BEFORE THE
STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

In the Matter of

Liberty Utilities (St. Lawrence Gas) Corp.

Case 24-G-0668

April 1, 2025

Prepared Exhibits of:

Staff Depreciation Panel

Fern Bahr
Utility Engineering Specialist 1

Jackson Harmon
Utility Engineering Specialist 1

Sara Orsino
Utility Engineering Specialist 2

Office of Rates and Tariffs
State of New York
Department of Public Service
Three Empire State Plaza
Albany, New York 12223-1350

List of Exhibits

Relied Upon Responses to
Interrogatories (IR)
Index of Exhibit__(SDP-1)
(Exhibit__(SDP-1) will be filed in its entirety
on April 8, 2025)

Depreciation Rate and Expense Summary
Liberty SLG

		Rate			Expense			Expense Difference		
		Present	Company Proposed	Staff Recommended	Present	Company Proposed	Staff Recommended	Company Proposed to Present	Staff Recommended to Present	Staff Recommended to Company Proposed
GAS PLANT										
	DISTRIBUTION PLANT									
374.00	LAND RIGHTS	1.43	1.43	1.43	$ 14,889	$ 14,889	$ 14,889	$ -	$ -	$ -
375.00	STRUCTURES AND IMPROVEMENTS	2.50	2.63	2.63	$ 24,282	$ 25,496	$ 25,496	$ 1,214	$ 1,214	$ -
376.10	MAINS - STEEL	1.66	1.86	1.86	$ 343,972	$ 385,207	$ 385,207	$ 41,235	$ 41,235	$ -
376.20	MAINS - PLASTIC	1.84	1.86	1.86	$ 191,412	$ 193,389	$ 193,389	$ 1,977	$ 1,977	$ -
378.00	MEASURING AND REGULATING STATION EQUIPMENT	2.00	2.18	2.00	$ 119,314	$ 130,291	$ 119,552	$ 10,977	$ 238	$ (10,739)
380.10	SERVICES - STEEL	2.17	2.51	2.33	$ 39,352	$ 45,427	$ 42,400	$ 6,075	$ 3,049	$ (3,027)
380.20	SERVICES - PLASTIC	2.17	2.51	2.33	$ 229,270	$ 264,664	$ 247,020	$ 35,394	$ 17,750	$ (17,644)
381.00	METERS	2.75	2.63	2.10	$ 79,137	$ 75,540	$ 60,432	$ (3,597)	$ (18,705)	$ (15,108)
382.00	METER INSTALLATIONS	2.75	2.63	2.10	$ 38,432	$ 36,685	$ 29,348	$ (1,747)	$ (9,084)	$ (7,337)
383.00	HOUSE REGULATORS	2.84	2.62	2.33	$ 13,280	$ 12,274	$ 10,900	$ (1,006)	$ (2,380)	$ (1,374)
384.00	HOUSE REGULATOR INSTALLATIONS	2.70	2.50	2.22	$ 3,921	$ 3,631	$ 3,224	$ (290)	$ (697)	$ (407)
385.00	INDUSTRIAL MEASURING AND REGULATING STATION EQUIPMENT	2.38	2.62	2.33	$ 41,460	$ 45,727	$ 40,606	$ 4,267	$ (854)	$ (5,121)
387.00	OTHER EQUIPMENT	5.50	5.25	5.25	$ 24,375	$ 23,267	$ 23,267	$ (1,108)	$ (1,108)	$ -
	TOTAL DISTRIBUTION PLANT				**$ 1,163,094**	**$ 1,256,487**	**$ 1,195,729**	**$ 93,393**	**$ 32,635**	**$ (60,757)**
	GENERAL PLANT									
390.00	STRUCTURES AND IMPROVEMENTS	2.50	2.62	2.63	$ 131,964	$ 138,562	$ 138,562	$ 6,598	$ 6,598	$ -
391.00	OFFICE FURNITURE AND EQUIPMENT	4.00	3.52	5.00	$ 19,874	$ 17,496	$ 17,496	$ (2,378)	$ (2,378)	$ -
391.10	OFFICE FURNITURE AND EQUIPMENT - COMPUTERS*	Individual	Individual	20.00	$ 110,999	$ 110,999	$ 148,167	$ -	$ 37,168	$ 37,168
392.00	TRANSPORTATION EQUIPMENT*	Individual	Individual	8.18	$ 541,514	$ 541,514	$ 374,211	$ -	$ (167,303)	$ (167,303)
393.00	STORES EQUIPMENT	5.00	2.17	4.00	$ 1,257	$ 545	$ 1,006	$ (712)	$ (251)	$ 461
394.00	TOOLS, SHOP AND GARAGE EQUIPMENT	4.00	3.71	4.00	$ 93,752	$ 86,879	$ 86,879	$ (6,873)	$ (6,874)	$ -
395.00	LABORATORY EQUIPMENT	4.00	4.59	5.00	$ 12,741	$ 14,630	$ 14,630	$ 1,889	$ 1,889	$ -
396.00	POWERWORK EQUIPMENT*	Individual	Individual	6.97	$ 213,773	$ 213,773	$ 133,396	$ -	$ (80,377)	$ (80,377)
397.00	COMMUNICATION EQUIPMENT	6.67	1.92	6.67	$ 2,376	$ 685	$ 685	$ (1,691)	$ (1,691)	$ -
398.00	MISCELLANEOUS EQUIPMENT	5.00	1.35	5.00	$ 1,260	$ 340	$ 340	$ (920)	$ (919)	$ -
	TOTAL GENERAL PLANT				**$ 1,129,510**	**$ 1,125,423**	**$ 915,372**	**$ (4,087)**	**$ (214,138)**	**$ (210,052)**
	TOTAL DEPRECIABLE EXPENSE				**$ 2,292,604**	**$ 2,381,910**	**$ 2,111,101**	**$ 89,306**	**$ (181,503)**	**$ (270,809)**

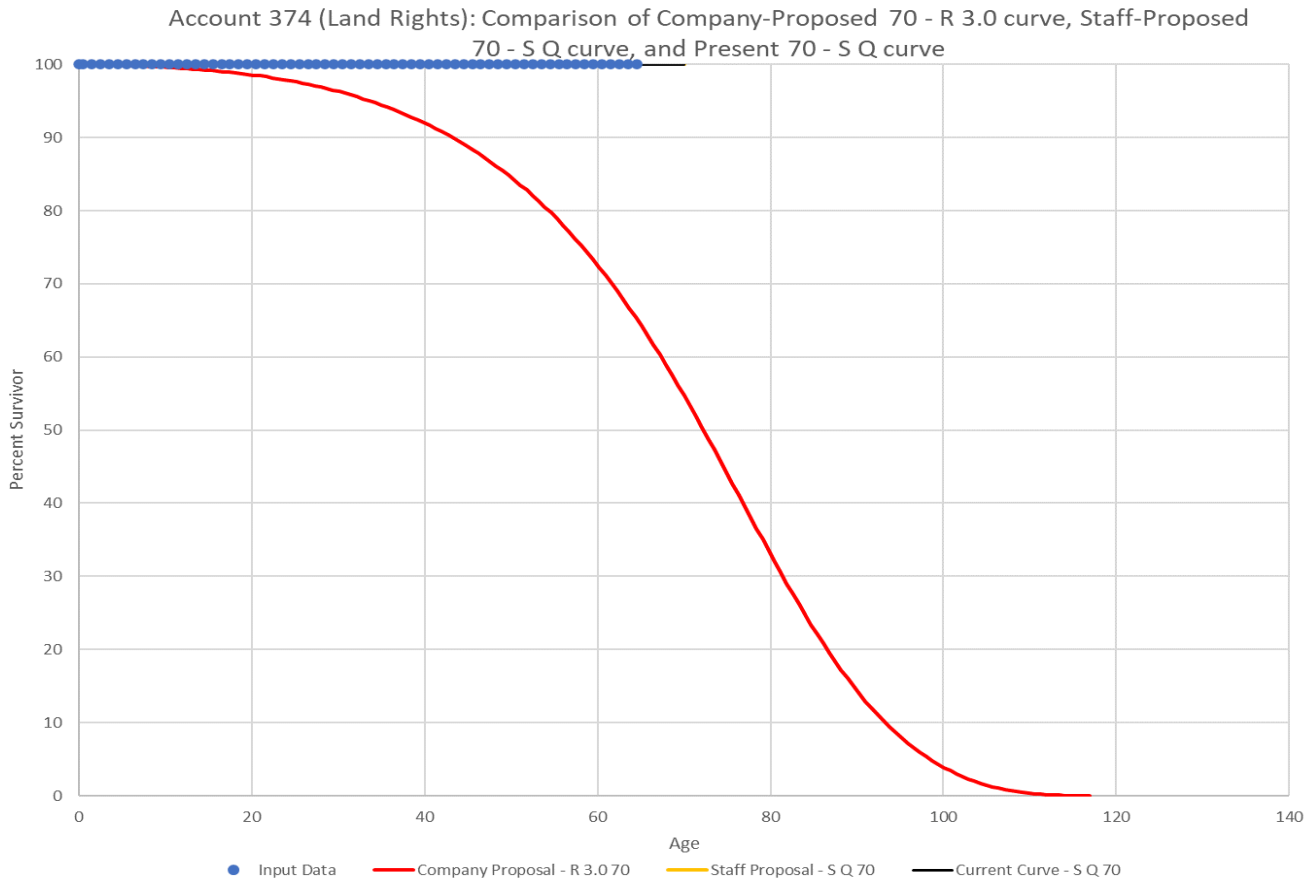
*Note: The Company's current and proposed data are based on the depreciation expense the Company provided in the Exhibit RR-CU-1 (2.28.2025)

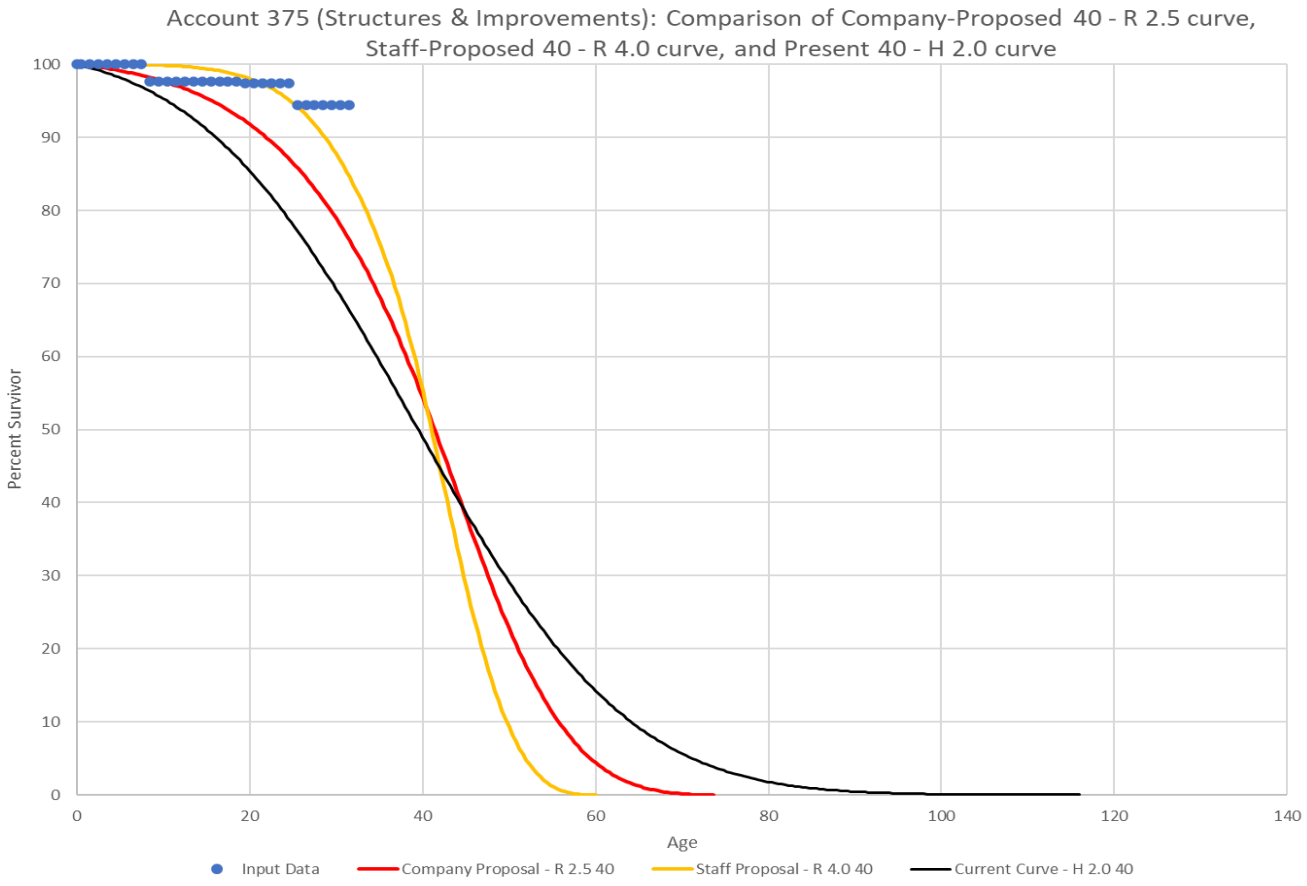
Average Service Life Summary
Liberty SLG

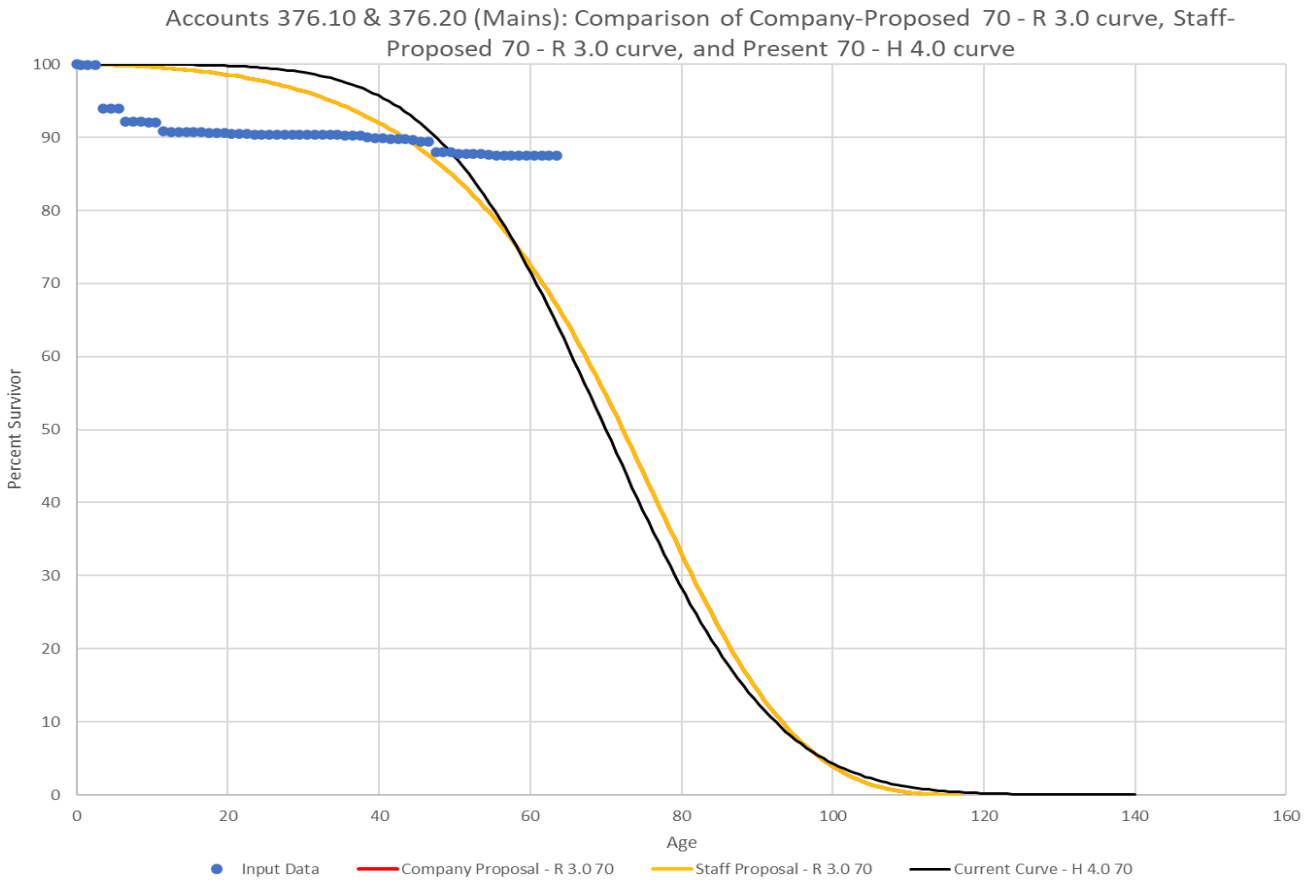
		Present	Company Proposed	Staff Recommended	Basis for Staff Recommendations that Differ from Company
GAS PLANT					
	DISTRIBUTION PLANT				
374.00	LAND RIGHTS	70	70	70	
375.00	STRUCTURES AND IMPROVEMENTS	40	40	40	
376.10	MAINS - STEEL	75	70	70	
376.20	MAINS - PLASTIC	68	70	70	
378.00	MEASURING AND REGULATING STATION EQUIPMENT	60	55	60	Mortality data supports present ASL and does not justify change
380.10	SERVICES - STEEL	60	60	60	
380.20	SERVICES - PLASTIC	60	60	60	
381.00	METERS	40	40	50	Mortality data supports a longer ASL
382.00	METER INSTALLATIONS	40	40	50	Mortality data supports a longer ASL
383.00	HOUSE REGULATORS	37	40	45	Mortality data supports a longer ASL
384.00	HOUSE REGULATOR INSTALLATIONS	37	40	45	Mortality data supports a longer ASL
385.00	INDUSTRIAL MEASURING AND REGULATING STATION EQUIPMENT	44	40	45	Mortality data supports a longer ASL, not shorter
387.00	OTHER EQUIPMENT	20	20	20	
	GENERAL PLANT				
390.00	STRUCTURES AND IMPROVEMENTS	40	40	40	
391.00	OFFICE FURNITURE AND EQUIPMENT	25	20	20	
391.10	OFFICE FURNITURE AND EQUIPMENT - COMPUTERS	Individual	Individual	5	
392.00	TRANSPORTATION EQUIPMENT	Individual	Individual	10	
393.00	STORES EQUIPMENT	20	25	25	
394.00	TOOLS, SHOP AND GARAGE EQUIPMENT	25	25	25	
395.00	LABORATORY EQUIPMENT	25	20	20	
396.00	POWERWORK EQUIPMENT	Individual	Individual	10	
397.00	COMMUNICATION EQUIPMENT	15	15	15	
398.00	MISCELLANEOUS EQUIPMENT	20	20	20	

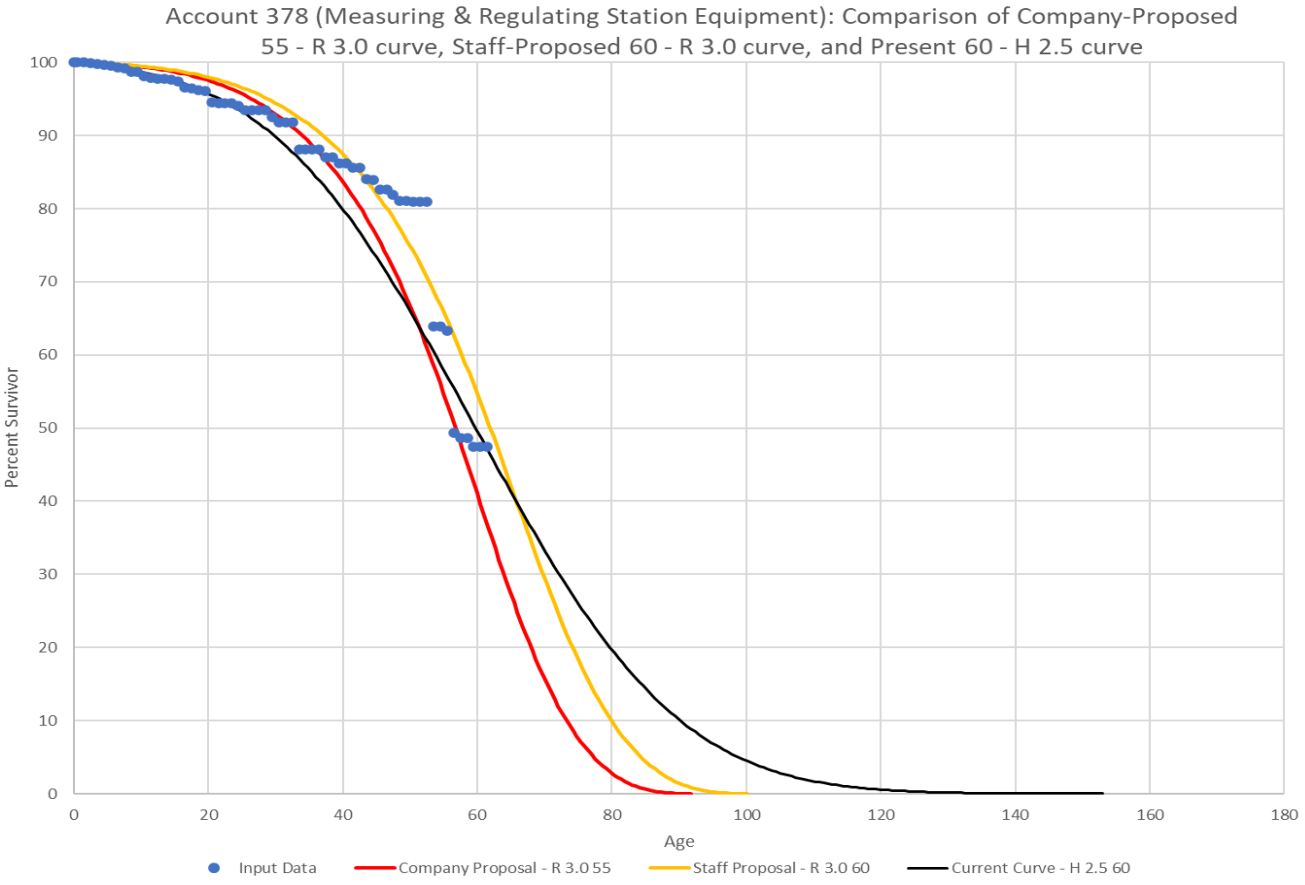
Survivor Curve Summary
Liberty SLG

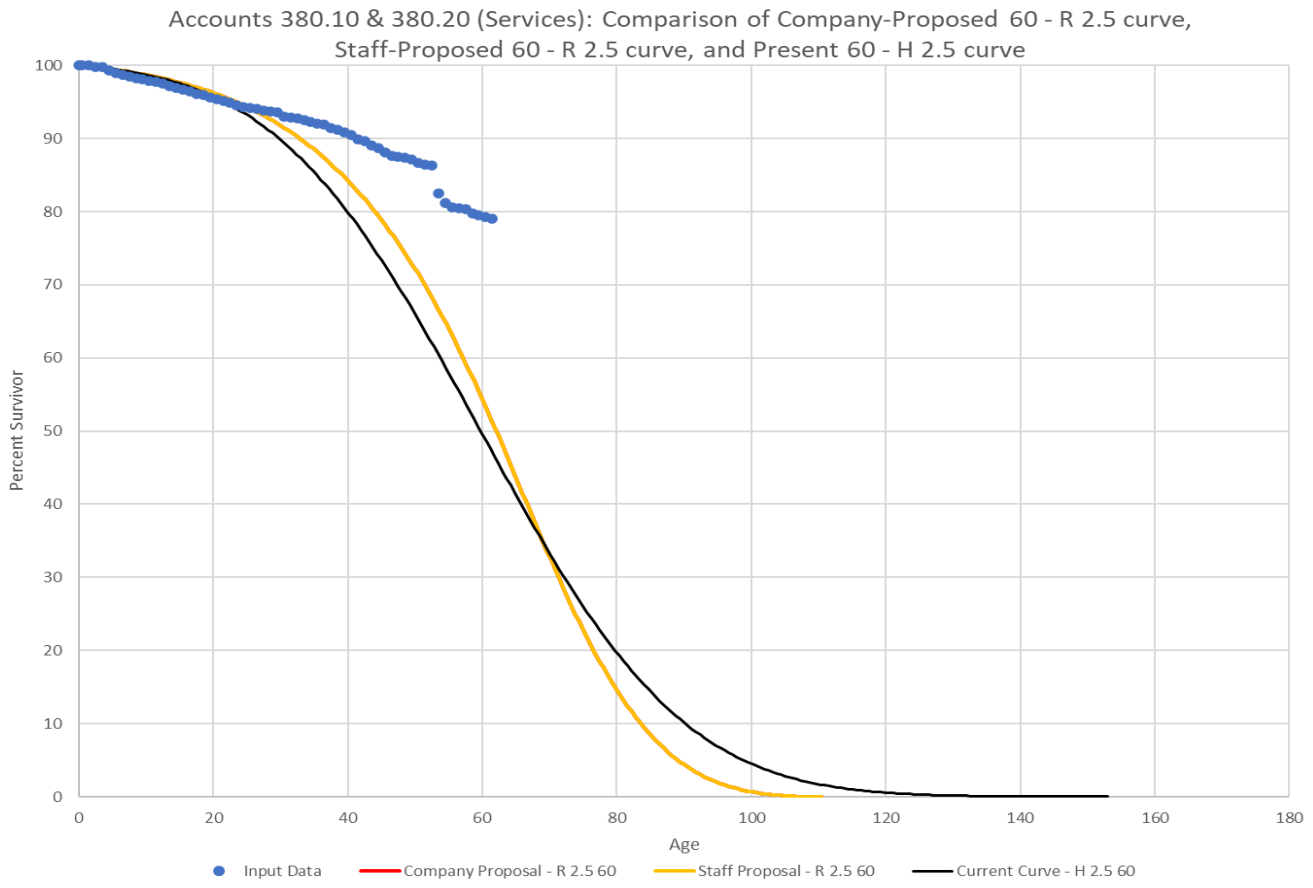
		Present	Company Proposed	Staff Recommended	Basis for Staff Recommendations that Differ from Company
GAS PLANT					
	DISTRIBUTION PLANT				
374.00	LAND RIGHTS	SQ	R3	SQ	Land does not depreciate as normal assets do, so a SQ curve is logical
375.00	STRUCTURES AND IMPROVEMENTS	h2.00	R2.5	R4	Better fitting to mortality data for Staff recommended ASL
376.10	MAINS - STEEL	h4.00	R3	R3	
376.20	MAINS - PLASTIC	h4.00	R3	R3	
378.00	MEASURING AND REGULATING STATION EQUIPMENT	h2.50	R3	R3	
380.10	SERVICES - STEEL	h2.50	R2.5	R2.5	
380.20	SERVICES - PLASTIC	h2.50	R2.5	R2.5	
381.00	METERS	h2.50	R2.5	R2	Better fitting to mortality data for Staff recommended ASL
382.00	METER INSTALLATIONS	h1.00	R2.5	R2	Better fitting to mortality data for Staff recommended ASL
383.00	HOUSE REGULATORS	h3.00	R2.5	R1	Better fitting to mortality data for Staff recommended ASL
384.00	HOUSE REGULATOR INSTALLATIONS	h3.00	R2.5	R1	Better fitting to mortality data for Staff recommended ASL
385.00	INDUSTRIAL MEASURING AND REGULATING STATION EQUIPMENT	h1.50	R2	R1.5	Better fitting to mortality data for Staff recommended ASL
387.00	OTHER EQUIPMENT	h2.00	R3	R3	
	GENERAL PLANT				
390.00	STRUCTURES AND IMPROVEMENTS	h4.00	R2.5	R2.5	
391.00	OFFICE FURNITURE AND EQUIPMENT	h0.50	SQ	SQ	
393.00	STORES EQUIPMENT	h5.00	SQ	SQ	
394.00	TOOLS, SHOP AND GARAGE EQUIPMENT	h2.00	SQ	SQ	
395.00	LABORATORY EQUIPMENT	h2.50	SQ	SQ	
397.00	COMMUNICATION EQUIPMENT	h2.00	SQ	SQ	
398.00	MISCELLANEOUS EQUIPMENT	h2.00	SQ	SQ	

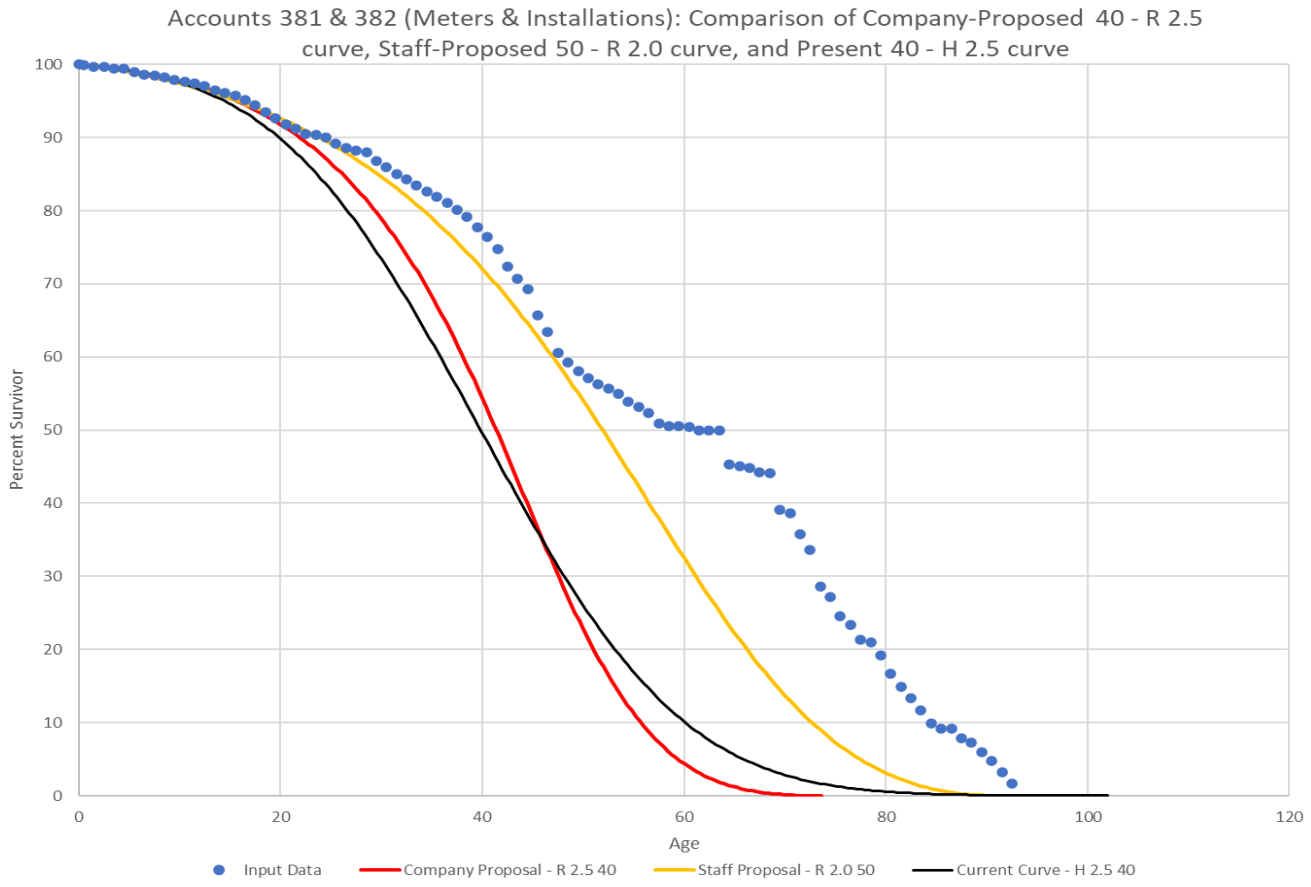

Account 374 (Land Rights): Comparison of Company-Proposed 70 - R 3.0 curve, Staff-Proposed 70 - S Q curve, and Present 70 - S Q curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
Age
Input Data
Company Proposal - R 3.0 70
Staff Proposal - S Q 70
Current Curve - S Q 70

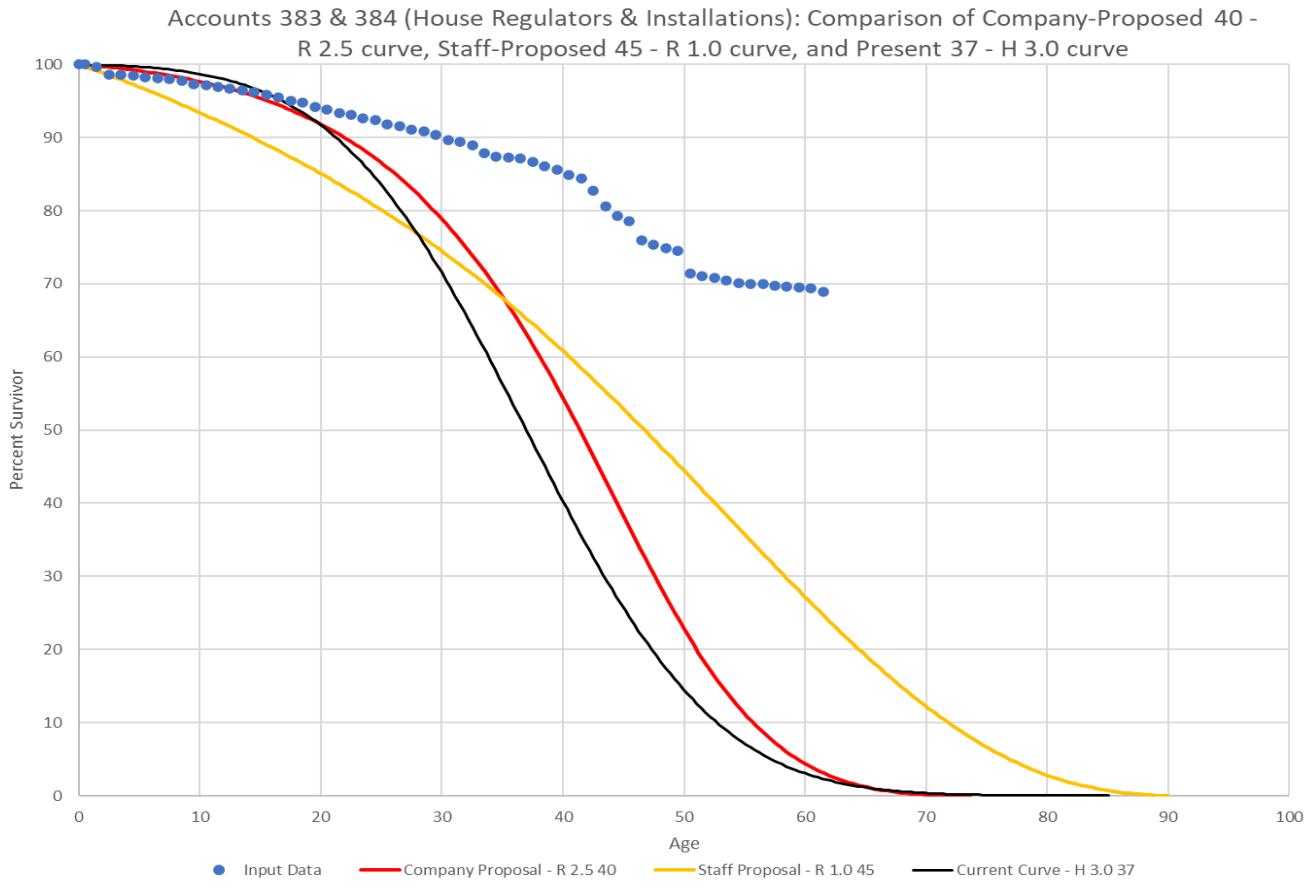

Account 375 (Structures & Improvements): Comparison of Company-Proposed 40 - R 2.5 curve, Staff-Proposed 40 - R 4.0 curve, and Present 40 - H 2.0 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
Age
Input Data
Company Proposal - R 2.5 40
Staff Proposal - R 4.0 40
Current Curve - H 2.0 40

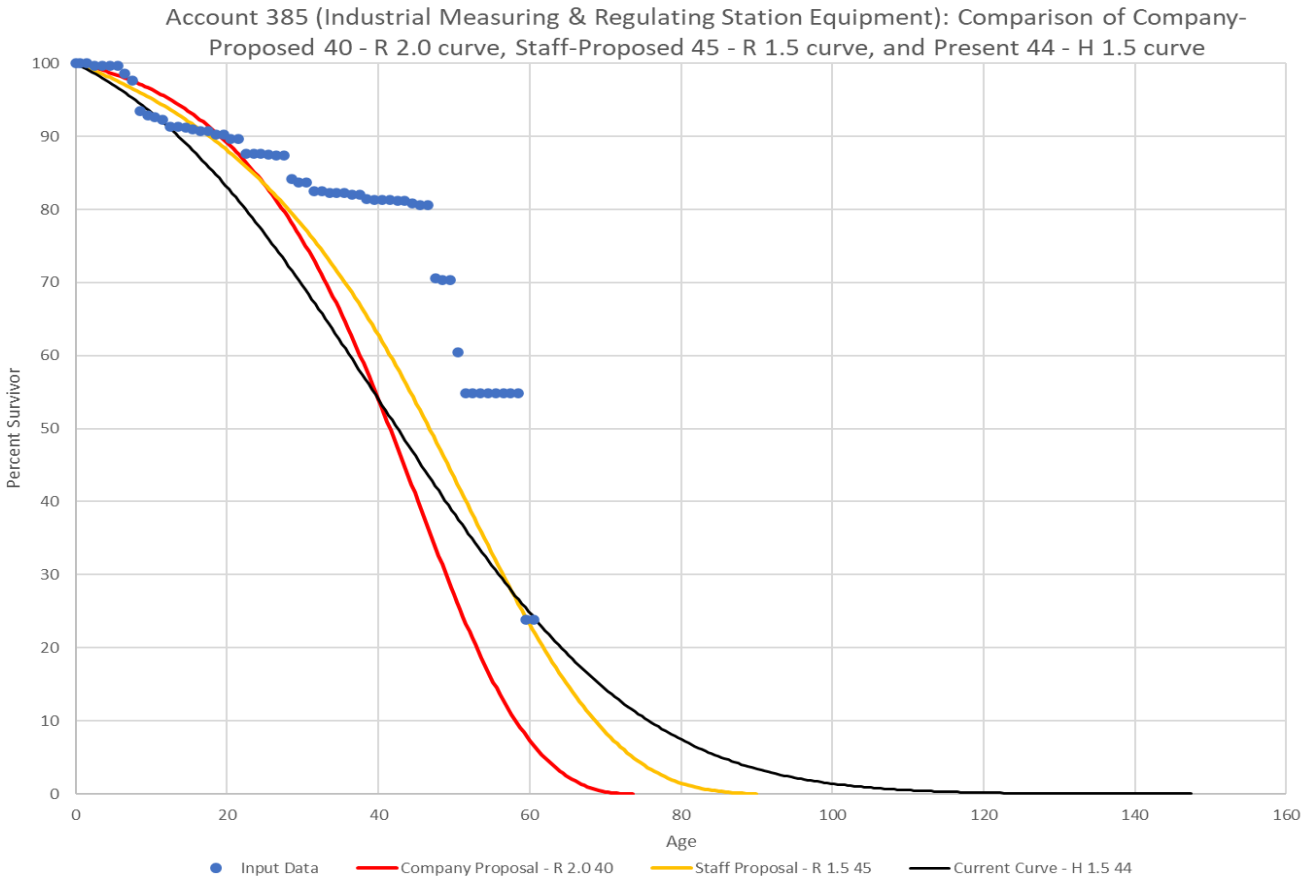

Accounts 376.10 & 376.20 (Mains): Comparison of Company-Proposed 70 - R 3.0 curve, Staff-Proposed 70 - R 3.0 curve, and Present 70 - H 4.0 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
Age
Input Data
Company Proposal - R 3.0 70
Staff Proposal - R 3.0 70
Current Curve - H 4.0 70

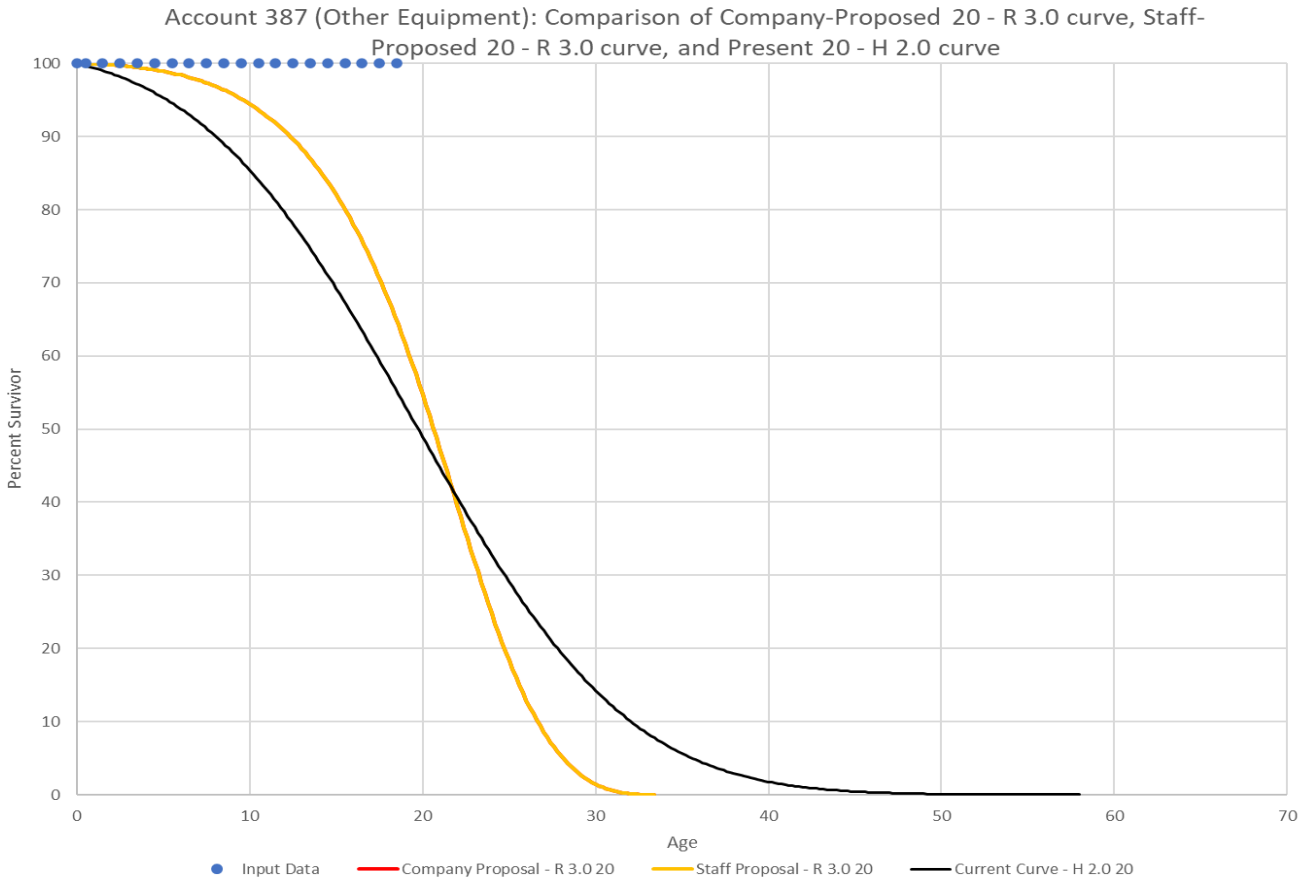

Account 378 (Measuring & Regulating Station Equipment): Comparison of Company-Proposed 55 - R 3.0 curve, Staff-Proposed 60 - R 3.0 curve, and Present 60 - H 2.5 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
Age
Input Data
Company Proposal - R 3.0 55
Staff Proposal - R 3.0 60
Current Curve - H 2.5 60

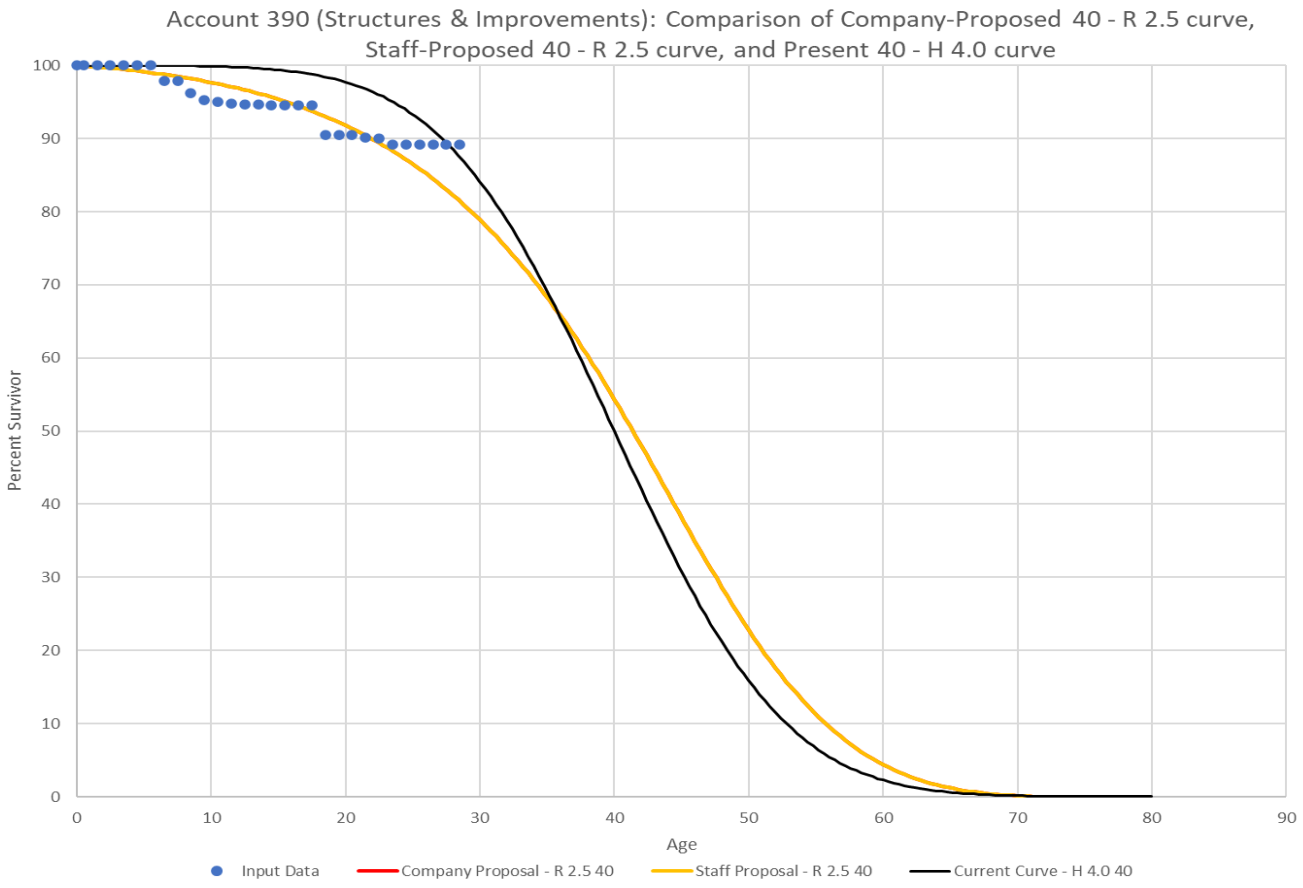

Accounts 380.10 & 380.20 (Services): Comparison of Company-Proposed 60 - R 2.5 curve, Staff-Proposed 60 - R 2.5 curve, and Present 60 - H 2.5 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
Age
Input Data
Company Proposal - R 2.5 60
Staff Proposal - R 2.5 60
Current Curve - H 2.5 60


Accounts 381 & 382 (Meters & Installations): Comparison of Company-Proposed 40 - R 2.5 curve, Staff-Proposed 50 - R 2.0 curve, and Present 40 - H 2.5 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
Age
Input Data
Company Proposal - R 2.5 40
Staff Proposal - R 2.0 50
Current Curve - H 2.5 40


Accounts 383 & 384 (House Regulators & Installations): Comparison of Company-Proposed 40 - R 2.5 curve, Staff-Proposed 45 - R 1.0 curve, and Present 37 - H 3.0 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100
Age
Input Data
Company Proposal - R 2.5 40
Staff Proposal - R 1.0 45
Current Curve - H 3.0 37


Account 385 (Industrial Measuring & Regulating Station Equipment): Comparison of Company-Proposed 40 - R 2.0 curve, Staff-Proposed 45 - R 1.5 curve, and Present 44 - H 1.5 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
Age
Input Data
Company Proposal - R 2.0 40
Staff Proposal - R 1.5 45
Current Curve - H 1.5 44


Account 387 (Other Equipment): Comparison of Company-Proposed 20 - R 3.0 curve, Staff-Proposed 20 - R 3.0 curve, and Present 20 - H 2.0 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
Age
Input Data
Company Proposal - R 3.0 20
Staff Proposal - R 3.0 20
Current Curve - H 2.0 20


Account 390 (Structures & Improvements): Comparison of Company-Proposed 40 - R 2.5 curve, Staff-Proposed 40 - R 2.5 curve, and Present 40 - H 4.0 curve
Percent Survivor
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
Age
Input Data
Company Proposal - R 2.5 40
Staff Proposal - R 2.5 40
Current Curve - H 4.0 40

Net Salvage Summary
Liberty SLG

		Present	Company Proposed	Staff Recommended	Basis for Staff Recommendations that Differ from Company
GAS PLANT					
	DISTRIBUTION PLANT				
374.00	LAND RIGHTS	0	0	0	
375.00	STRUCTURES AND IMPROVEMENTS	0	-5	-5	
376.10	MAINS - STEEL	-25	-30	-30	
376.20	MAINS - PLASTIC	-25	-30	-30	
378.00	MEASURING AND REGULATING STATION EQUIPMENT	-20	-20	-20	
380.10	SERVICES - STEEL	-30	-50	-40	Historic salvage supports making the salvage rate more negative, -40 percent is already adqeuate and incorporates gradualism.
380.20	SERVICES - PLASTIC	-30	-50	-40	Historic salvage supports making the salvage rate more negative, -40 percent is already adqeuate and incorporates gradualism.
381.00	METERS	-10	-5	-5	
382.00	METER INSTALLATIONS	-10	-5	-5	
383.00	HOUSE REGULATORS	-5	-5	-5	
384.00	HOUSE REGULATOR INSTALLATIONS	0	0	0	
385.00	INDUSTRIAL MEASURING AND REGULATING STATION EQUIPMENT	-5	-5	-5	
387.00	OTHER EQUIPMENT	-10	-5	-5	
	GENERAL PLANT				
390.00	STRUCTURES AND IMPROVEMENTS	0	-5	-5	
391.00	OFFICE FURNITURE AND EQUIPMENT	0	0	0	
391.10	OFFICE FURNITURE AND EQUIPMENT - COMPUTERS	Individual	Individual	0	
392.00	TRANSPORTATION EQUIPMENT	Individual	Individual	18	
393.00	STORES EQUIPMENT	0	0	0	
394.00	TOOLS, SHOP AND GARAGE EQUIPMENT	0	0	0	
395.00	LABORATORY EQUIPMENT	0	0	0	
396.00	POWERWORK EQUIPMENT	Individual	Individual	28	
397.00	COMMUNICATION EQUIPMENT	0	0	0	
398.00	MISCELLANEOUS EQUIPMENT	0	0	0	

Depreciation Reserve Summary
Liberty SLG

		Book Reserve Present	Company Theoretical Reserve	Company Reserve Imbalance	Staff Theoretical Reserve	Staff Reserve Imbalance
GAS PLANT						
	DISTRIBUTION PLANT					
374.00	LAND RIGHTS	$ 444,183	$ 335,737	$ (108,446)	$ 376,844	$ (67,339)
375.00	STRUCTURES AND IMPROVEMENTS	$ 432,610	$ 466,701	$ 34,091	$ 521,183	$ 88,573
376.10	MAINS - STEEL	$ 11,945,959	$ 10,821,673	$ (1,124,286)	$ 10,822,006	$ (1,123,952)
376.20	MAINS - PLASTIC	$ 3,735,182	$ 3,383,648	$ (351,534)	$ 3,383,770	$ (351,412)
378.00	MEASURING AND REGULATING STATION EQUIPMENT	$ 3,542,677	$ 2,743,644	$ (799,033)	$ 2,541,759	$ (1,000,918)
380.10	SERVICES - STEEL	$ 2,441,328	$ 1,964,005	$ (477,323)	$ 1,833,113	$ (608,215)
380.20	SERVICES - PLASTIC	$ 4,769,450	$ 3,836,938	$ (932,512)	$ 3,581,662	$ (1,187,788)
381.00	METERS	$ 1,216,476	$ 1,267,077	$ 50,601	$ 846,394	$ (370,082)
382.00	METER INSTALLATIONS	$ 877,053	$ 679,460	$ (197,593)	$ 465,092	$ (411,961)
383.00	HOUSE REGULATORS	$ 298,515	$ 240,641	$ (57,874)	$ 168,246	$ (130,269)
384.00	HOUSE REGULATOR INSTALLATIONS	$ 121,826	$ 79,175	$ (42,651)	$ 59,453	$ (62,373)
385.00	INDUSTRIAL MEASURING AND REGULATING STATION EQUIPMENT	$ 648,767	$ 573,726	$ (75,041)	$ 480,912	$ (167,855)
387.00	OTHER EQUIPMENT	$ 286,508	$ 255,710	$ (30,798)	$ 255,658	$ (30,850)
	TOTAL DISTRIBUTION PLANT	**$ 30,760,534**	**$ 26,648,135**	**$ (4,112,399)**	**$ 25,336,092**	**$ (5,424,442)**
	GENERAL PLANT					
390.00	STRUCTURES AND IMPROVEMENTS	$ 2,056,836	$ 2,038,211	$ (18,625)	$ 2,038,210	$ (18,626)
391.00	OFFICE FURNITURE AND EQUIPMENT	$ 205,232	$ 225,562	$ 20,330	$ 225,560	$ 20,328
393.00	STORES EQUIPMENT	$ 20,637	$ 19,086	$ (1,551)	$ 19,086	$ (1,551)
394.00	TOOLS, SHOP AND GARAGE EQUIPMENT	$ 724,785	$ 879,568	$ 154,783	$ 879,567	$ 154,782
395.00	LABORATORY EQUIPMENT	$ 20,238	$ 124,933	$ 104,695	$ 124,931	$ 104,693
397.00	COMMUNICATION EQUIPMENT	$ 240	$ 26,378	$ 26,138	$ 26,378	$ 26,138
398.00	MISCELLANEOUS EQUIPMENT	$ 17,364	$ 23,337	$ 5,973	$ 23,337	$ 5,973
	TOTAL GENERAL PLANT	**$ 3,045,332**	**$ 3,337,075**	**$ 291,743**	**$ 3,337,070**	**$ 291,738**
	TOTAL DEPRECIABLE EXPENSE	**$ 33,805,866**	**$ 29,985,210**	**$ (3,820,656)**	**$ 28,673,162**	**$ (5,132,704)**
	Percent of Surplus					15.18%
	Amortizing to ten percent					5.18%
	$ to be Amortized over 20 year period					$ 1,752,118
	Annual Amortization $ Amount					$ 87,606

CHAPTER XIII

THEORETICAL RESERVE STUDIES

Introduction

As discussed in Chapter IV, the sole purpose of depreciation accounting is to rateably allocate the capital costs of the property over its average service life through current charges to utility expenses. In depreciation accounting, depreciation expense is calculated either monthly or annually, charged (debited) to the current expense, and credited to the depreciation reserve (accumulated provision for depreciation account). Most commissions require that the depreciation reserve be charged (debited) at retirement with the book cost of plant and credited with any actual net salvage received. Some commissions, however, require that salvage and cost of removal be recovered through current income and expense accounts, respectively, allowing only the book (original or gross) cost of the plant to be accounted for through depreciation charges.

It is intended that the depreciation reserve at the end of an accounting period be that part of the book cost of the plant in service which has been charged to depreciation expense. If depreciation rates have been accurately estimated, the depreciation reserve will reflect the investment in service capacity, utility, or service life of the surviving plant which has been used up in operations. Therefore, the unconsumed usefulness of the plant is its book cost less the depreciation reserve.

In many regulatory customer rate-setting procedures, the depreciation reserve is a deduction from rate base. Therefore, it is desirable that the depreciation reserve be as accurate as possible. Financial reporting standards also demand accuracy.

The depreciation reserve is a balance sheet account, shown as a reduction to the property, plant, and equipment balance and is not a cash reserve. Depreciation accounting is not intended for the purpose of funding plant replacement. The cash flows resulting from the recovery of the capital invested in plant are not required to be retained in the utility accounts or assets. Utility directors have the responsibility and freedom to use these funds in accordance with their best judgement.

Theoretical Reserve In General

It is important that utility management and regulators monitor the consumed service capacity of plant and its complement—unconsumed service value. Because the dollars representing the unconsumed service value, calculated by subtracting the theoretical reserve from the book cost, must be recovered from operations over the property's average remaining life, the utility and the regulators should strive to ensure that the unrecovered dollars are reasonable in relationship to the property's remaining life.

One way to estimate this theoretical consumed service capacity of plant or the adequacy of the depreciation reserve is to perform theoretical reserve studies, often called reserve

requirement studies. The results of analyses from theoretical reserve studies answer many questions about the consumption pattern of plant. However, theoretical reserve studies should not be used to modify the life and net salvage parameters for calculating future depreciation rates. If a theoretical reserve study reflects an inadequate reserve, and the service lives are reduced solely on this basis, a new theoretical reserve study based on the new service lives would indicate not a "corrected" reserve but instead a greater deficiency, calling for even higher depreciation rates. This would not be a correct application of the results of a theoretical reserve study.

Theoretical reserve studies also have been conducted for the purpose of allocating an existing reserve among operating units or accounts. Such allocation is done when either the reserve has not been accumulated in sufficient detail or cannot be determined from utility records.

In recent years, theoretical reserve studies have been used to estimate the theoretically correct book depreciation reserve based upon past and/or future service life and net salvage considerations. Changes in technology and challenges from competition place a greater emphasis on theoretical reserve studies. Periodic comparisons of the theoretical reserves to the actual book reserves and the booking, as depreciation expense, of any reserve imbalance decrease the risk that the original cost of plant will not be recovered during its service life.

The booked consumed service capacity of plant is also expressed by the reserve ratio, which is the book depreciation reserve divided by the book plant balance. A higher ratio indicates a higher consumption of service capacity or life.

For example, the reserve and the reserve ratio, for a single unit, continually increase with each accounting period until the unit is retired. The reserve ratio for a single vintage with a large number of units, however, does not steadily increase. The ratio increases, with some fluctuations caused by the retirement dispersion, until the vintage's age equals its average service life, after which the ratio decreases with the later period retirements until the vintage's units are all retired.

The reserve ratio for an account containing several vintages also does not steadily increase. It may be affected by vintages with differing survivor curve characteristics caused by improvements which lengthen the property's service life. Other factors affecting reserve ratios are inflation and the pattern of growth in vintage installations.

Treatment of Reserve Imbalances

A reserve imbalance exists when the theoretical reserve is either greater or less than the actual reserve. If changes are made to the estimated service life and net salvage, creating a reserve imbalance, a decision must be made as to whether and how to correct the reserve imbalance. Should the imbalance be amortized (debited or credited) to the current depreciation expense over a short period of time; or should a remaining life depreciation rate be used to spread the imbalance over the future remaining life of the plant; or should future depreciation rates be adjusted to reflect the current estimated service life of the plant leaving the decision to adjust the reserve for the future? Further analysis will provide additional information to assist in making these decisions.

When a depreciation reserve imbalance exists, one should investigate why past depreciation rates, average service lives, salvage, or cost of removal amounts differ from current estimates. Care should be taken to analyze these effects before correcting for the reserve imbalances. Instances will occur where subsequent experience shows the original estimates no longer to be appropriate. It should be noted that only after plant has lived its entire useful life will the true depreciation parameters become known. Recognizing the nature of depreciation and its requirement for future estimations, no adjustment in annual depreciation accruals to reflect a reserve requirement, based on current rates, should be made unless there is a clear indication that the theoretical reserve is materially different from the book reserve.

Whereas the judgement of materiality is subjective, if further analysis confirms a material imbalance, one should make immediate depreciation accrual adjustments. The use of an annual amortization over a short period of time or the setting of depreciation rates using the remaining life technique are two of the most common options for eliminating the imbalance. The size of the plant account, the reserve ratio, the account remaining life, the technology of the plant in the account, and the account reserve imbalance in relationship to the account annual accrual all have a bearing on the chosen course of action.

Calculating a Theoretical Depreciation Reserve

There are two accepted methods for calculating a theoretical depreciation reserve, the prospective method and the retrospective method.

For any given class of depreciable plant, the theoretical reserve plus the estimated future depreciation accruals equals the service value of the plant (i.e., book cost less estimated net salvage). Under the prospective method, the future depreciation accruals are first estimated. Under the retrospective method, the aggregate of past net accruals (annual depreciation accruals less salvage and cost of removal) is determined.

Future depreciation accruals represent the estimated aggregate of annual depreciation charges during the average remaining life of the plant. Future depreciation accruals are based on the best available data as to past and future conditions affecting the average service lives and net salvage percentages of plant. Past accruals are calculated based upon depreciation rates deemed reasonable for the future but applied to the annual average historical plant balances.

Reasonable estimates of plant service lives, net salvage percentages, and resulting depreciation rates incorporating future conditions are used to estimate the theoretical depreciation reserve.

Prospective Method

As previously expressed, the theoretical reserve, as of the study date, is equal to the plant balance minus future accruals (the depreciation rate times the average annual plant balance times the expected remaining life in years) and minus estimated net salvage value expected at the end of the plant's average life. Expressed as a percent of book cost of plant, the theoretical reserve ratio using the prospective method is:

$$TR = (100\% - S_f) - (100\% - S_a)(ARL/ASL) \quad (1)$$

where TR is the theoretical reserve ratio
where S_f is the future net salvage
where S_a is the average net salvage percentage, calculated by averaging the total net salvage experienced to-date with the estimated future net salvage
where ARL is the average remaining life
where ASL is the average service life

Future credits to the depreciation reserve are the sum of the future annual accruals over the average remaining life of the plant plus future net salvage. Future accruals are calculated by multiplying the current depreciation rate, using the whole life technique, by the estimated average remaining life of the plant investment as shown below. Expressed as a mathematical formula, the future accruals are:

$$A_f = d * ARL \quad (2)$$

where A_f is the future accruals
where d is the current depreciation rate, using the whole life technique
where ARL is the average remaining life

If the theoretical reserve is developed for several depreciable property groups contained in an account, an individual depreciation rate must be used for each depreciable property group. It would be improper to use the account rate. The formula for determining this rate is as follows:

$$d = (100\% - S_a)/ASL \quad (3)$$

where d is the current whole life depreciation rate
where S_a is the calculated average net salvage percentage (the composite of the future net salvage and the net salvage realized in the past)
where ASL is the average service life of the particular category of plant

The prospective method is illustrated in Table 13-1. This example of a theoretical reserve is developed for a total category. However, a theoretical reserve may be developed for each vintage.

TABLE 13-1
THEORETICAL RESERVE STUDY PROSPECTIVE METHOD

Year Placed	Plant Remaining 1/1/95	Proportion Surviving [1]	Realized Life [1]	Remaining Life	Vintage Average Life [1]	Annual Accruals Without Net Salvage	Future Accruals Without Net Salvage
a	b	c	d	e	f=d+c*e	g=b/f	h=e*g
1994	$988	.988	.494	4.559	5.00	$198	$903
1993	925	.925	1.451	3.839	5.00	185	710
1992	825	.825	2.326	3.240	5.00	165	535
1991	704	.704	3.090	2.713	5.00	141	383
1990	569	.569	3.727	2.236	5.00	114	255
1989	431	.431	4.227	1.795	5.00	86	54
1988	296	.296	4.590	1.383	5.00	59	82
1987	175	.175	4.826	.999	5.00	35	35
1986	75	.075	4.951	.654	5.00	15	10
1985	12	.012	4.994	.500	5.00	2	3
Totals	$5,000					$1,000	$3,068
Years				3.07	5.00		

where S_f is Future Net Salvage: (From a Depreciation Study) 1.0%
where S_a is Average Net Salvage: (From a Depreciation Study) 4.0%
where ARL is Expectancy (Composite Average Remaining Service Life:
(Total Column h ÷ Total Column g) 3.07 Years
where ASL is Composite Average Service Life:
(Total Column b ÷ Total Column g) 5.0 Years
where TR is Theoretical Reserve Ratio:
(100% - S_f) - ((100% - S_a) * (ARL/ASL) 40.1%

[1] Proportion surviving, realized life, average service life and remaining life are taken from Vintage Group Projection Life Table - Iowa curve S0 - 5 year service life.

Retrospective Method

The retrospective method is generally used when the reserve is needed for an individual item or group of items within an account and the remaining life, which is needed for the prospective method, cannot be reasonably determined. Under this method, estimates must be made of total theoretical past accruals, total past retirements, and total past net salvage. These estimates are used in the following formula:

$$TR = (A_p - R + S_r) * 100/P \qquad (4)$$

where TR is the theoretical reserve ratio
where A_p is the sum of all theoretical past accruals or an estimate obtained by summing up the yearly average plant balances and multiplying this sum by the current depreciation rate
where R is the sum of past retirements
where S_r is the sum of realized net salvage
where P is the current account balance of the plant account

An example illustrating the application of the retrospective method is shown in Table 13-2. The similarity between the theoretical reserve ratios calculated in Tables 13-1 and 13-2 is due to the fact that the same retirement frequency and average net salvage figures were used in both examples. In reality, retirements do not occur in a perfect retirement pattern or frequency. The retrospective method is used when vintage retirement information in not available.

TABLE 13-2

THEORETICAL RESERVE STUDY RETROSPECTIVE METHOD

Activity Year	Plant Balance January 1[2]	Additions During Year[2]	Retirements During Year[2]	Plant Balance December 31	Average Plant Balance	Net Salvage On Retirements[2]
a	b	c	d	e b+c-d	f (b+e)/2	g
1994	$5,000	$1,000	$1,000	$5,000	$5,000	$50
1993	5,000	1,000	1,000	5,000	5,000	50
1992	5,000	1,000	1,000	5,000	5,000	50
1991	5,000	1,000	1,000	5,000	5,000	50
1990	5,000	1,000	1,000	5,000	5,000	50
1989	5,000	1,000	1,000	5,000	5,000	50
1988	5,000	1,000	1,000	5,000	5,000	50
1987	5,000	1,000	1,000	5,000	5,000	50
1986	5,000	1,000	1,000	5,000	5,000	50
1985	5,000	1,000	1,000	5,000	5,000	50
1984	4,988	1,000	988	5,000	4,994	49
1983	4,913	1,000	925	4,988	4,951	46
1982	4,738	1,000	825	4,913	4,826	41
1981	4,442	1,000	704	4,738	4,590	35
1980	4,011	1,000	569	4,442	4,227	28
1979	3,442	1,000	431	4,011	3,727	22
1978	2,738	1,000	296	3,442	3,090	15
1977	1,913	1,000	175	2,738	2,326	9
1976	988	1,000	75	1,913	1,451	4
1975	0	1,000	12	988	494	1
1974	0	0	0	0	0	0
Totals	$82,173	$20,000	$15,000	$87,173	$84,676	$750

[2] Additions, retirements, plant balances and net salvage (R and S_r) obtained from accounting records.

where P is Plant balance December 31, 1994	$ 5,000
where P_a is Sum of average plant balances	$ 84,676
where ASL is Depreciable property group average service life[3]	5 years
where S_a is Depreciable property group average net salvage[3]	5.0%
where d is Depreciable property group depreciation rate (100%-S_a)/ASL	19.0%
where A_p is Sum of past accruals (P_a * d)	$ 16,088
where R is Retirements January 1, 1974 to December 31, 1994	$ 15,000
where S_r is Net salvage from retirements	$ 750
here T is Theoretical reserve amount (A_p-R+S_r)	$ 1,838
where TR is Theoretical reserve ratio (T/P) * 100%	36.8%

Discussion

There are variations to both of the methods described above. For example, the retrospective method could be improved if actual past accruals were available from the accounting records. Another variation involves an age-life calculation wherein the theoretical reserve is calculated by multiplying the depreciation rate by the average age of the plant. The age-life result has a tendency to overstate the theoretical reserve since it assumes equal life group procedures and, therefore, overlooks the effect of early retirements.

Generally, these variations result in the development of different theoretical reserves, both for the individual categories and for the overall composite. It should be realized, therefore, that the determination of theoretical reserves is not an exact science, but a calculation resulting in an approximation of the actual reserve.

Alternatively, the theoretical reserve may be tested using reserve ratios, the actual reserve divided by the plant investment. Both the demise of reserve ratios in the tax laws and the effect of growth and inflation on plant balances have reduced the use of this test. Nonetheless, annual comparisons between reserve ratios and the analysis necessary to explain the changes in these ratios provide valuable insight as to the changes in retirement patterns in a plant account and the effects of salvage and cost of removal on the overall recovery of the invested capital. Presently, the main use of reserve ratios is to help identify these areas for further depreciation analysis.

Theoretical reserve studies focus attention on the variance between the actual and theoretical reserves. Before deciding on a method to address the elimination of any variances, further analysis should be made to discover the causes for the variance. Theoretical reserve studies should be used as a tool in the depreciation study process and not as an end in themselves.

---

[3] Depreciable property group average service life (ASL) and average net salvage (S_a) from a depreciation study.