIS OF STRUCTURES AND IMPROVEMENTS ACCOUNTS?

A. Structures and improvements accounts include building structures, individual components of structures such as roofs, lighting, and heating, and other property improvements such as fencing. Typically, the primary building structures account for most of the total value in these accounts. Certain building types and systems can, with proper maintenance, survive for hundreds of years or more. Other types of buildings with less durable materials or more integrated materials have can have lives from 50 to 100 years, and individual building components such as roofing and lighting typically range in expected life from several years to 40 or more years. Changing land value or land use typically drives the retirement of entire building systems rather than failure of the primary building structure. For accounts with terminal retirement dates, building structures are expected to survive.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 331 STEAM STRUCTURES AND IMPROVEMENTS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 7: account 331 Steam Structures and Improvements



The Company proposes an R2.5 curve with an average age of 100 years. This curve begins to deviate from the actual retirement data at an age of 20 years and exhibits substantial deviation for survival past 50 years. The Alliance Study offers no explanation for the basis of the proposed curves or the deviation from the historic data.[23] The primary structures for this account house coal generation facilities and are unlikely to be retired prior to the terminal retirement dates for the corresponding units. Furthermore, many of these units are approaching retirement. As assets approach terminal retirement maintenance becomes more economical

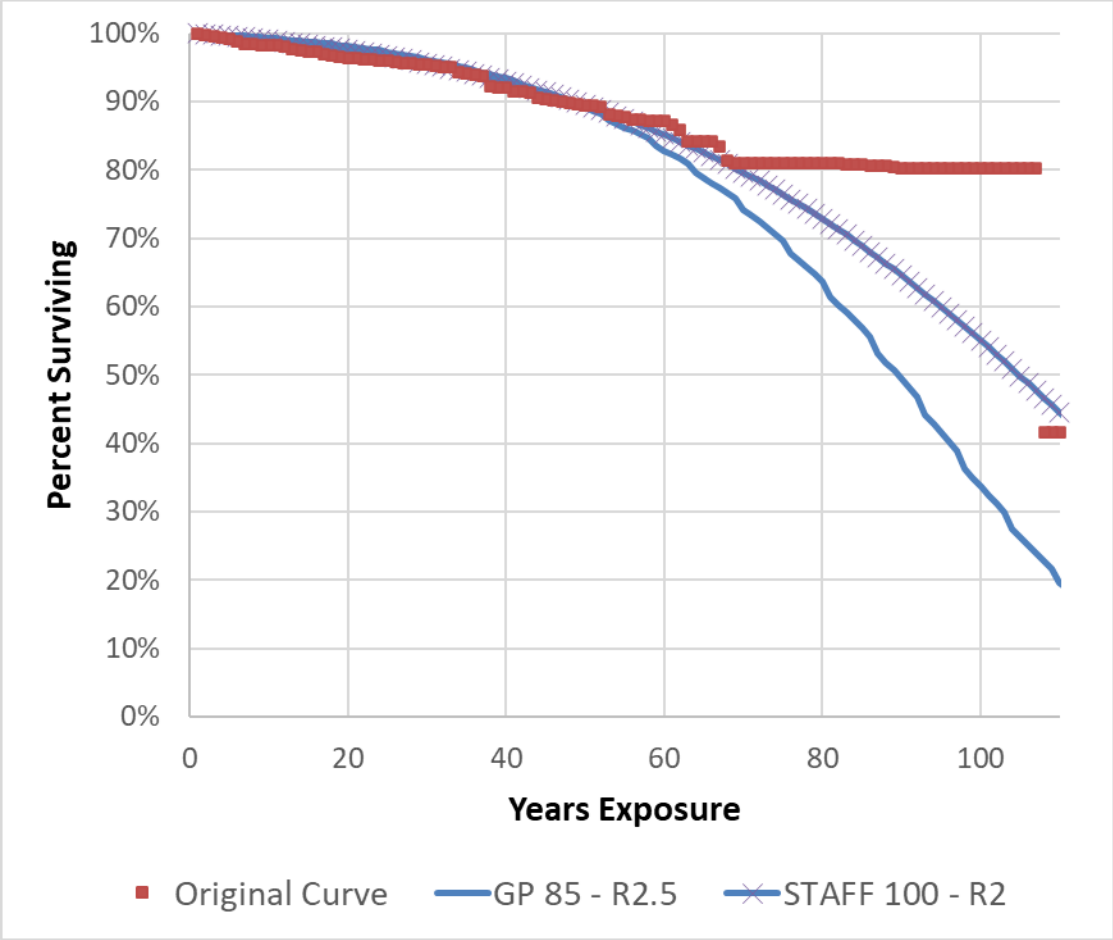
[23] Alliance Study page 45.

than replacement. Deteriorating building systems such as roofing and heating that would typically be replaced mid-life are more economical to repair towards a plant's end of life because of the short duration over which replacement facilities would function. I recommend the use of an R2.5 curve with a 120-year average life. This recommendation is based on the factors described above and includes consideration of the Company's analysis and expectations.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 352 TRANSMISSION SUBSTATION STRUCTURES AND IMPROVEMENTS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 8: Account 352 Transmission Substation Structures and Improvements



The Company proposes an R2.5 curve with an 85-year average life. The Company's proposed curve is a poor fit of historic data for assets of 50 years old. The Company justifies its proposed curve based on the potential for the Grid Investment Program to retire some substation structures.[24] However, the Grid Investment Program is only expected to affect 2.6 percent of substations over the next three years.[25] Furthermore, brownfield substation

[24] Alliance Study page 64.

[25] Response to Informal Data Requests Depreciation Study Meeting 2022-08-18.

investments will retain all structures except control houses, and control houses are expected to be more robust in the future.[26]

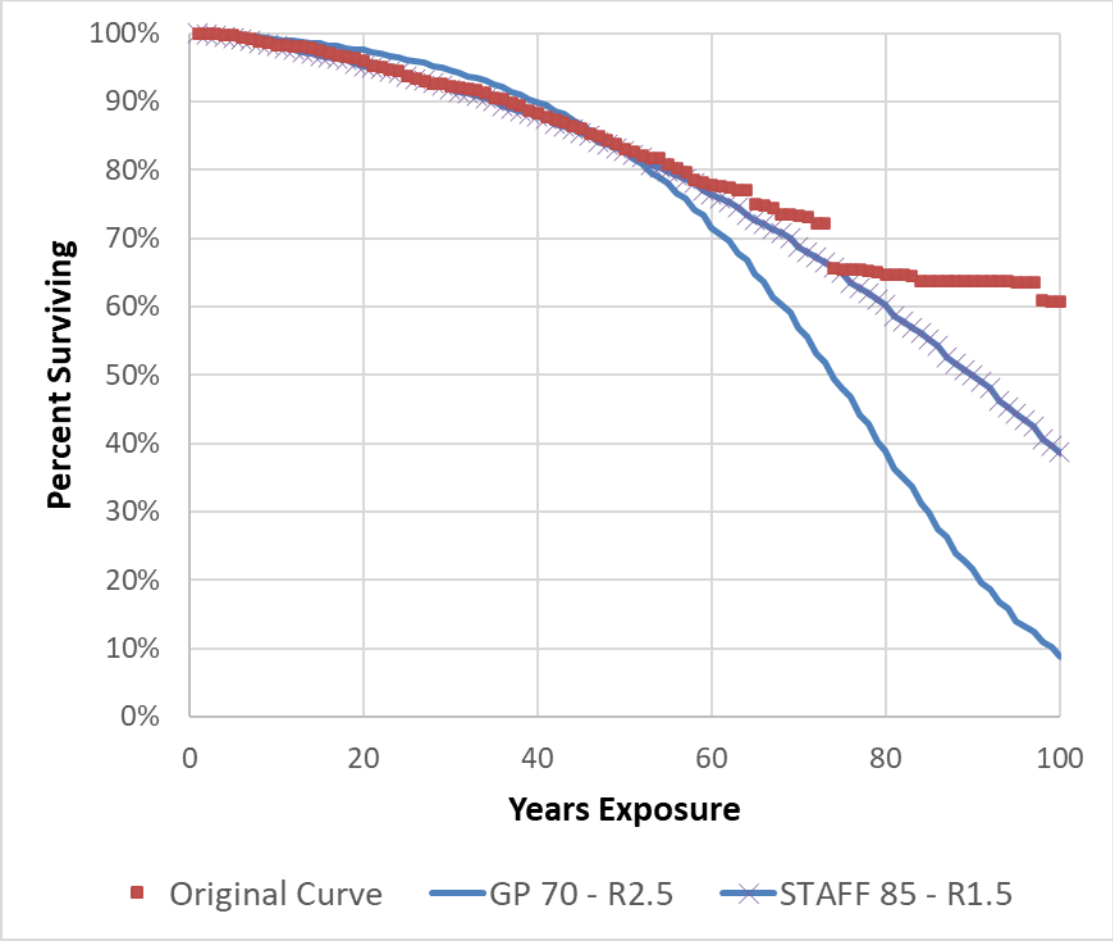
I recommend an R2 survival curve with a 100-year average life be used for this account. This recommendation is based on a visual fit of the data, with less weight placed on the ages 70 through 100 to reflect the potential impact of the Grid Investment Program and the Company's expectation that control houses will be more robust in the future.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 361 DISTRIBUTION SUBSTATION STRUCTURES?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

[26] Alliance Study page 64.

Figure 9: Account 361 Distribution Substation Structures



The Company proposes an R2.5 survivor curve with an average life of 70 years. This curve results in a marginal deviation from the data for ages 20 through 40 and deviates materially from the historical data after age 50. The Company bases its recommendation on the potential impact of the Grid Investment Program and actuarial analysis.[27] As I noted for Account 352 however, the Grid Investment Program affects only 2.6 percent of the Company's substations and will therefore have a minimal impact on the average life. Furthermore, the Actuarial analysis does not support the Company's recommended curve. Staff proposes a curve that has

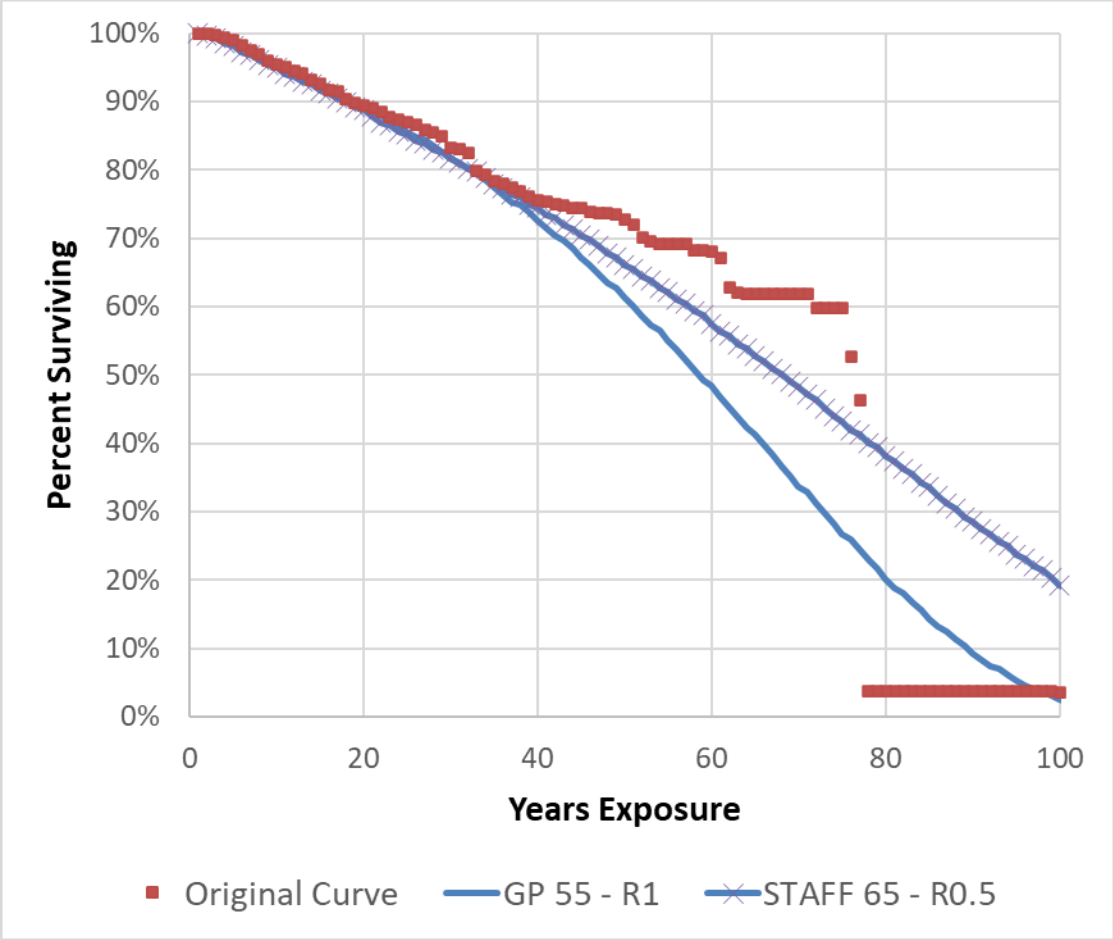
[27] Alliance Study page 78.

an improved fit for both the 20 to 40 age band and the 50 and later ages. Staff proposes an R1.5 curve with an 85-year average life. This recommendation provides an improved fit of the Company's data and remains consistent with the Company's expectations related to the Grid Investment Program and more robust control houses.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 390 GENERAL STRUCTURES AND IMPROVEMENTS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 10: Account 390 General Structures and Improvements



The Company proposes an R1 survivor curve with an average life of 55 years. This curve deviates materially from the historical data between ages 40 and 90. The Company's recommended curve is based on Company expectations regarding the lives of various building components ranging from 15 to 55 years and the main structures of the buildings surviving 60 to 80 years.[28] As with the other structure accounts, I recommend basing the survivor curve for this account on historic data with less weight given to the oldest assets. I recommend an R0.5 curve with a 65-year average life. Unlike my recommendations for most other asset accounts, my recommendation for this account materially exceeds the actual percent surviving for later ages. I attribute this to a single abnormal retirement that is not representative of expected outcomes.[29] My consistent treatment of placing less weight on tail or older aged portions of the historic survival curves is consistent with the Alliance Study which, quoting Depreciation Systems, states "Points at the end of the curve are often based on fewer exposures and may be given less weight than those points based on larger samples."[30] My recommendation for this account applies judgment that is consistent with the judgment used for my other recommendations. I consistently recommend curves that are fit to the Company's historic data but that have lower weight placed on the oldest portions of the survivor curves.

[28] Alliance Study page 98.

[29] Ga Power Actuarial Data Set at 2020.xls rows 25877 to 25879 show that retirement in 2001 accounts for all of the change in the historic survival curve from experience years 74 through 76, indicating that a single building or building system was retired which had multiple vintages. Response to Staff DR STF-AI-1-1 Attachment.

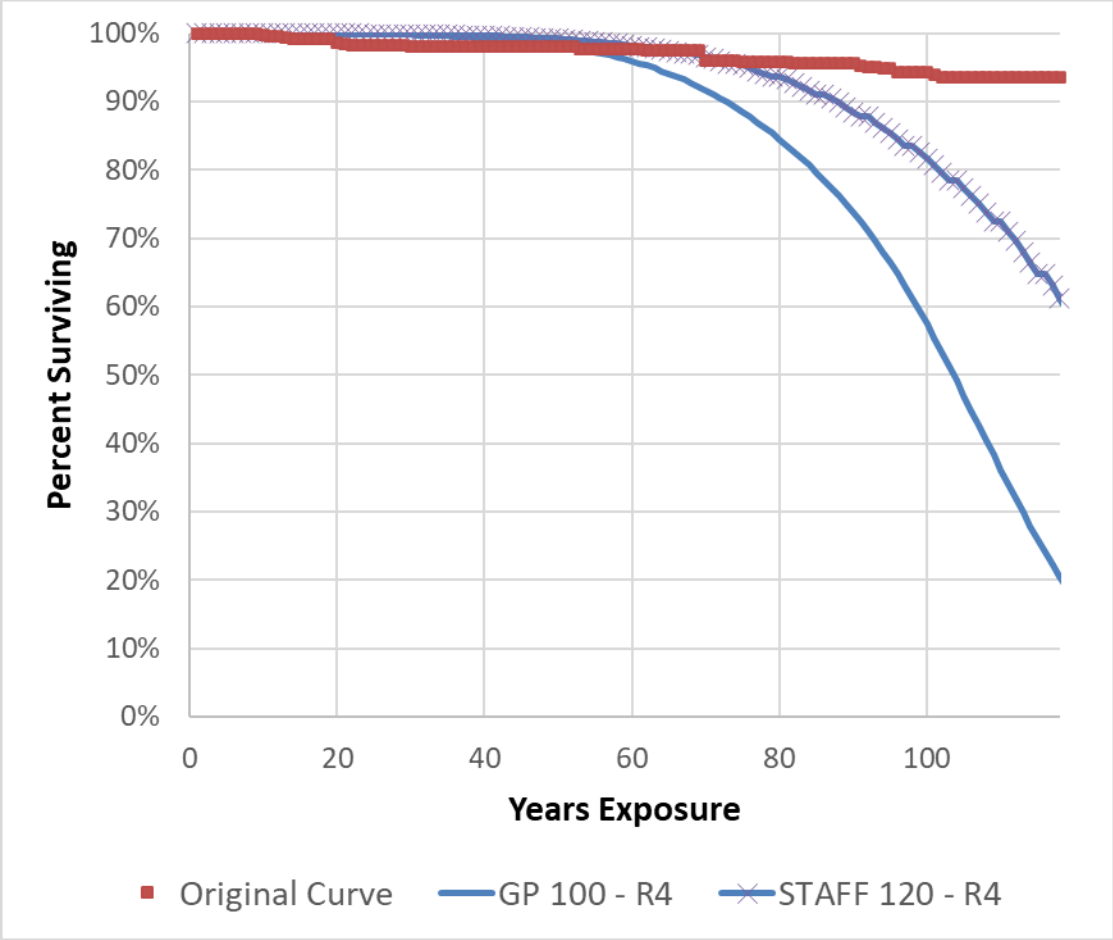
[30] Alliance Study page 16.

c. Miscellaneous Accounts

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 332 RESERVOIRS, DAMS, AND WATERWAYS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 11: 332 Reservoirs, Dams, and Waterways



The Company proposes an R4 survivor curve with an average life of 100 years. This curve deviates materially from the historical data after 60 years of exposure. The Company provides no basis for its proposed curve or to justify the deviation from historic data.[31] I recommend an

[31] Alliance Study page 46.

R4 curve with an average life of 120 years. The majority of assets in this account are concrete structures or earthworks that will not be retired until the terminal retirement of corresponding hydro facility. Other hydro asset accounts have a similar length of history but display substantially greater retirements. This indicates that the retirement experience of the older assets in this account is reliable.

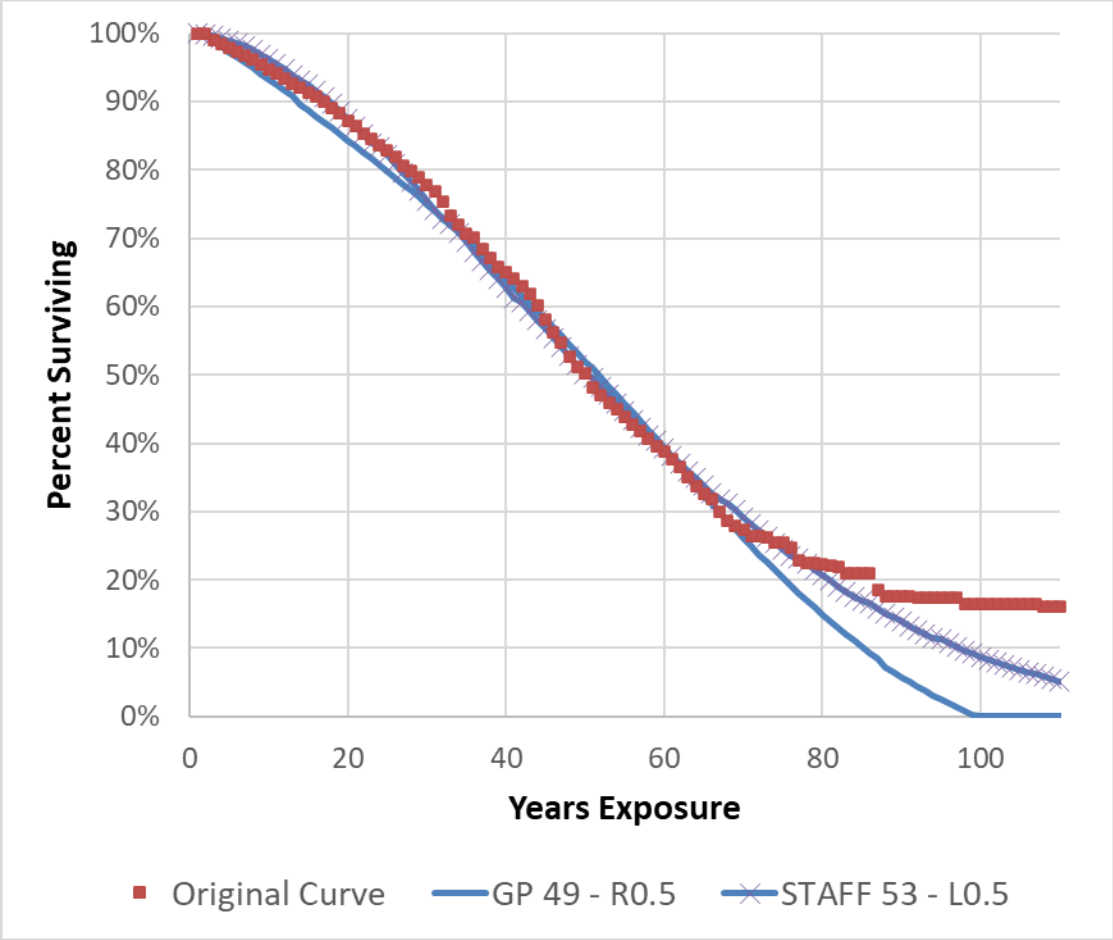
I recommend an R4 curve with a 120-year average life be used for this account. This recommendation reflects consideration of the Company's opinion regarding the appropriate shape of the retirement curve while also incorporating the extended average life suggested by actual retirement data and the fact that most assets in this account will survive to terminal retirement. I understand that the Company is undertaking a hydro modernization program to extend the lives of some hydro facilities. However, based on my review of the retirement units in this Account I do not expect the modernization to result in a material change in the Company's actual survival curve because most of the value in these accounts will not be retired as part of the modernization.[32] Furthermore, my recommended curve shows a substantially shorter life than the company's historic data indicate in order to account for the potential of the modernization project.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 353 STATION EQUIPMENT?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

[32] Response to Staff DR STF-AI-1-1 Attachment "Georgia Power RTU at 2020.xlsx".

Figure 12: Account 353 Station Equipment



The Company proposes an R0.5 survivor curve with an average life of 49 years. This curve results in a marginal deviation from the data for ages 10 through 30 and deviates materially from the historical data after age 70. The Company's recommendation is based on input from Company personnel and actuarial analysis.[33] The Company identities changing equipment type and operating equipment with closer tolerances as factors that may shorten asset lives relative to historic data. I recommend the use of an L0.5 curve with a 53-year average life. This curve has an improved fit of the Company's data for 10 to 30 years of experience relative to the

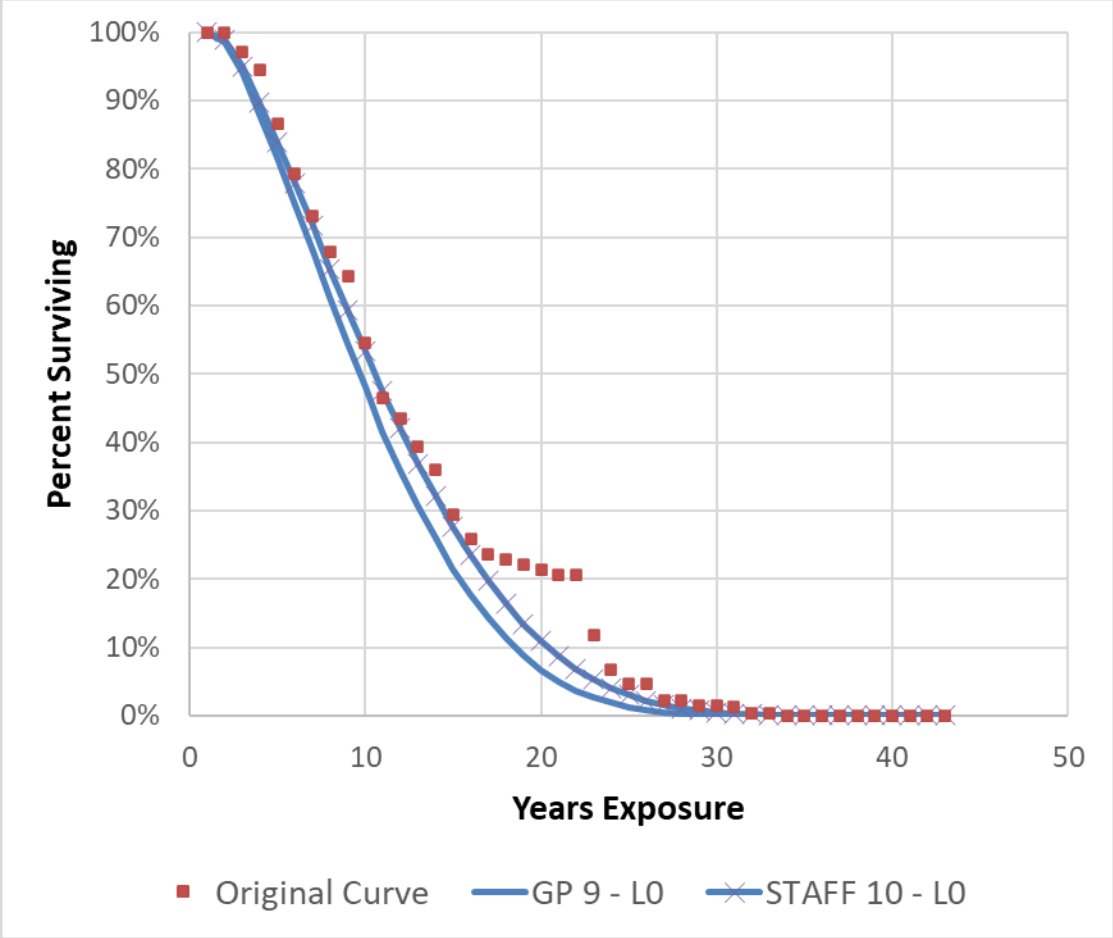
[33] Alliance Study page 65.

Company's proposed curve while still achieving a shorter average life than indicated in the tail of the data.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 392.3 HEAVY TRUCKS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 13: Account 392.3 Heavy Trucks



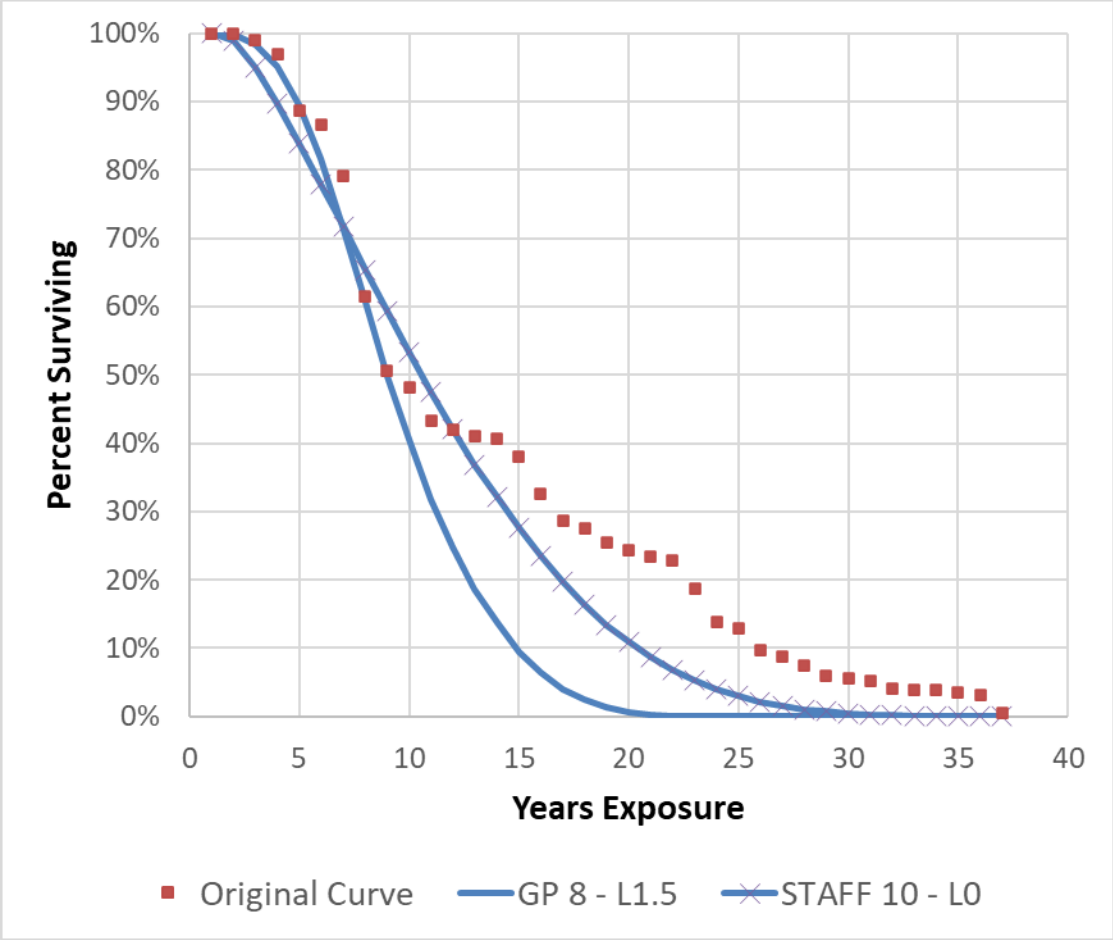
The Company proposes an L0 survivor curve with an average life of 9 years. This curve results in a marginal deviation from the data for ages 3 through 25. The Company's recommendation is based on actuarial analysis and information gathered from Company personnel, who report

that certain trucks are used on double shifts, potentially increasing mileage.[34] I recommend the use of an L0 curve with a 10-year average life. Actuarial analysis supports an L0 with 10 years over one with 9 years, as can be seen by the improved fit across the entire exposure period.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 392.4 TRAILERS AND ATVS?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

Figure 14: Account 392.4 Trailers and ATVs



[34] Alliance Study page 102.

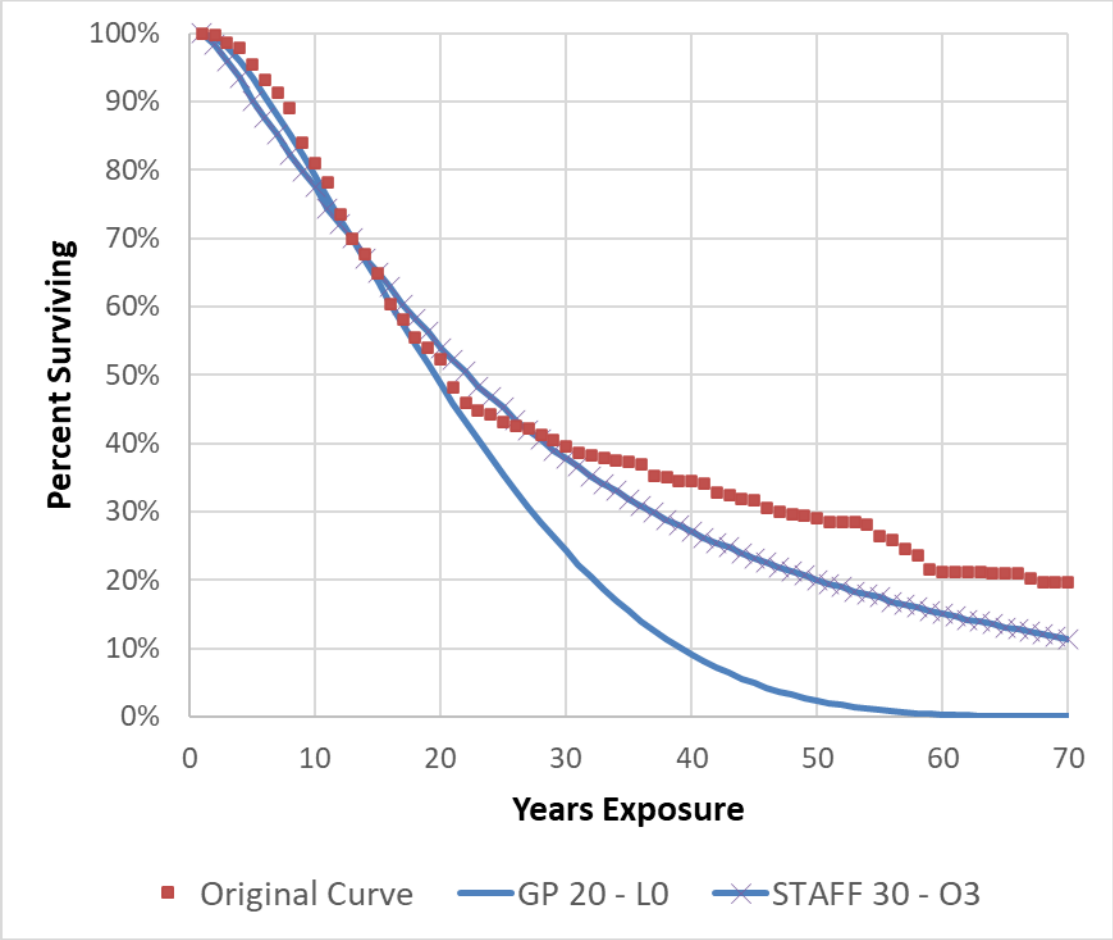
The Company proposes an L1.5 survivor curve with an average life of 8 years. This curve deviates materially from the historical data after year 8. The Company justifies the recommendation based on the variety of assets in the account and actuarial analysis. However, this curve performs poorly at modeling the mixed asset nature of the account, which has short lived assets like ATVs and long-lived assets such as trailers.[35] While the Company's recommended curve fits the short-lived assets well, the fit of the Company's recommended curve is poor for trailers which is reflected in the deviation of the fit after age 8. I recommend the use of an L0 curve with an average life of 10 years. This curve sacrifices some fit of the early survival curve but achieves a large improvement in the fit of the longer-lived assets.

Q. WHAT IS YOUR RECOMMENDATION FOR THE ACCOUNT 397 COMMUNICATIONS EQUIPMENT?

A. The figure below compares the Company's historic data with the Company's proposed survivor curves and Staff's recommended survivor curve.

[35] Alliance Study page 103.

Figure 15 Account 397 Communications Equipment



The Company proposes an L0 survivor curve with an average life of 20 years. This curve deviates materially from the historical data after year 20. The Company's recommendation is based on an input from Company personnel and life analysis results.[36] However, the Company personnel input is that approximately half of the accounts value will consist of fiber, microwaves towers, and antennae, which have expected lives of 40 years. As with the previous account 392.4, the Company's proposed curve in this account fits short lived assets well, but at the cost of poorly fitting the retirement characteristics of long-lived assets such as fiber. I

[36] Alliance Study page 105.

recommend the use of an O3 curve with a 30-year average life. This curve provides a reasonable fit of the short-lived assets in this account while still appropriately representing expectations for longer lived assets.

Q. WHAT IS YOUR ASSESSMENT OF THE DEPRECIATION PARAMETERS NOT DISCUSSED IN THIS TESTIMONY?

A. I have reviewed the proposed remaining lives and net salvage rates for each account in this case that accumulates depreciation. I found the remaining parameters proposed by the Company to be reasonable and consistent with the data and expectations.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.