BEFORE THE CORPORATION COMMISSION

OF THE STATE OF KANSAS

IN THE MATTER OF THE APPLICATION	**)**	
OF ATMOS ENERGY CORPORATION FOR	**)**	
ADJUSTMENT OF ITS NATURAL GAS	**)**	**DOCKET NO. 19-ATMG-525-RTS**
RATES IN THE STATE OF KANSAS	**)**	

DIRECT TESTIMONY OF

JAMES S. GARREN

RE: DEPRECIATION

ON BEHALF OF

THE CITIZENS' UTILITY RATEPAYER BOARD

OCTOBER 31, 2019

DIRECT TESTIMONY AND EXHIBITS

OF JAMES S. GARREN

Contents

A. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND POSITION.

A. My name is James S. Garren. I am an analyst with the economic consulting firm of Snavely King Majoros & Associates, Inc. ("Snavely King").

Q. HAVE YOU PREPARED A SUMMARY OF YOUR QUALIFICATIONS AND EXPERIENCE?

A. Yes. Attachment A is a summary of my qualifications and experience.

Q. PLEASE DESCRIBE YOUR BACKGROUND IN UTILITY DEPRECIATION.

A. Since my employment at Snavely King in 2010, I have participated as an analyst in approximately 35 separate depreciation studies of electric, gas and water utilities on behalf of the firm's clients, most of which are state commissions or state-funded consumer advocate agencies. In that role, I have worked closely with the firm's principals in performing life and net salvage analyses, calculation of depreciation rates, and preparation of testimony. Additionally, I am familiar with the firm's proprietary depreciation software, the Snavely Comprehensive Investment Analysis System ("SCIAS"). I am also recognized as a Certified Depreciation Professional by the Society of Depreciation Professionals.[1]

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[1] "The Society of Depreciation Professionals was organized in 1987 to recognize the professional field of depreciation analysis and individuals contributing to this field; to promote the professional development and professional ethics of practitioners in the field of depreciation analysis; to collect and exchange information about depreciation analysis; and to provide a national forum of programs and publications concerning depreciation." http://www.depr.org/?page=AboutUs . For certification, an applicant must have at least 5 years of full time professional depreciation experience, at least 2 years of which must be in the area of depreciation administration. Among other requirements, the applicant must pass a two part (Technical and Ethics) closed book examination which includes questions about, *inter alia*, Plant and Reserve Accounting, Life Analysis Concepts, Life Analysis Using Actuarial Models, Life Analysis Using Simulation Models, Salvage and Cost of Retiring Analysis, Technology Forecasting and Depreciation Calculations." http://www.depr.org/?page=Certification

Q. FOR WHOM ARE YOU APPEARING IN THIS PROCEEDING?

A. I am appearing on behalf of the Kansas Citizens' Utility Ratepayer Board ("CURB").

Q. WHAT IS THE OBJECTIVE OF YOUR TESTIMONY?

A. Atmos Energy Corp. ("Atmos" or "the Company") has filed an Application to change its base rates for utility service with the Kansas Corporation Commission ("KCC" or "the Commission"). In its Application, the Company filed a Depreciation Study with accompanying Direct Testimony. The objective of my testimony is to detail my analysis of the Company's Depreciation Studies regarding average service lives and net salvage for Storage, Transmission, Distribution and General plant.

B. SUMMARY

Q. WHAT INFORMATION HAVE YOU REVIEWED IN PREPARATION FOR THIS TESTIMONY?

A. I have reviewed the written direct testimony and exhibits of Ned W. Allis of Gannett Fleming, who presents testimony on the Company's Depreciation Study based on plant balances at September 30, 2018. Mr. Allis's recommendations were ultimately applied in this case to the Company's test year plant balances at March 31, 2019. Upon examination of this testimony and the underlying studies, I prepared numerous data requests which were propounded to Atmos by CURB at my request.

I have now had the opportunity to review Atmos's responses to these data requests as well as the documents attached to Atmos's filing. In response to some of the data requests, CURB has been provided the depreciation data Mr. Allis used to perform his studies. I used this data, along with information obtained through discovery to conduct my own analysis. As a result, I am proposing certain adjustments to Mr. Allis's proposed depreciation rates and accruals for plant depreciation.

Q. ARE YOUR PROPOSED DEPRECIATION RATES AND EXPENSES HIGHER OR LOWER THAN MR. ALLIS'S?

A. In general, my proposed depreciation rates and resulting annual depreciation expenses are lower than Mr. Allis's for most accounts.

Q. IN BRIEF, WHY ARE YOUR PROPOSED DEPRECIATION RATES LOWER THAN THE RATES PROPOSED BY MR. ALLIS?

A. My depreciation rates are lower than those proposed by Mr. Allis for two principal reasons. First, I have adjusted the average service lives used to calculate depreciation rates for seven distribution accounts. Second, I have proposed that the Commission adopt an alternative method of estimating future net salvage, which is based on the most recent five-year history of the Company's net salvage experience.

Q. WOULD YOU PLEASE SUMMARIZE THE TOTAL IMPACT OF THE ADJUSTMENTS YOU HAVE MADE?

Yes. Please refer to the table below for a comparison of the depreciation rates and expenses:

Table JSG-1

Summary of Depreciation Rates and Expenses
Based on September 30, 2018Plant Balances

	Atmos Rate	Atmos Expense	CURB Rate	CURB Expense	Adjustment
Storage	3.02%	$133,694	3.02%	$195,344	$61,650
Transmission	4.54%	$80,584	7.63%	$135,331	$54,747
Distribution	3.65%	$12,754,557	2.76%	$9,652,919	($3,101,638)
General	7.26%	$762,571	7.37%	$774,563	($12,082)
Total	3.73%	$13,731,406	2.92%	$10,758,158	($2,973,248)

Q. ARE YOU SPONSORING ANY EXHIBITS IN CONJUNCTION WITH THIS TESTIMONY?

A. Yes. I have prepared Exhibit JSG-1, Schedule 1, which shows the calculation of depreciation rates and expenses for all mass property accounts. Exhibit JSG-1, Schedule 2 shows the calculation of total future net salvage. Exhibit JSG-2 contains the service life analysis for the accounts which I am proposing to adjust.

Q. CAN YOU SUMMARIZE THE ISSUES THAT YOU ARE GOING TO BE ADDRESSING IN THIS TESTIMONY?

A. Yes. In this testimony, I address two issues. First, is the selection of average service lives for electric plant. The second is a proposed change to the methodology for estimating future net salvage.

Service Life analysis

- I am proposing to adjust the average service lives of seven distribution accounts. Each adjustment is an increase to the average service life of that account.
- My proposed increases to average service lives are in line with the Company's historical data.

Net Salvage analysis

- I am proposing that the Commission adopt a method that utilizes the most recent five-year average of recorded net salvage to estimate required annual accruals and future net salvage over the remaining life of plant.
- This method is superior to the alternative method proposed by Mr. Allis because it matches future estimates to the Company's actual experience.
- Mr. Allis's proposed method is flawed due to his reliance on a ratio of two numbers—net salvage and retirements—that are not related, resulting in unreliable future indications.
- The ratio Mr. Allis is proposing also utilizes numbers from two different time periods, resulting in the inclusion of significant inflation that should not be charged to ratepayers.

C. DISCUSSION OF SERVICE LIVES FOR MASS PROPERTY ACCOUNTS

Q. WOULD YOU PLEASE EXPLAIN YOUR ADJUSTMENT TO SERVICE LIVES?

A. I have identified seven accounts where I believe Mr. Allis's proposed average service lives vary from the historical indications. In each of these cases, Mr. Allis's proposed average service life diverges significantly from the statistical indications. I have reviewed Mr. Allis's responses to numerous data requests, including but not limited to CURB DR Nos., 1-36, 1-43, 1-52, 1-72, 1-73, 1-74, and 1-75, to determine what basis Mr. Allis used to develop recommendations that were inconsistent with the historical data for these accounts. In response to data request CURB 1-75, Mr. Allis stated:

> Consistent with authoritative depreciation texts and accepted depreciation practices, there are no FERC accounts for which the proposed survivor curve is based solely on a regression or other statistical analysis. The life and curve selection process for each account is based on informed judgment that considers both mathematical and visual curve matching based on the retirement rate method, as well as other known information concerning the account gathered through interviews with Company personnel, site visits, industry experience, and general knowledge of the equipment in each account. The reason for not relying solely on "best-fitting" curves from the statistical analysis is that the estimation of survivor curves is a process of estimating the future life characteristics for the assets currently in service, and therefore judgment must be incorporated in order to ensure the most reasonable estimates.

Mr. Allis provides no specific information or insight regarding his reasoning for any particular account. I have reviewed information provided by Mr. Allis relating to industry statistics, Company maintenance programs and management expectations. I have discussed each account in detail below. However, as a general matter, I have not found any information relating to these accounts which would suggest that future expectations should be anticipated to diverge significantly from historical information.

Q. PLEASE DEFINE "AVERAGE SERVICE LIFE" AS IT IS USED IN UTILITY DEPRECIATION CALCULATIONS.

A. The "average service life" for a given account is a projection of the number of years that a new unit of plant can be expected to remain used and useful on average. This concept is useful because modern depreciation analysis utilizes what we call "group depreciation." With "group depreciation," we depreciate the value of a collection of units rather than depreciate the value of an individual unit or units over the lifetime of those units. This group depreciation assumes that many units in each account will be retired at earlier ages, and thus have a shorter than average life, and many units will retire at later ages, and thus have a longer than average life. Average service life is used to calculate the average remaining life, which, in turn, is the denominator in the calculation of depreciation expense. Group depreciation is also why we do not study the lives of units in an account, but rather, the lives of dollars in these accounts. Therefore, all else being equal, a longer average service life directly results in a lower depreciation expense.

Q. PLEASE DESCRIBE THE PROPER WAY TO DETERMINE THE AVERAGE SERVICE LIFE COMPONENT OF DEPRECIATION RATES.

A. I have analyzed Atmos's distribution accounts using an actuarial life analysis process called the Retirement Rate method. Actuarial methodologies were developed initially in the 17th and 18th centuries, primarily by life insurance companies that invented mathematical means of estimating the mortality risk of individuals over a long period of time. This resulted in the development of "life tables," which show the mortality risk of a group of individuals with similar risk factors at each age.

The Retirement Rate method is an actuarial technique used to study plant lives, much like the actuarial techniques used in the insurance industry to study human lives. It requires a record of the dates of placement (birth) and retirement (death) for each asset unit studied. Retirement data that contains this date of placement and retirement is referred to as "aged data" because it tells the analyst the age of the plant at the time it was retired. The Retirement Rate method is the most sophisticated of the statistical life analysis methods because it relies on the most refined level of data.

In the Retirement Rate method, aged retirement data, as described above, and total plant in service at a given age (referred to collectively as "exposures") from a company's records are used to construct an observed or original life table ("OLT"). I discuss the composition of an observed life table in detail below, and the details are important because they result in data points showing the percentage of a given unit of plant that is expected to survive at a given age. The actuarial analysis smooths and extends the observed life table by fitting it into a family of 31 standardized survivor curves ("Iowa curves"). The curve-fitting uses the least squared differences approach to find a best-fit life for each curve. The "sum of least squared difference" is a common means of fitting curves (in this case the Iowa curves) to a set of data (in this case the observed life table data). The difference between each point of data and a point on a line is squared, and the square of all those differences is summed to provide the total difference between the set of data and the line. The line that produces the least difference from the set of data is considered the "best fit." The purpose of squaring the difference is to ensure that negative differences contribute to the overall difference rather than canceling out positive differences.

Numerous iterative calculations are required for a Retirement Rate analysis. In the end, the analysis produces a life and Iowa curve best fit for a single average vintage. My understanding is that this is the same type of life analysis that Atmos performed for its depreciation studies.

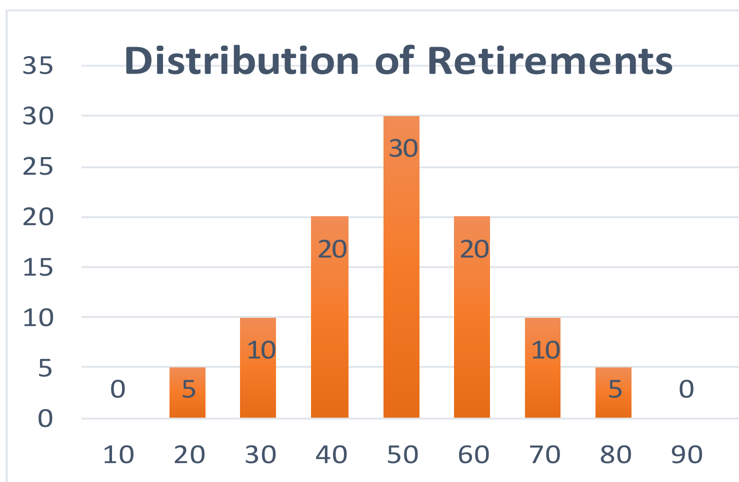
Q. WHAT ARE IOWA CURVES?

A. An Iowa curve is a surrogate or standardized observed life table based on a specific pattern of retirements around an average service life. The Iowa curves were devised over 60 years ago at Iowa State University. The curves provide a set of standard patterns of retirement dispersion. Retirement dispersion merely recognizes that accounts are comprised of individual assets or units having different lives.

For example, imagine an account that begins with a new addition of one hundred units. These units are unlikely to all retire at the same time. Rather, different units within the group will retire at different times. Represented graphically, the result might appear as follows:

Graph JSG-1

Age:	Units Retired
10	0
20	5
30	10
40	20
50	30
60	20
70	10
80	5
90	0

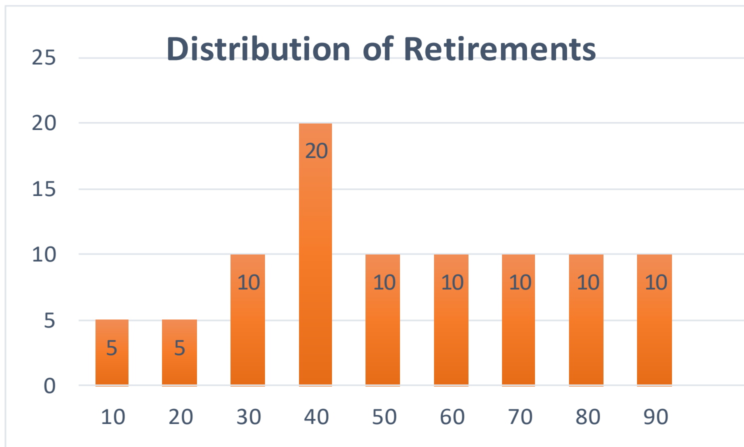


In this example, the average service life would be fifty, and the retirement dispersion curve would tell us how the retirements are arranged around the average service life. In this example, the distribution of retirements around the average service life is symmetrical, with the "mode," or the age with the highest number of retirements, being at the average service life. In this data, the retirements are also relatively tightly grouped around the average service life.

Iowa curves describe many different patterns of dispersions. Returning to our example, imagine a different pattern of retirements as follows:

Graph JSG-2

Age:	Units Retired
10	5
20	5
30	10
40	20
50	10
60	10
70	10
80	10
90	10



In this example, the average service life is still fifty, but the dispersion characteristics are very different. The mode is at age 40, which is an earlier age than the average, and overall the distribution of retirements is more spread out than in the previous example. By using different types of Iowa curves, I can capture these different characteristics that can be seen in retirement data.

One way that Iowa curves illustrate these different patterns is by their orientation as left-skewed, symmetrical or right-skewed curves, which are known, respectively, as “L curves,” “S curves,” and “R curves.” The letters describe the location of the “mode,” as discussed above, relative to the average service life. Hence, in the first example, which is symmetrical, I would use an “S curve,” whereas in the second example, in which the mode was at a younger age than the average service life, I would use an “L curve.” If the mode falls after the average service life, then I would use an "R curve." In addition to L, S and R curves, there is a set of Origin Modal, or "O curves," which are so called because the mode for these curves is at age one, or the "origin." Generally speaking, O-shaped Iowa curves are not appropriate for utility plant.

In addition to the letter that describes the location of the mode, Iowa curves are numbered one through six, which identifies the spread of the retirement dispersion. Lower numbers represent a wider retirement dispersion. Referring to the first example above, in which the retirements were more tightly grouped around the average service life, a higher number would be used, whereas in the second example, in which the retirements were more diffuse, a lower number would be used.

To combine these two concepts, an appropriate Iowa curve for the first example might be an S5, whereas an appropriate Iowa curve for the second example might be a L2. This combination of one letter and one number defines a dispersion pattern. Adding an average service life to an Iowa curve (*e.g.*, 5-S0) provides a survivor curve intended to depict a reasonable expectation of how a group of assets will survive, or conversely be retired, over the expected average service life.

Table JSG-2 below compares curves with the same shape (S0) but different average service lives (5 and 10- years) to illustrate different iterations with the same curve. The percent surviving represents the amount of plant surviving at each age interval shown in the first column. The 5 S0 life and curve sums to the five-year average service life, while the 10 S0 life and curve sums to a ten-year average service life.

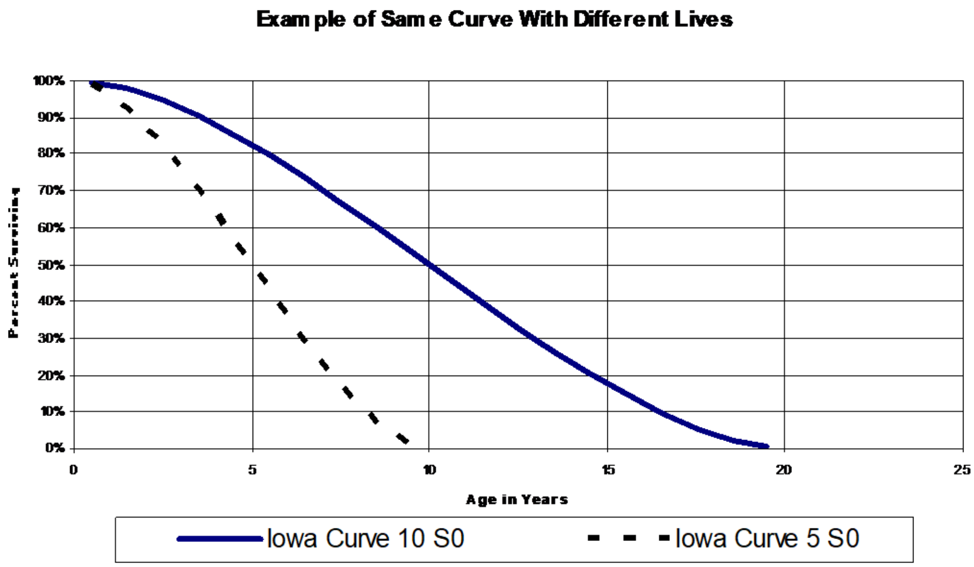
Table JSG-2

Sample Survivor Curves

Age	5 S0 Curve Percent Surviving	10 S0 Curve Percent Surviving
0.5	0.99	1.00
1.5	0.92	0.98
2.5	0.83	0.94
3.5	0.70	0.90
4.5	0.57	0.85
5.5	0.43	0.80
6.5	0.30	0.74
7.5	0.17	0.67
8.5	0.08	0.60
9.5	0.01	0.53
10.5		0.47
11.5		0.40
12.5		0.33
13.5		0.26
14.5		0.20
15.5		0.15
16.5		0.10
17.5		0.06
18.5		0.02
19.5		0.00
Total	**5.00**	**10.00**

These are called "curves" because, when plotted on charts with the x-axis representing "age" and the y-axis representing "percent surviving," they appear as shown below in Graph 3:

Graph JSG-3



Q. HOW DO YOU USE THE IOWA CURVES IN YOUR SERVICE LIFE ANALYSIS?

A. The purpose of Iowa curves is to enable the calculation of an average remaining life. Remaining life calculations take the current age of each vintage within an account and then use the retirement rate projected by the appropriate Iowa curve to project the remaining life of each of these vintages of plant. Ultimately, depreciation accruals for plant investment are calculated from remaining lives, so it is important to select the correct average service life and the correct Iowa curve.

Q. IS IT NECESSARY TO FIT ALL OF THE AVAILABLE DATA POINTS TAKEN FROM THE OBSERVED LIFE TABLE?

A. No. In some cases, it is appropriate to disregard some or even many of the oldest aged data. This is because actuarial data that the company keeps often is tied to long-lived assets that represent so small a percentage of the total plant as to not be statistically significant or represent accounting anomalies, such as retirements that were never recorded. This process, which is represented in the graphs below, is called a "T-cut." While there is no hard and fast rule for where a T-cut is appropriate, it is generally appropriate to make a T-cut where the remaining retirement data diverges materially from the established pattern of retirements seen to that point.

The decision to make a T-cut, and at what point in the data set to make the cut, is one of the most important, yet subjective, elements to an actuarial analysis. In most cases, making a "larger" T-cut (that is, one that results in fitting the curve to less of the actuarial data) will result in a shorter estimated average service life, because the data eliminated is for the longest-lived assets in the set of data.

Additionally, an inconclusive analysis may occur if data points are eliminated from an observed life table with a limited data set (that is, an account that has a short history of plant exposed to retirement). Typically, the portion of an Iowa curve between 85% surviving and 15% surviving most distinguishes one curve from another. Apart from O curves, Iowa curves follow a parabolic distribution of retirements (that is, as we discussed above, they tend to have limited retirements at the beginning and end of their life). Thus, the portion between 85% and 15% surviving is the most indicative of the appropriate life and curve because that is when the bulk of retirements in a given account happen, and where variation in the pattern of retirements tends to occur. If a T-cut eliminates too much of the observed life table data, the matching of that data to an Iowa curve will be more likely to produce ambiguous and misleading results. I believe that the full set of aged data should be used in the service life analysis unless specific circumstances warrant exclusion of the data.

Q. CAN YOU WALK THROUGH THE ANALYSIS OF A PARTICULAR ACCOUNT AS AN EXAMPLE?

A. Yes. Understanding how a life table functions is crucial to understanding service life analyses. Therefore, let us take 376.00 – Overhead Conductors and Devices, as an example. Below, I have reproduced ages 0 to 4.5 of the observed life table for Account 376.00 using an experience band of 1926-2018.

Table RC-3

Observed Life Table for Account 376.00

Age (Years)	Exposures ($)	Retirements ($)	Retirement Ratio (%)	Survivor Ratio (%)	Cumulative Survivors
BAND		**1926 - 2018**			
0	196,030,969	325,757	0.1662	99.8338	1.0000
0.5	209,598,950	560,376	0.2674	99.7326	0.9983
1.5	200,216,067	529,453	0.2644	99.7356	0.9957
2.5	187,746,178	478,861	0.2551	99.7449	0.9930
3.5	171,831,061	461,635	0.2687	99.7313	0.9905
4.5	163,919,946	433,654	0.2646	99.7354	0.9878

The first column shows the age. The observed life table groups data from all vintages together and analyzes the mortality characteristics based on the age of the plant. In the next column are exposures. This is the total plant in service exposed to retirement at a given age. Exposures decrease as age increases because the most recent vintages have not yet had time to attain higher ages. Next, we have retirements, which are total retirements on all vintages that occur at a given age. Earlier, we discussed aged retirement data, and this is where that data comes into play. To review, the age of the retirement is the year that it was taken out of service minus the age that it was put into service. The next column, retirement ratio, is simply retirements divided by exposures. Broadly, this tells you what the odds of a given unit retiring at this age should be. The survivor ratio is then 100% minus the retirement ratio, which, converse to retirement ratio, tells you what percent of the exposures should survive this age. Finally, cumulative survivors are an iterative calculation that begins at 100% and then is multiplied by the previous year's survivor ratio. This measures the chance that a unit will survive at the beginning of its life, which is 100%, and then subjects that percentage to the risk of retirement at each subsequent age.

The cumulative survivors at each age become the data points, which are then compared to the points on each Iowa curve by an algorithm to arrive at the best fit. For Account 376.00, the life-curve combination with the lowest sum of squared differences is an R1.5 curve with a 63-year average service life with a sum of squared differences of 236.707. The curve fitting results display the average service life that gives the lowest sum of squared differences for each different curve shape. Table RC-4 presents the top seven curve fits for this account:

Table RC-4

Curve Fitting Results for Account 376.00

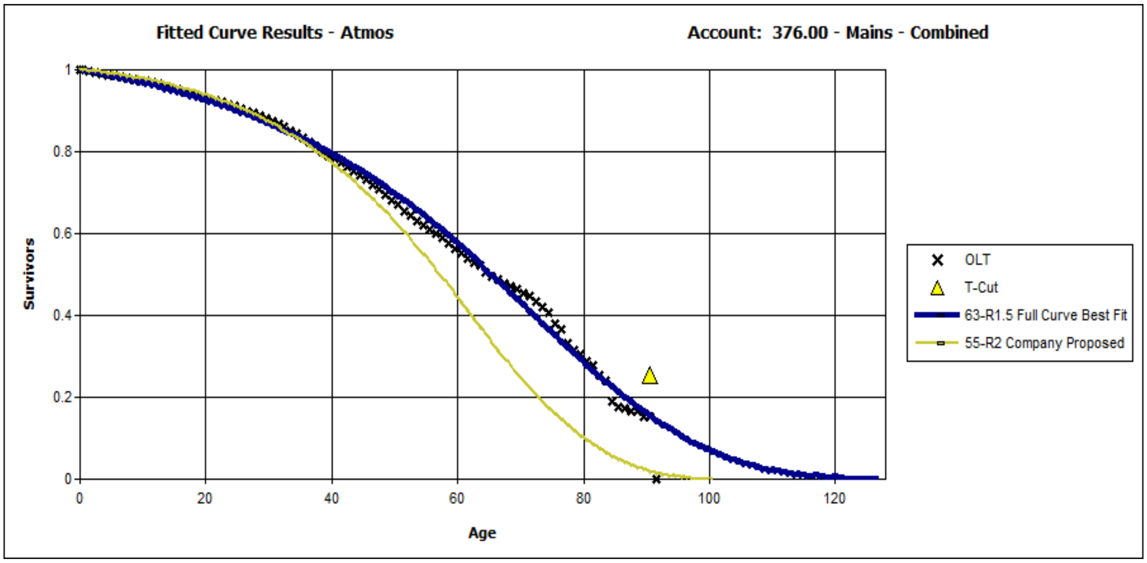
Curve	Life	Sum of Squared Differences
BAND	**1926 - 2018**	
R1.5	63.0	236.707
S0.5	64.0	386.793
S1	64.0	603.824
R1	62.0	726.040
L1.5	67.0	875.992
R2	63.0	969.316
S0	64.0	1,025.349

Reviewing this table grants a sense of the range of lives that might be appropriate given the curve shape selection. Looking further down the curve fitting results for Account 376.00, we can see that the best-fit results for each curve shape range from as low as 62 years to as high as 67 for the top seven results. We can also see that the number components in the best-fitting Iowa curves are quite low, generally between 0 and 2. Generally, we would expect the retirement pattern of this account to be widely dispersed with a long, flat retirement curve. We can also see that the Company's proposed curve for Account 376, an R2 curve, is the sixth best-fitting curve shape for this account. However, the best-fitting average service life for the R2 curve shape is 63 years, rather than the 55 year life the Company is proposing.

The next section of the life analysis is a graph, depicted below as Graph RC-5, which plots the cumulative survivors from the observed life table against the best-fitting Iowa curve and the Iowa curve proposed by Mr. Allis. I provide the graph for each of the Company's accounts below in my account-by-account analysis. I also include these graphs, in Excel format, in Exhibit JSG-2.

Graph RC-5

Best Curve Fit Results for Account 376



Graph RC-5 illustrates that Mr. Allis's proposed life and curve combination is a reasonable fit to the available data through approximately age 40. However, thereafter, Mr. Allis's selection predicts a significantly more precipitous increase in the rate of retirements than is actually seen in the Company's experience. The best-fitting 63-R1.5 life and curve remain an excellent fit to the historical data through the end of the available data at approximately age 90.

Q. DO YOU HAVE CONCERNS WITH MR. ALLIS'S SERVICE LIFE ANALYSIS?

A. Broadly speaking, I do not have major concerns with Mr. Allis's service life analysis in this case. Rather, my concern is with the extent to which Mr. Allis's proposed service lives seem to diverge from the results of his life analysis. By way of an example, Mr. Allis provides an explanation of his rationale for selecting the 55-R1.5 life and curve for Account 376. I discuss this account, along with Mr. Allis's rationale below. Otherwise, Mr. Allis provides no specific explanation for his proposals for any of the other accounts.

Q. HAVE YOU PROVIDED THE RESULTS OF YOUR MATHEMATICAL FITTING ANALYSIS?

A. Yes, Exhibit JSG-2 includes a Schedule titled "Best Fit Curve Results" for each account studied that shows my mathematical curve fitting analysis. Except in limited cases, the "best fit" here, defined as the life-curve combination with the least sum of squared differences, has been selected as our proposed average service life and retirement dispersion curve for that account. These differ from the best fits resulting from Mr. Allis's analysis primarily because we have selected different T-cuts for our analysis. As can be seen in the graphs presented for each account in Exhibit JSG-2, I have generally tried to make T-cuts where there appears to be a significant break in the pattern of retirements or where the retirements end.

Q. ARE THERE INSTANCES WHERE THE MATHEMATICAL BEST FIT LIFE AND CURVE ARE NOT APPROPRIATE?

A. Certainly. The mathematical best fit is appropriate in most cases in which the future retirement patterns can reasonably be expected to follow historical experience. However, this is not always the case. There are numerous factors that might lead a utility depreciation expert, who is familiar with the plant account for a given company for a given account, to conclude that future depreciation expectations are different than historical experience. These factors, including major replacement or maintenance projects, differing life expectations of new technologies, or economic or engineering decisions of utility management, might significantly affect the expectations for future retirement rates. Thus, informed judgment is an important component of the service life analysis, but any decision not to follow historical experience must be supported by a reasonable basis.

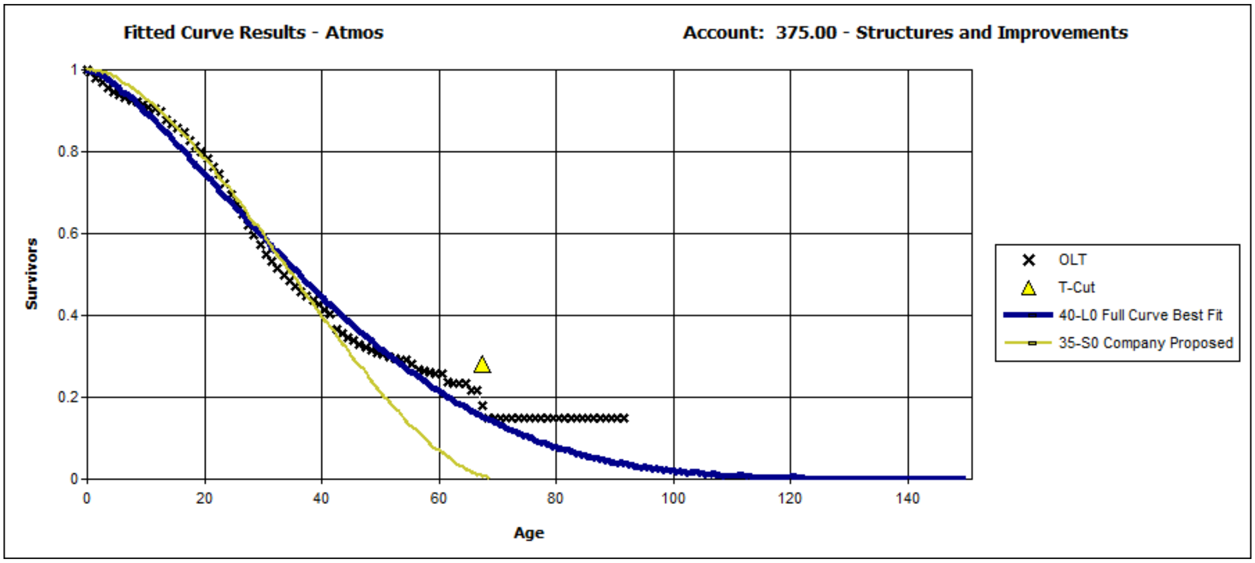
Q. ARE THERE ACCOUNTS THAT YOU STUDIED WHERE THE BEST FITTING CURVE IS NOT APPROPRIATE?

Yes. The actuarial analysis results for Account 381.00 – Meters, suggests an average service life that is significantly longer than I would generally consider appropriate for this type of plant. In that case, I am proposing an average service life that is at the maximum range of what I would consider appropriate for Meter plant and maintained the R2 curve shape that Mr. Allis proposed for this account.

Q. CAN YOU DISCUSS YOUR SERVICE LIFE ANALYSIS AND PROPOSAL FOR EACH ACCOUNT?

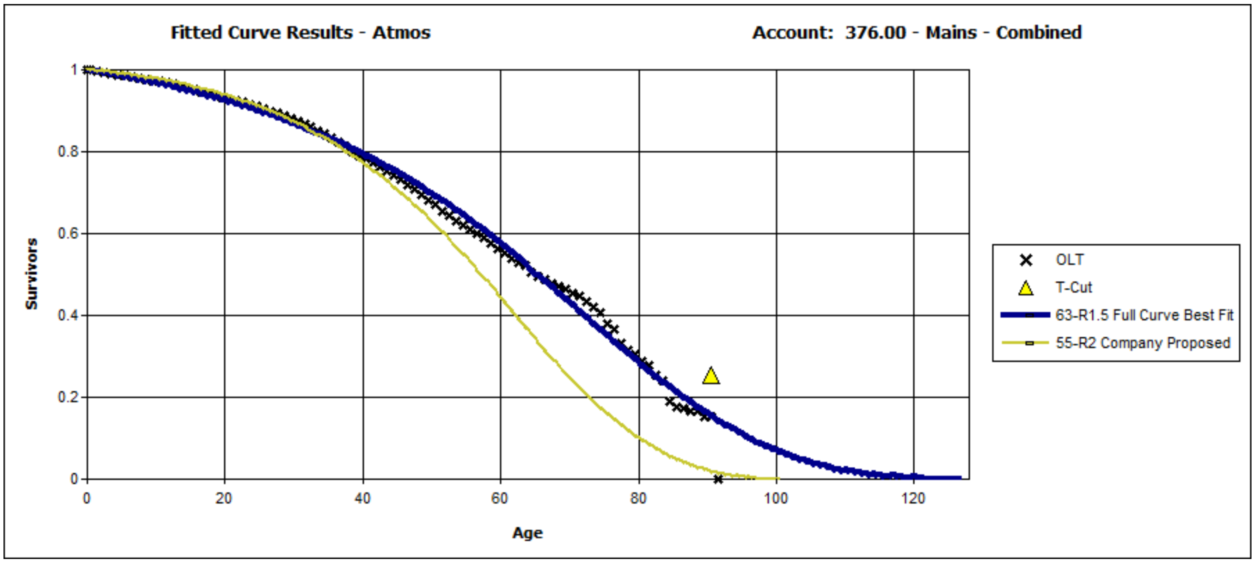
A. Yes. Below is a brief discussion of my average service life proposals for each of the accounts which I am proposing to adjust.

Account 375.00 – Structures and Improvements



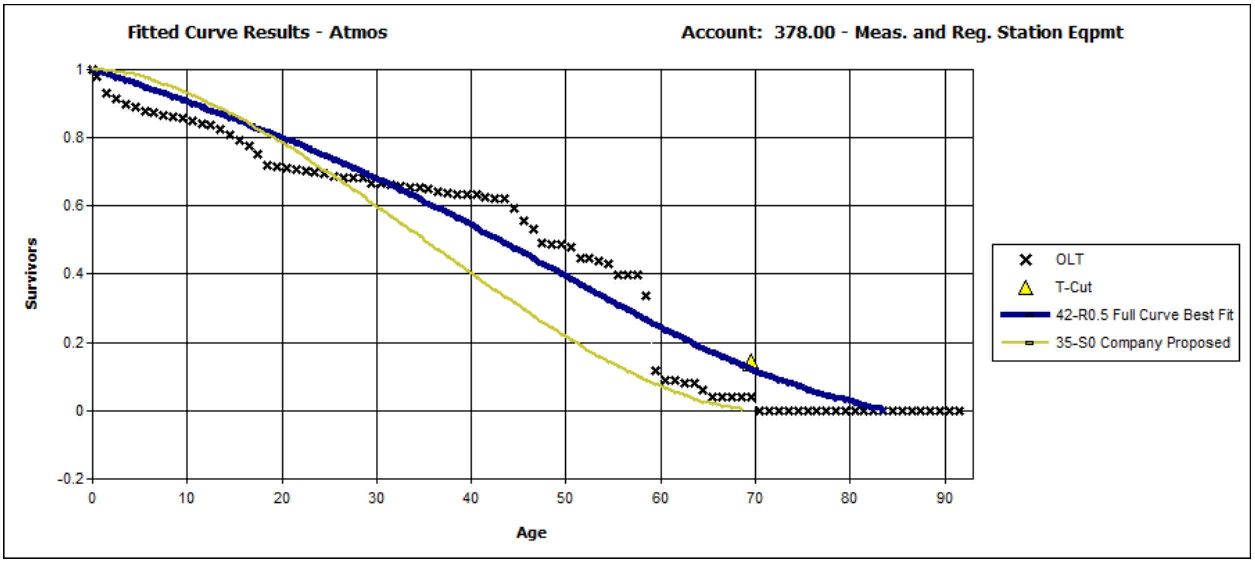
Mr. Allis has proposed a 35-S0 life and curve combination for this account. As we can see from the above graph, the 35-S0 curve is a reasonable close match to the data through approximately age 40. However, beyond age 40, it becomes clear that the rate of retirements declines as they increase in age. This pattern is consistent with what we would expect from this type of plant. This account includes structures made from many different types of materials, some of which would be expected to last significantly longer than the average service life. I am proposing a 40-L0 life and curve shape, which is the best fit to the available data.

<u>Account 376.00, 376.01, 376.02, – Mains (Cathodic Protection, Steel, and Plastic)</u>



Mr. Allis has proposed a 55–R2 life and curve shape for the collective Mains accounts, including catholically protected, steel and plastic. Mr. Allis studied the lives of all three sub-accounts together. In his testimony, Mr. Allis points out that "the statistical analysis through 2018 indicates a longer service life than the current estimate."[2] The available data supports a longer life than Mr. Allis is proposing. Mr. Allis rationalizes utilizing the lower average service life by the stating that "the Company also has a replacement program that will affect a significant portion of mains in the coming years". In cases where a replacement project of this kind is unusual, it *might* be appropriate to lower the average service life based on future expectations. However, in the case of Mains, these types of replacement programs are a regular occurrence, with older types of mains being replaced with newer types. As a result, future replacement programs don't need to be specifically accounted for. That being the case, the historical record is still the best indicator of future results. Therefore, I am proposing the 63–R1.5 life and curve, which are the best fitting to the available data.

Account 378.00 – Measuring and Regulating Station Equipment

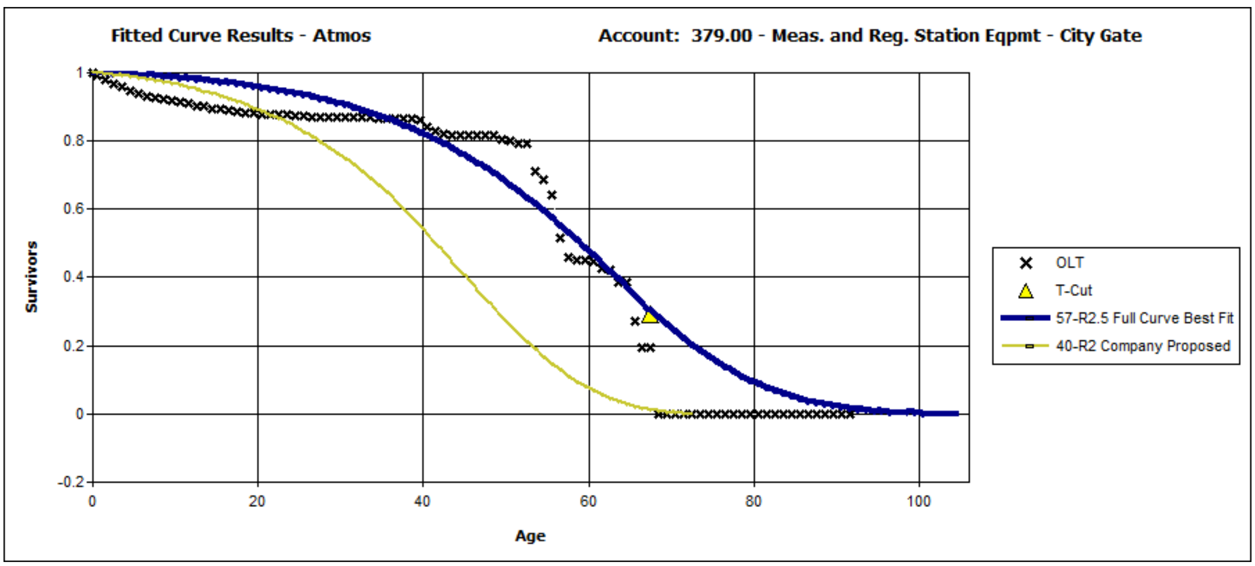


Mr. Allis is proposing a 35–S0 life and curve combination for this account. For this account, none of the Iowa curves produce a particularly good fit to the available data. However, looking at the range of best results gives us a good indication of the range of appropriate lives and curves.

Curve	**Life**	**Sum of Squared Differences**
BAND	**1926 - 2018**	
R0.5	42.0	4,640.306
R1	43.0	5,006.938
S-0.5	42.0	5,433.005
O1	41.0	5,447.313
S0	43.0	6,326.088
O2	47.0	6,464.160
R1.5	44.0	6,489.132

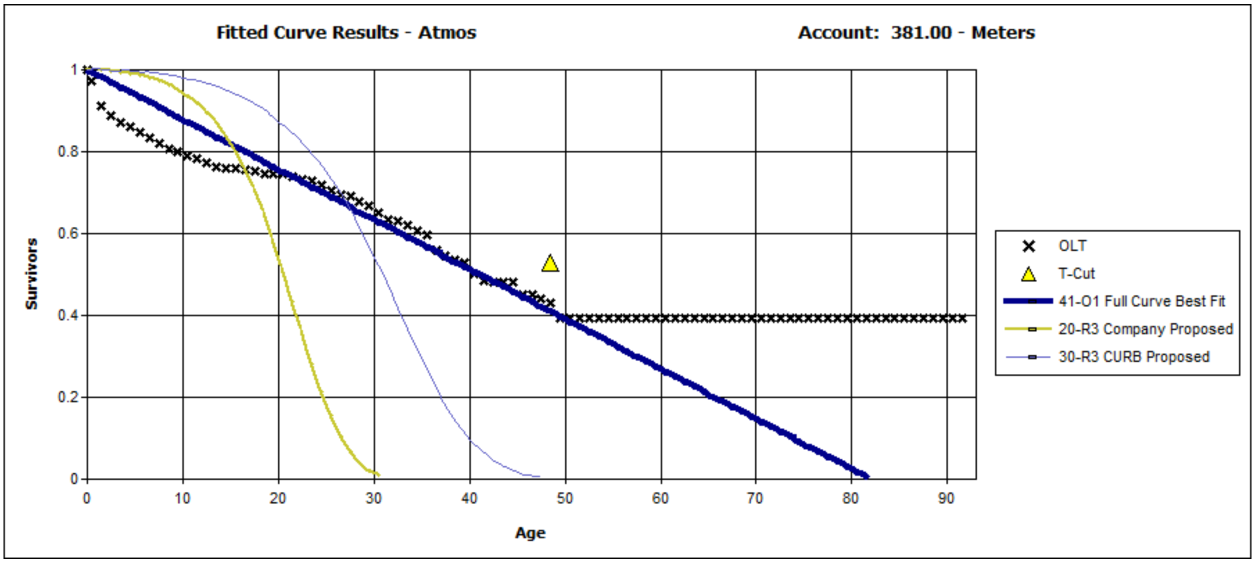
Here we can see the seven best-fitting lives and curves, falling in a range of lives between 41 years and 47 years, with most of the best results with modal numbers in the low range from 0 to 1.5. Indeed, we can see the S0 curve shape that Mr. Allis is proposing in these best results, but paired with a significantly higher average service life. Given that the range of best-fitting results are all quite close, the overall best-fitting life and curve, the 42–R0.5 is quite reasonable, despite not being an ideal fit. Therefore, I am proposing the 42–R0.5 life and curve combination.

<u>Account 379 – Measuring and Regulating Station Equipment – City Gate</u>.



Mr. Allis is proposing a 40–R2 life and curve combination. This is not a particularly good match to the available data. Despite a period of higher than usual retirements at early ages in this account's history, the overall retirement pattern is consistent with a mid-modal R-shaped curve. Therefore, I am proposing a 57–R2.5 life and curve combination, which is the best fit to the historical data.

Account 381.00 – Meters



Mr. Allis is proposing a 20–R3 life and curve combination for this account. The historical data is consistent with a much longer average service life than Mr. Allis is proposing. However, the historical data is consistent with a longer average service life than I would anticipate. I am therefore proposing a 30–R3 life and curve combination, which is a shorter curve than the historical data indicates, but at the high end of what I would consider reasonable for this type of plant.

D. DISCUSSION OF NET SALVAGE

Q. WHAT IS NET SALVAGE?

A. "Salvage" is the theoretical value of property after retirement. Net salvage is gross salvage minus cost of removal. Cost of removal is the cost that the Company incurs for the process of retiring plant in service. Gross salvage is the amount that the Company can recoup from its retirements through sales of parts and scrap. Thus, net salvage is the net of the proceeds and expenses of retiring plant. Because net salvage is considered part of the cost of the investment in plant in service, it is collected as part of depreciation expense to recoup that cost of investment just as the rest of the Company's investment in plant in service is also recovered through depreciation charges.

Q. PLEASE DESCRIBE THE ISSUES ASSOCIATED WITH THE COLLECTION OF NET SALVAGE.

A. The primary issue is that companies are allowed to include the future cost of removing plant currently in service as part of current depreciation rates. This means that a utility collects cost of removal in current rates, via depreciation expense, for an expenditure that will be made at some point in the future. However, this presents an issue because the actual amount of net salvage that the Company will incur in the future is unknown. With net salvage, we are forced to estimate both the timing, and the expected amount of future net salvage that the Company will require to retire its current plant in service.

Q. HOW IS MR. ALLIS PROPOSING TO ESTIMATE THE COMPANY'S FUTURE NET SALVAGE?

A. Mr. Allis proposes a methodology that calculates a ratio of annual net salvage over retirements. Mr. Allis has examined this ratio in five and ten year periods over the past fifteen years. Mr. Allis then exercises his judgment to incorporate the historical data, the age of the plant, managerial expectations, and the experience of other utilities in the industry, and arrives at a net salvage ratio for each account.

Q. CAN YOU DESCRIBE YOUR CONCERNS WITH THIS METHODOLOGY?

A. Yes. I have several significant concerns with this methodology. First, this methodology produces unrealistically high future net salvage ratios. Second, net salvage and retirements are not causally related or mathematically correlated in any way, and therefore reliance on this ratio yields unreliable and unsound results. This type of analysis is insufficient to support the large amounts of future net salvage that Mr. Allis is proposing that Atmos be allowed to collect.

Q. CAN YOU EXPLAIN WHY YOU BELIEVE MR. ALLIS'S METHODOLOGY RESULTS IN UNREALISTICALLY HIGH NET SALVAGE RATIOS?

A. Yes. In brief, there is a disconnect between the Company's actual incurred cost of removal and the future net salvage accruals that this methodology suggests. For example, if we look at Account 380.00 - Services, we can see how excessive these results can be. Based on the simple five-year average of experienced net salvage in this account, we would expect there to be $14.5 million of negative future net salvage over the remaining life of this account. If we take the five-year average net salvage ratio of net salvage over retirements in this account, which is negative 77%, the total future net salvage over the remaining life would be $63.4 million, or 77% of $82.3 million, which is the total plant in service for Account 380.00. This means that the Company would be collecting roughly *$48.9 million more* over the course of the life of the plant than if a simple five-year average of actual net salvage was used. Now, Mr. Allis is not proposing to use the five-year average; he is only proposing a negative 40% net salvage ratio, but even then, the Company would be collecting *$26 million* more over the life of the plant using the ratio of net salvage over retirements than by simply taking the most recent five-year average of experienced net salvage.

Q. DO FUTURE COST OF REMOVAL EXPENSES JUSTIFY HIGHER FUTURE NET SALVAGE RATIOS?

A. No. Setting aside the question of the accuracy of net salvage of retirements as a means for forecasting future net salvage, the logic of collecting for large excesses for future net salvage is flawed. This is because Atmos, like any utility, is continuously adding and retiring plant with no end date. This means that, in a real sense, the future never truly arrives. As plant in service increases, the amount being collected for future net salvage will increase in turn. The result is that *present* distribution customers will be constantly paying an amount for future net salvage costs that are more than a reasonable estimate of those costs.

It is instructive to contrast this ongoing net salvage situation with net salvage for a single piece of plant with a final retirement date. This is the way that production plant is depreciated in general. In such cases, a terminal net salvage estimate is arrived at using a terminal net salvage study which carefully estimates the actual cost of removing all plant for the relevant unit. That terminal net salvage is then distributed over the remaining life of the plant. This is a reasonable application of the principle that current customers should bear the cost of future net salvage. With no termination date, current customers are perpetually asked to bear the cost of ill-defined and excessive future net salvage.

Q. CAN YOU EXPLAIN WHY NET SALVAGE AND RETIREMENTS ARE NOT RELATED TO EACH OTHER?

A. Yes. There are two ways in which net salvage could be related to retirements: causally and mathematically correlated. First, let us examine how retirements and net salvage could be related causally, which would be the case if retirements were a causal driver of net salvage. There is an intuitive logic to this notion. A retirement happens when a given unit of plant is taken out of service. If, as part of taking that unit out of service, it needs to be physically removed, then there will be some cost to the Company associated with that removal. However, we know that this is not actually what drives most cost of removal. In fact, most retirements occur when old plant is being replaced by new plant. What this means is that the cost of removal actually becomes part of the cost of the new replacement plant, with part of the cost of that new project merely allocated to cost of removal.

Q. IS THERE ANY OTHER WAY IN WHICH COST OF REMOVAL AND RETIREMENTS MIGHT BE RELATED?

A. The other way in which retirements and net salvage could be related is by mathematical correlation (that is, even without a causal relationship, it is possible that there is a close relationship between the two amounts, such that when one increases, it would be possible to reasonably predict that the other would also increase). The lack of any real correlative connection between net salvage and retirements is clear when we look at how much the cost of removal to retirement ratio varies from year to year. To illustrate the variance in net salvage, I examined the ratios for the Company's largest transmission plant account, Account 376 -Mains for the period of available data, from 2004-2018.

Table JSG-4

Net Salvage History Account 376 – Mains[3]

YEAR	RETIREMENTS	NET SALVAGE	NET SALVAGE PERCENTAGE
2004	$3,169,518	$(112,392)	(4)%
2005	749,382	(276,643)	(37)%
2006	210,249	(244,589)	(116)%
2007	525,828	(279,508)	(53)%
2008	327,137	(441,592)	(13)%5
2009	602,677	(223,225)	(37)%
2010	502,639	(442,771)	(88)%
2011	818,444	(391,173)	(48)%
2012	2,018,190	(1,829,077)	(91)%
2013	1,345,445	(965,510)	(72)%
2014	1,372,668	(706,931)	(52)%
2015	1,207,408	(1,716,871)	(142)%
2016	721,244	(575,0260	(80)%
2017	1,040,195	(731,385)	(70)%
2018	399,291	(275,090)	(69)%

Table JSG-4, above, reproduces the net salvage and retirement history for Account 376. We can see the annual cost of removal ratio for this account varies significantly, from as low as negative 4% in 2004 to as high as negative 142% in 2015. The table also illustrates that there is no observable trend over this period, with the Net Salvage Percentage increasing and decreasing from year to year without any pattern. Moreover, in addition to the net salvage percentage increase or decrease from year to year, Retirements and Cost of Removal increase and decrease from year to year completely independent of one another. These types of unrelated swings in retirements and cost of removal happen because there

[3] From Allis workpapers.

is no causal or mathematical relationship between retirements and cost of removal. Thus, retirements and net salvage amounts increase and decrease independent of each other. This lack of correlation means that net salvage ratios vary significantly for any given account from year to year, even relying on a five-year average. The result is that estimates of future cost of removal—sometimes forty years or more into the future—are extremely unreliable.

Q. ARE THERE ANY OTHER PROBLEMS WITH THE METHODOLOGY THAT MR. ALLIS IS PROPOSING?

A. Yes. In addition to the other problems discussed with this ratio of net salvage to retirements, there is a mismatch in the periods between the two numbers. Cost of removal is always valued in current dollars. For example, an amount from 2012 is shown at 2012-dollar values. In contrast, retirements are always recorded at original cost. A given retirement may be recorded in 2012, but the dollar values represented in that retirement could be from 1986, 1970, or 1920, consistent with wildly varying current dollar values. What this means is that the method Mr. Allis is proposing contains a significant amount of inflation inherent in it. Mr. Allis concedes this in his response to CURB DR No. 1-69, in which he states:

> The method of estimating net salvage includes statistical analysis which incorporates the ratio of historical net salvage and historical retirements. Because the net salvage analysis incorporates different time periods of the net salvage incurred and retirements (cost basis from the year installed), there may be some past inflation included in the analysis. However, it should be noted that while retirements and cost of removal may be recorded at different time periods, the age of historical retirements is typically less than the probable life of assets currently in service. As a result, there is typically less inflation in the historical analysis than will occur in the future over the probable life of assets in service and, therefore, the net salvage analysis generally produces conservative estimates of future net salvage.

As Mr. Allis notes here, the periods of inflation included in the analyses are relevant, however the rate of inflation is also important. Mr. Allis's net salvage date includes cost of removal from 1992 through 2018. Over this period, not just Atmos, but most utilities have experienced significant increases to their cost of removal relative to retirement costs. In other words, inflation in their cost of removal. This inflation has resulted from a variety of causes. Some of those causes, the increase of labor costs, for instance, might reasonably be expected to continue into the future. However, some sources of inflation, specifically changes to utility practices as it related to cost of removal for safety and environmental concerns have already taken place, and we would not expect those changes to be mirrored in the future. Thus, projecting historical inflation into the future does not necessarily make sense.

Another issue that this raises is that ratepayers are effectively being charged for future net salvage at inflated future dollar values but are required to pay those amounts with current dollars.

Finally, there is the time-value of money to be considered. In effect, charging current ratepayers for future net salvage is asking current ratepayers to provide a loan to the Company for funds to potentially be used on future costs. Normally, as when the Company makes an investment in plant, consumers are expected to not only repay the principal amount of this investment, but to also pay a return *on* this investment until such time as the Company has fully recovered the investment. However, in the case of net salvage, current ratepayers are being asked to provide the Company with a loan without any kind of compensation to ratepayers.

Q. WHAT ARE YOU PROPOSING REGARDING THE COMPANY'S NET SALVAGE PROPOSALS?

A. I am proposing a methodology which utilizes the most recent five-year average of net salvage to estimate future net salvage. I have estimated total future net salvage by multiplying the annual accrual requirement by the account remaining life. This is a straight-line accrual estimate and approach. I believe that the Company's most recent five years of net salvage data provide the best indication of the appropriate annual accrual for the immediate future. This average should then be updated with each subsequent depreciation study, perhaps in a technical update like the one Mr. Allis has submitted in this proceeding. Accordingly, I propose that the Company calculate its total future net salvage by multiplying its required current annual net salvage accrual based on its most recent five-year average of net salvage for each account by the remaining life (*i.e.*, the plant not yet depreciated) for that account. This methodology is superior to the Company's proposal.

Q. PLEASE PROVIDE AN EXAMPLE.

A. I will use Account 380 – Services to demonstrate. The most recent five-year average net salvage is negative $539,861, and I have estimated a 26.8-year remaining life for the account. The September plant account balance was $83.3 million. Given these facts, I have calculated a negative -17.5 future net salvage ratio for the account as follows.

Account 365 Overhead Conductors and Devices Plant FNS Ratio

1.	Average Net Salvage 5-year average	($539,861)
2.	Required Annual Accrual $	$539,861
3.	Remaining Life	17.5 years
4.	Total Future Net Salvage (L3 x L2)	($14,468,275)
5.	Plant Balance	$82,330,078
6.	Future Net Salvage Ratio (L4/L5)	(17.5)
7.	Required Annual NS Accrual Rate % (L2/L5)	.65%

Q. DOES YOUR APPROACH ACCOUNT FOR INFLATION?

A. Yes, my approach does account for inflation because it is a rate (%) that is applied to annual plant balances which are in turn affected by inflation. Thus, my approach accounts for inflation as it is incurred.

Q. IN WHAT WAYS IS YOUR PROPOSED METHODOLOGY SUPERIOR TO THE METHODOLOGY PROPOSED BY MR. ALLIS?

A. The principal way in which this methodology is superior to the Company's proposed methodology is that it effectively matches the Company's depreciation rate to the costs incurred by the Company. Setting aside for a moment my other criticisms of the Company's methodology, the overarching problem is that the Company's methodology is an estimate of costs that it will not incur for years, and in some cases decades. By its very nature, projecting costs by decades into the future carries significant inherent uncertainty. In contrast, utilizing the five-year average of incurred net salvage ensures that a company is always compensated for their net salvage costs because its net salvage accruals are directly tied to its incurred net salvage. Using the five-year average would also ensure that charges to distribution customers closely equate to the Company's actual expenditures, therefore ensuring that customers are not being overcharged for costs that may not be incurred and that the Company collects enough to cover its cost of removal.

E. <u>CONCLUSION</u>

Q. CAN YOU SUMMARIZE THE ADJUSTMENTS THAT YOU HAVE PROPSOED IN YOUR TESTIMONY?

A. Yes. To summarize, I have made two types of adjustments to the depreciation methodology employed by Atmos. One, I have adjusted the average service lives of seven mass property accounts. Two, I have proposed that the Commission adopt a method of calculating future net salvage which is based simply on the five-year average of historical net salvage. The total impact of these adjustments to Atmos's Depreciation Rate and Expenses is an aggregate amount of ($2,973,248), as shown in Table JSG-1.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

VERIFICATION

DISTRICT OF COLUMBIA) ss:

James S. Garren, being duly sworn upon his oath, deposes and states that he is a consultant for the Citizens' Utility Ratepayer Board, that he has read and is familiar with the foregoing *Direct Testimony*, and that the statements made herein are true and correct to the best of his knowledge, information, and belief.

James S. Garren

SUBSCRIBED AND SWORN to before me this 28th day of October, 2019.

Nasaha Thorpe
Notary Public

My Commission expires: June 30, 2020

NASAHA THORPE
NOTARY PUBLIC
EXP.
6-30-20
DISTRICT OF COLUMBIA

ATMOS ENERGY CORPORATION
KANSAS DIVISION

TABLE 1. SUMMARY OF ESTIMATED SURVIVOR CURVES, NET SALVAGE PERCENTS, ORIGINAL COST, BOOK RESERVE AND CALCULATED ANNUAL DEPRECIATION ACCRUAL RATES AS OF SEPTEMBER 30, 2018

ACCOUNT (1)	SURVIVOR CURVE (2)	NET SALVAGE (3)	ORIGINAL COST AS OF SEPTEMBER 30, 2018 (4)	BOOK DEPRECIATION RESERVE (5)	FUTURE ACCRUALS (6)	CALCULATED ANNUAL ACCRUAL AMOUNT (7)	CALCULATED ANNUAL ACCRUAL RATE (8)=(7)/(4)	COMPOSITE REMAINING LIFE (9)=(6)/(7)
STORAGE PLANT								
350.20 RIGHTS OF WAY	50-R5	(34)	568,935.31	471,671	289,959	13,613	2.39%	21.3
351.00 STRUCTURES AND IMPROVEMENTS	50-R4	(34)	102,922.98	97,129	40,653	1,745	1.70%	23.3
352.00 WELLS	50-S4	(34)	1,391,004.89	567,729	1,294,400	55,316	3.98%	23.4
352.02 RESERVOIRS	FULLY ACCRUED		36,514.65	36,515	(0)	-	0.00%	-
353.00 PIPELINES	60-R4	(34)	1,156,753.92	511,605	1,036,934	31,233	2.70%	33.2
354.00 COMPRESSOR STATION EQUIPMENT	50-S2	(34)	2,570,713.36	1,195,565	2,245,832	79,358	3.09%	28.3
355.00 MEASURING AND REGULATING EQUIPMENT	40-S3	(34)	220,010.72	220,011	74,516	3,268	1.49%	22.8
356.00 PURIFICATION EQUIPMENT	40-R4	(34)	288,382.11	288,382	97,673	6,342	2.20%	15.4
357.00 OTHER EQUIPMENT	35-S3	(34)	125,321.36	125,321	42,446	4,468	3.57%	9.5
TOTAL STORAGE PLANT			**6,460,559.30**	**3,513,928**	**5,122,414**	**195,344**	**3.02**	
TRANSMISSION PLANT								
367.00 MAINS - CATHODIC PROTECTION	55-R2	(103)	1,511,138.93	169,948	2,902,713	124,048	8.21%	23.4
367.01 MAINS - STEEL	55-R2	(166)	115,654.77	23,462	284,227	7,559	6.54%	37.6
369.00 MEASURING AND REGULATING STATION EQUIPMENT	40-R2	0	147,567.11	56,318	91,249	3,724	2.52%	24.5
TOTAL TRANSMISSION PLANT			**1,774,360.81**	**249,728**	**3,278,189**	**135,331**	**7.63**	
DISTRIBUTION PLANT								
374.02 RIGHTS OF WAY	60-R4	0	333,483.38	113,924	219,559	5,240	1.57%	41.9
375.00 STRUCTURES AND IMPROVEMENTS	40 - L0	(0)	152,684.89	111,474	41,268	1,438	0.94%	28.7
376.00 MAINS - CATHODIC PROTECTION	63 - R1.5	(22)	4,475,503.47	1,434,148	4,032,236	80,709	1.80%	50.0
376.01 MAINS - STEEL	64 - R1.5	(23)	59,621,101.28	2,878,374	70,370,916	1,364,306	2.29%	51.6
376.02 MAINS - PLASTIC	65 - R1.5	(23)	116,666,085.42	28,351,429	115,706,002	2,183,956	1.87%	53.0
376.03 MAINS - ANODES								
FULLY ACCRUED			1,055,339.36	1,055,339	0	-	0.00%	-
AMORTIZED	15-SQ	0	6,418,561.14	2,759,000	3,659,561	430,537	6.71%	8.5
TOTAL ACCOUNT 376.03			7,473,900.50	3,814,339	3,659,562	430,537	5.76	
376.04 MAINS - LEAK CLAMPS								
FULLY ACCRUED			5,430,307.82	5,430,308	(0)	-	0.00%	-
AMORTIZED	14-SQ	0	3,026,548.38	1,346,600	1,679,948	215,378	7.12%	7.8
TOTAL ACCOUNT 376.04			8,456,856.20	6,776,908	1,679,948	215,378	2.55	
378.00 MEASURING AND REGULATING STATION EQUIPMENT	42 - R0.5	(1)	5,606,146.10	1,638,302	4,044,263	123,151	2.20%	32.8
379.00 MEASURING AND REGULATING STATION EQUIPMENT - CITY GATE	57 - R2.5	(1)	3,504,195.85	855,193	2,682,220	60,560	1.73%	44.3
380.00 SERVICES	44-R2	(18)	82,330,078.73	33,146,662	63,651,692	2,375,063	2.88%	26.8
381.00 METERS	30 - R3	0	28,447,818.39	16,430,304	11,999,253	597,275	2.10%	20.1
382.00 METER INSTALLATIONS	25-R1.5	(17)	28,114,434.07	8,020,072	24,871,772	1,870,058	6.65%	13.3
383.00 HOUSE REGULATORS	25-R1.5	(10)	2,010,808.00	242,840	1,965,789	255,297	12.70%	7.7
384.00 HOUSE REGULATOR INSTALLATIONS	25-R1.5	(7)	209,461.47	151,354	73,362	12,870	6.14%	5.7
385.00 INDUSTRIAL MEASURING AND REGULATING EQUIPMENT	30-R1.5	(1)	1,830,296.06	584,512	1,264,107	72,235	3.95%	17.5
387.00 OTHER EQUIPMENT	20-R4	(6)	628,454.28	627,586	40,219	4,846	0.77%	8.3
TOTAL DISTRIBUTION PLANT			**349,861,308.09**	**105,177,421**	**306,302,166**	**9,652,919**	**2.76**	
GENERAL PLANT								
390.00 STRUCTURES AND IMPROVEMENTS	40-R1.5	(3)	2,200,666.71	562,774	1,702,312	70,635	3.21%	24.1
390.09 LEASEHOLD IMPROVEMENTS	30-R2	0	39,013.13	22,462	16,551	1,505	3.86%	11.0
391.00 OFFICE FURNITURE AND EQUIPMENT	15-SQ	0	483,974.70	319,500	164,475	32,250	6.66%	5.1
392.00 TRANSPORTATION EQUIPMENT	8-L3	1	327,475.32	211,399	112,730	59,332	18.12%	1.9
393.00 STORES EQUIPMENT	25-SQ	0	15,268.15	1,432	13,836	610	3.99%	22.7
394.00 TOOLS, SHOP AND GARAGE EQUIPMENT	20-SQ	0	3,892,130.60	1,295,700	2,596,431	195,220	5.02%	13.3
395.00 LABORATORY EQUIPMENT	15-SQ	0	12,933.38	9,913	3,020	863	6.67%	3.5
396.00 POWER OPERATED EQUIPMENT	9-S0.5	83	28,786.18	23,735	(18,930)	(5,736)	-19.93%	3.3
397.00 COMMUNICATION EQUIPMENT	15-SQ	0	670,634.10	324,333	346,301	44,974	6.71%	7.7
397.02 FIXED RADIOS	15-SQ	0	250,007.12	93,152	156,855	16,687	6.67%	9.4
398.00 MISCELLANEOUS EQUIPMENT	15-SQ	0	281,077.59	88,081	192,997	18,738	6.67%	10.3
399.01 SERVERS HARDWARE	7-SQ	0	47,499.04	23,093	24,406	6,779	14.27%	3.6
399.02 SERVERS SOFTWARE	7-SQ	0	15,235.37	3,261	11,974	2,177	14.29%	5.5
399.03 NETWORK HARDWARE	7-SQ	0	449,831.37	222,052	227,779	65,080	14.47%	3.5
399.06 PC HARDWARE								
FULLY ACCRUED			256,017.00	256,017	-	-	0.00%	-
AMORTIZED	5-SQ	0	728,487.04	430,850	297,637	148,819	20.43%	2.0
TOTAL ACCOUNT 399.06			984,504.04	686,867	297,637	148,819	15.12	
399.07 PC SOFTWARE								
FULLY ACCRUED			14,249.25	14,249	0	-	0.00%	-
AMORTIZED	5-SQ	0	57,076.53	26,527	30,550	11,315	19.82%	2.7
TOTAL ACCOUNT 399.07			71,325.78	40,776	30,550	11,315	15.86	
399.08 APPLICATION SOFTWARE	7-SQ	0	736,829.93	631,513	105,317	105,317	14.29%	1.0
TOTAL GENERAL PLANT			**10,507,192.51**	**4,560,043**	**5,984,242**	**774,563**	**7.37**	
TOTAL DEPRECIABLE PLANT			**368,603,420.71**	**113,501,120**	**320,687,011**	**10,758,158**	**2.92**	
NONDEPRECIABLE AND ACCOUNTS NOT STUDIED								
301.00 ORGANIZATION				(25,000)				
302.00 FRANCHISES AND CONSENTS			37,160.26	15,036				
303.00 MISCELLANEOUS INTANGIBLE PLANT			3,917.80	(10,081)				
350.10 LAND			49,164.40					
365.00 LAND AND LAND RIGHTS			4,761.40					
374.00 LAND AND LAND RIGHTS			670,926.24					
389.00 LAND AND LAND RIGHTS			152,534.90					
TOTAL NONDEPRECIABLE AND ACCOUNTS NOT STUDIED			918,465.00	(20,045)				
TOTAL GAS PLANT			**369,521,885.71**	**113,481,075**				

ACCOUNT	Five-Year Average Net Salvage	REMAINING LIFE	ORIGINAL COST AS OF SEPTEMBER 30, 2018	Future Net Salvage Accruals	Net Salvage Percentage
(1)	2	(3)	(4)	(5)	(6)
STORAGE PLANT					
350.20		21.3	568,935.31		
351.00		23.3	102,922.98		
352.00		23.4	1,391,004.89		
352.02		0	36,514.65		
353.00		33.2	1,156,753.92		
354.00		28.3	2,570,713.36		
355.00		22.8	220,010.72		
356.00		15.4	288,382.11		
357.00		9.5	125,321.36		
TOTAL STORAGE PLANT	**(80,152)** *	**27.3**	**6,460,559.30**	**(2,188,150)**	-33.87
TRANSMISSION PLANT					
367.00	(66,732)	23.4	1,511,138.93	(1,561,522)	-103.33
367.01	(5,107)	37.6	115,654.77	(192,034)	-166.04
369.00	0	24.5	147,567.11	-	0.00
DISTRIBUTION PLANT					
374.02	0	41.9	333,483.38	-	0.00
375.00	(2)	28.7	152,684.89	(57)	-0.04
376.00	(19,833)	49.96	4,475,503.47	(990,880)	-22.14
376.01	(264,215)	51.58	59,621,101.28	(13,628,188)	-22.86
376.02	(517,013)	52.98	116,666,085.42	(27,391,346)	-23.48
376.03					
	0	0	1,055,339.36	-	0.00
	0	8.5	6,418,561.14	-	0.00
			7,473,900.50		
376.04					
	0	0	5,430,307.82	-	0.00
	0	7.8	3,026,548.38	-	0.00
			8,456,856.20		
378.00	(2,327)	32.84	5,606,146.10	(76,419)	-1.36
379.00	(750)	44.29	3,504,195.85	(33,218)	-0.95
380.00	(539,861)	26.8	82,330,078.73	(14,468,275)	-17.57
381.00	909	20.09	28,447,818.39	18,262	0.06
382.00	(359,204)	13.3	28,114,434.07	(4,777,410)	-16.99
383.00	(25,691)	7.7	2,010,808.00	(197,821)	-9.84
384.00	(2,676)	5.7	209,461.47	(15,254)	-7.28
385.00	(1,047)	17.5	1,830,296.06	(18,323)	-1.00
387.00	(4,741)	8.3	628,454.28	(39,350)	-6.26
390.00	(2,673)	24.1	2,200,666.71	(64,419)	-2.93
390.09	0	11	39,013.13	-	0.00
391.00	0	5.1	483,974.70	-	0.00
392.00	1,761	1.9	327,475.32	3,346	1.02
393.00	0	22.7	15,268.15	-	0.00
394.00	0	13.3	3,892,130.60	-	0.00
395.00	0	3.5	12,933.38	-	0.00
396.00	7,267	3.3	28,786.18	23,981	83.31
397.00	0	7.7	670,634.10	-	0.00
397.02	0	9.4	250,007.12	-	0.00
398.00	0	10.3	281,077.59	-	0.00
399.01	0	3.6	47,499.04	-	0.00
399.02	0	5.5	15,235.37	-	0.00
399.03	0	3.5	449,831.37	-	0.00
399.06	0				#DIV/0!
		0	256,017.00	-	0.00
		2	728,487.04	-	0.00
			984,504.04		
399.07	0				
		0	14,249.25	-	0.00
		2.7	57,076.53	-	0.00
			71,325.78		
399.08	0	1	736,829.93	-	0.00

* For Storage plant, a ten year average of net salvage was used, rather than a five year average

Observed Life Table Results
Atmos
Account: 375.00 - Structures and Improvements

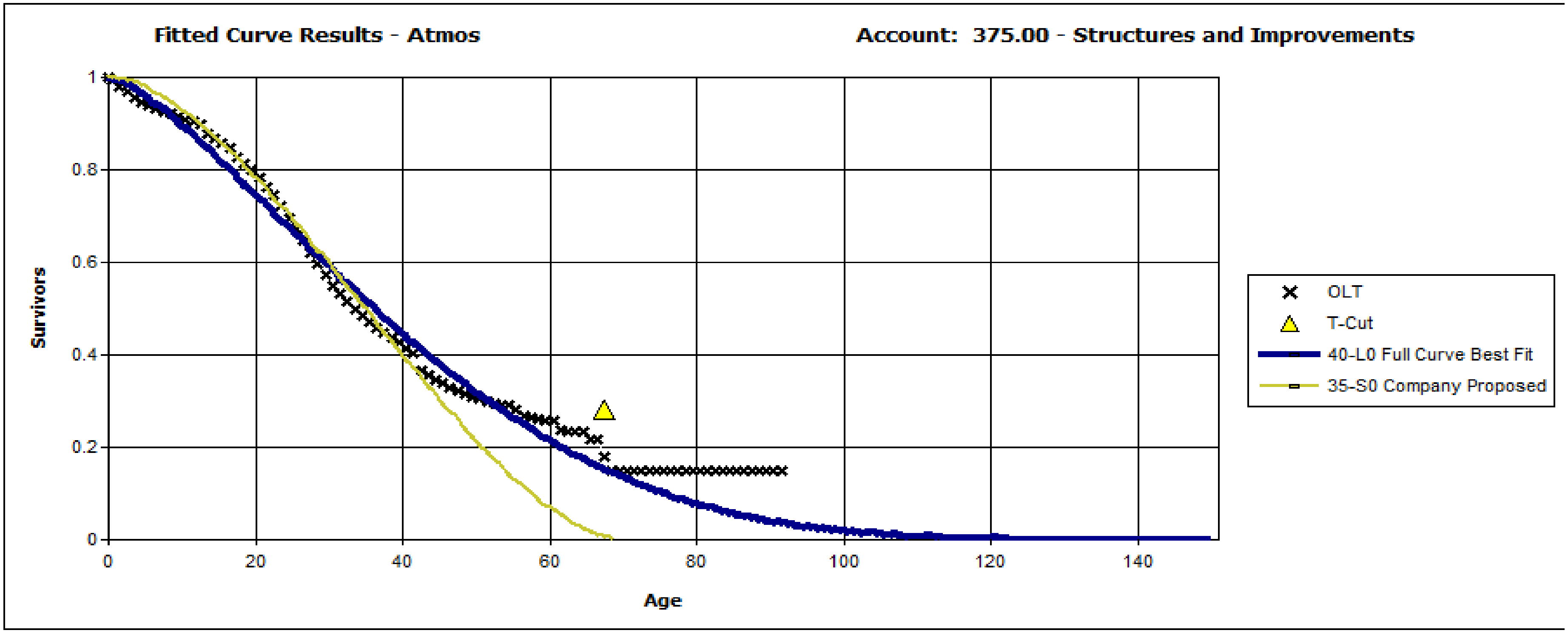
Age	Exposures	Retirements	Retirement Ratio (%)	Survivor Ratio (%)	Cumulative Survivors
BAND		1926 - 2007			
0	277,114	2,114	0.7627	99.2373	1.0000
0.5	286,543	3,305	1.1535	98.8465	0.9924
1.5	283,438	3,580	1.2632	98.7368	0.9809
2.5	279,857	3,434	1.2272	98.7728	0.9685
3.5	276,423	2,987	1.0806	98.9194	0.9566
4.5	273,436	2,407	0.8803	99.1197	0.9463
5.5	271,029	2,024	0.7466	99.2534	0.9380
6.5	269,005	1,723	0.6404	99.3596	0.9310
7.5	267,283	1,170	0.4376	99.5624	0.9250
8.5	266,113	1,541	0.5790	99.4210	0.9210
9.5	264,572	1,590	0.6010	99.3990	0.9156
10.5	277,536	1,789	0.6445	99.3555	0.9101
11.5	268,134	1,958	0.7303	99.2697	0.9043
12.5	256,943	5,611	2.1838	97.8162	0.8977
13.5	241,056	2,818	1.1690	98.8310	0.8781
14.5	226,799	2,479	1.0931	98.9069	0.8678
15.5	207,177	2,679	1.2931	98.7069	0.8583
16.5	204,498	4,476	2.1887	97.8113	0.8472
17.5	200,301	3,502	1.7484	98.2516	0.8287
18.5	196,799	3,409	1.7321	98.2679	0.8142
19.5	192,729	4,328	2.2458	97.7542	0.8001
20.5	182,659	4,345	2.3787	97.6213	0.7821
21.5	178,315	4,157	2.3312	97.6688	0.7635
22.5	145,747	4,854	3.3305	96.6695	0.7457
23.5	140,893	5,056	3.5887	96.4113	0.7209
24.5	135,837	4,640	3.4159	96.5841	0.6950
25.5	131,197	4,767	3.6336	96.3664	0.6713
26.5	126,430	5,031	3.9789	96.0211	0.6469
27.5	121,399	4,564	3.7591	96.2409	0.6211
28.5	116,836	4,828	4.1326	95.8674	0.5978
29.5	112,007	4,387	3.9163	96.0837	0.5731
30.5	107,621	3,717	3.4538	96.5462	0.5506
31.5	103,904	3,414	3.2861	96.7139	0.5316
32.5	100,489	2,854	2.8398	97.1602	0.5141
33.5	97,636	2,984	3.0565	96.9435	0.4995
34.5	94,651	2,587	2.7335	97.2665	0.4843
35.5	92,064	2,387	2.5928	97.4072	0.4710
36.5	89,677	2,435	2.7154	97.2846	0.4588
37.5	87,242	2,062	2.3632	97.6368	0.4464
38.5	85,180	2,022	2.3742	97.6258	0.4358
39.5	83,158	2,234	2.6864	97.3136	0.4255
40.5	80,924	2,199	2.7172	97.2828	0.4140
41.5	78,725	7,090	9.0061	90.9939	0.4028
42.5	72,282	2,124	2.9383	97.0617	0.3665
43.5	70,808	1,772	2.5026	97.4974	0.3557
44.5	70,512	1,716	2.4338	97.5662	0.3468
45.5	68,931	1,723	2.4995	97.5005	0.3384
46.5	67,483	1,723	2.5539	97.4461	0.3299
47.5	65,202	1,540	2.3622	97.6378	0.3215
48.5	72,104	1,154	1.6011	98.3989	0.3139
49.5	69,554	1,215	1.7468	98.2532	0.3089
50.5	68,204	1,005	1.4731	98.5269	0.3035
51.5	66,794	835	1.2496	98.7504	0.2990
52.5	65,869	653	0.9912	99.0088	0.2953
53.5	55,341	478	0.8636	99.1364	0.2924
54.5	52,180	1,590	3.0475	96.9525	0.2898
55.5	16,614	818	4.9232	95.0768	0.2810
56.5	15,806	196	1.2428	98.7572	0.2672
57.5	14,916	154	1.0291	98.9709	0.2639
58.5	14,762	117	0.7930	99.2070	0.2611
59.5	14,315	76	0.5295	99.4705	0.2591
60.5	13,599	1,157	8.5085	91.4915	0.2577
61.5	11,268	42	0.3690	99.6310	0.2358
62.5	11,227	33	0.2907	99.7093	0.2349
63.5	11,111	16	0.1466	99.8534	0.2342
64.5	11,094	821	7.3964	92.6036	0.2339
65.5	11,874	1	0.0072	99.9928	0.2166
66.5	11,873	1,941	16.3445	83.6555	0.2166
67.5	9,932	1,762	17.7369	82.2631	0.1812
68.5	5,449	1	0.0255	99.9745	0.1490
69.5	4,506	1	0.0195	99.9805	0.1490
70.5	2,726	0	0.0000	100.0000	0.1490
71.5	2,726	0	0.0000	100.0000	0.1490
72.5	2,726	0	0.0000	100.0000	0.1490
73.5	2,726	0	0.0000	100.0000	0.1490
74.5	1,094	0	0.0000	100.0000	0.1490
75.5	1,094	0	0.0000	100.0000	0.1490
76.5	1,094	0	0.0000	100.0000	0.1490
77.5	1,094	0	0.0000	100.0000	0.1490
78.5	708	0	0.0000	100.0000	0.1490
79.5	708	0	0.0000	100.0000	0.1490
80.5	348	0	0.0000	100.0000	0.1490
81.5	840	0	0.0000	100.0000	0.1490
82.5	2,160	0	0.0000	100.0000	0.1490
83.5	2,160	0	0.0000	100.0000	0.1490
84.5	2,160	0	0.0000	100.0000	0.1490
85.5	2,160	0	0.0000	100.0000	0.1490
86.5	1,320	0	0.0000	100.0000	0.1490
87.5	0	0	0.0000	100.0000	0.1490
88.5	0	0	0.0000	100.0000	0.1490
89.5	0	0	0.0000	100.0000	0.1490
90.5	0	0	0.0000	100.0000	0.1490
91.5	0	0	0.0000	100.0000	0.1490

Best Fit Curve Results
Atmos
Account: 375.00 - Structures and Improvements

Curve	Life	Sum of Squared Differences
BAND	**1926 - 2018**	
L0	40.0	708.870
L0.5	40.0	927.291
O2	41.0	1,075.957
O1	38.0	1,605.525
L1	40.0	1,720.732
S-0.5	39.0	1,879.581
O3	50.0	2,317.326
R0.5	38.0	2,535.620
L1.5	39.0	3,129.712
S0	39.0	3,193.894
O4	65.0	3,566.248
R1	39.0	4,825.246
S0.5	39.0	4,999.861
L2	39.0	5,267.575
R1.5	39.0	7,397.288
S1	39.0	7,529.867
S1.5	39.0	10,413.832
R2	39.0	10,996.959
L3	39.0	12,082.951
S2	39.0	13,950.465
R2.5	38.0	14,692.210
R3	38.0	19,192.784
S3	38.0	21,040.383
L4	38.0	22,817.295
R4	37.0	27,020.096
S4	37.0	29,987.300
L5	36.0	32,072.712
R5	36.0	36,082.776
S5	36.0	38,187.545
S6	35.0	45,241.363
SQ	33.0	58,869.385

Analytical Parameters

OLT Placement Band:	1926 - 2007
OLT Experience Band:	1926 - 2018
Minimum Life Paramet	1
Maximum Life Parame	100
Life Increment Parame	1
Max Age (T-Cut):	67.5



Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter:	1
Maximum Life Parameter:	100
Life Increment Parameter:	1
Max Age (T-Cut):	67.5

Atmos

375.00 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 40 L0

			BG/VG Average			
		Surviving	Service	Remaining	ASL	RL
Year	Age	Investment	Life	Life	Weights	Weights
(1)	(2)	(3)	(4)	(5)	(6)=(3)/(4)	(7)=(6)*(5)
2018	0.5	0	40.00	39.55	0	0
2017	1.5	0	40.00	38.78	0	0
2016	2.5	0	40.00	38.08	0	0
2015	3.5	0	40.00	37.42	0	0
2014	4.5	0	40.00	36.80	0	0
2013	5.5	0	40.00	36.22	0	0
2012	6.5	0	40.00	35.66	0	0
2011	7.5	0	40.00	35.13	0	0
2010	8.5	0	40.00	34.62	0	0
2009	9.5	0	40.00	34.12	0	0
2008	10.5	0	40.00	33.64	0	0
2007	11.5	7,613	40.00	33.18	190	6,314
2006	12.5	9,233	40.00	32.73	231	7,554
2005	13.5	10,277	40.00	32.29	257	8,296
2004	14.5	11,442	40.00	31.86	286	9,115
2003	15.5	17,145	40.00	31.45	429	13,479
2002	16.5	0	40.00	31.04	0	0
2001	17.5	0	40.00	30.64	0	0
2000	18.5	0	40.00	30.25	0	0
1999	19.5	665	40.00	29.86	17	496
1998	20.5	70,130	40.00	29.48	1,753	51,690
1997	21.5	0	40.00	29.11	0	0
1996	22.5	2,730	40.00	28.74	68	1,961
1995	23.5	0	40.00	28.37	0	0
1994	24.5	0	40.00	28.01	0	0
1993	25.5	0	40.00	27.65	0	0
1992	26.5	0	40.00	27.30	0	0
1991	27.5	0	40.00	26.95	0	0
1990	28.5	0	40.00	26.61	0	0
1989	29.5	0	40.00	26.27	0	0
1988	30.5	0	40.00	25.94	0	0
1987	31.5	0	40.00	25.61	0	0
1986	32.5	0	40.00	25.28	0	0
1985	33.5	0	40.00	24.96	0	0
1984	34.5	0	40.00	24.64	0	0
1983	35.5	0	40.00	24.32	0	0
1982	36.5	0	40.00	24.01	0	0
1981	37.5	0	40.00	23.71	0	0
1980	38.5	0	40.00	23.40	0	0
1979	39.5	0	40.00	23.10	0	0
1978	40.5	0	40.00	22.81	0	0
1977	41.5	0	40.00	22.51	0	0
1976	42.5	0	40.00	22.22	0	0
1975	43.5	0	40.00	21.94	0	0
1974	44.5	0	40.00	21.66	0	0
1973	45.5	0	40.00	21.38	0	0
1972	46.5	0	40.00	21.10	0	0
1971	47.5	647	40.00	20.83	16	337
1970	48.5	725	40.00	20.56	18	373
1969	49.5	1,476	40.00	20.29	37	749
1968	50.5	135	40.00	20.03	3	68
1967	51.5	345	40.00	19.77	9	171
1966	52.5	90	40.00	19.51	2	44
1965	53.5	9,875	40.00	19.26	247	4,754
1964	54.5	370	40.00	19.00	9	176
1963	55.5	3,380	40.00	18.76	84	1,585
1962	56.5	590	40.00	18.51	15	273
1961	57.5	70	40.00	18.26	2	32
1960	58.5	0	40.00	18.02	0	0
1959	59.5	330	40.00	17.78	8	147
1958	60.5	85	40.00	17.55	2	37
1957	61.5	660	40.00	17.31	17	286
1956	62.5	0	40.00	17.08	0	0
1955	63.5	0	40.00	16.85	0	0
1954	64.5	0	40.00	16.63	0	0
1953	65.5	180	40.00	16.40	5	74
1952	66.5	0	40.00	16.18	0	0
1951	67.5	0	40.00	15.96	0	0
1950	68.5	137	40.00	15.74	3	54
1949	69.5	0	40.00	15.53	0	0
1948	70.5	1,780	40.00	15.32	45	682
1947	71.5	0	40.00	15.11	0	0
1946	72.5	0	40.00	14.90	0	0
1945	73.5	0	40.00	14.69	0	0
1944	74.5	235	40.00	14.48	6	85
1943	75.5	0	40.00	14.28	0	0
1942	76.5	0	40.00	14.08	0	0
1941	77.5	0	40.00	13.88	0	0
1940	78.5	0	40.00	13.68	0	0
1939	79.5	0	40.00	13.48	0	0
1938	80.5	0	40.00	13.29	0	0
1937	81.5	182	40.00	13.10	5	59
1936	82.5	0	40.00	12.91	0	0
1935	83.5	0	40.00	12.72	0	0
1934	84.5	0	40.00	12.53	0	0
1933	85.5	0	40.00	12.34	0	0
1932	86.5	840	40.00	12.16	21	255
1931	87.5	1,320	40.00	11.97	33	395
		152,685			3,817	109,538

AVERAGE SERVICE LIFE 40.00
AVERAGE REMAINING LIFE 28.70

Observed Life Table Results
Atmos
Account: 376.00 - Mains - Combined

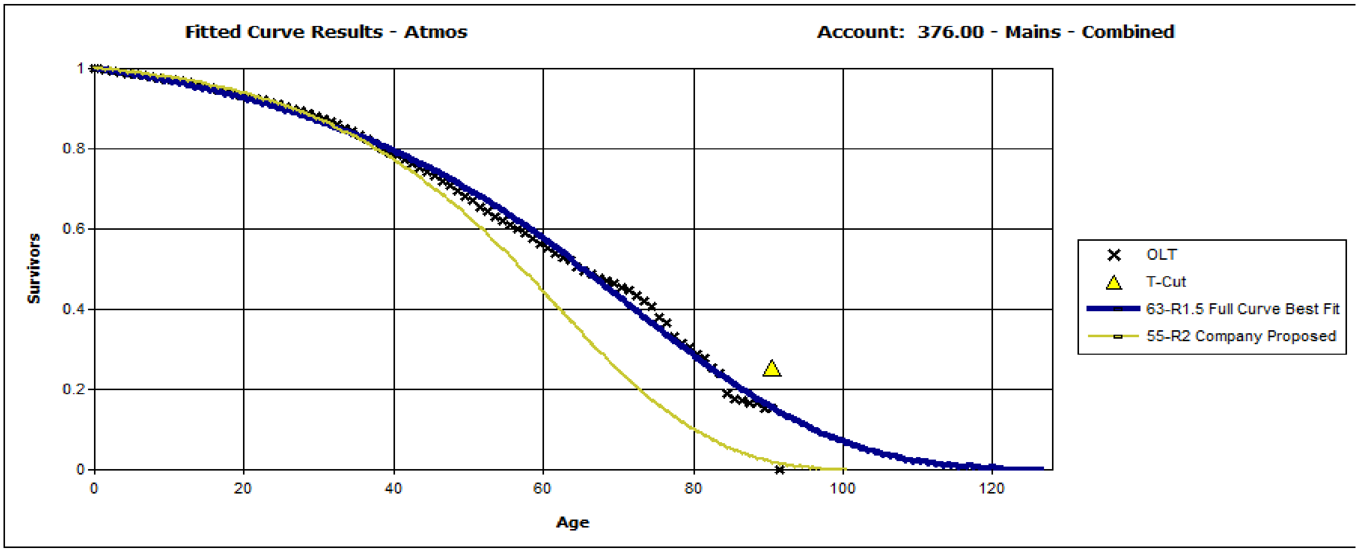
Age	Exposures	Retirements	Retirement Ratio (%)	Survivor Ratio (%)	Cumulative Survivors
BAND		1926 - 2018			
0	196,030,969	325,757	0.1662	99.8338	1.0000
0.5	209,598,950	560,376	0.2674	99.7326	0.9983
1.5	200,216,067	529,453	0.2644	99.7356	0.9957
2.5	187,746,178	478,861	0.2551	99.7449	0.9930
3.5	171,831,061	461,635	0.2687	99.7313	0.9905
4.5	163,919,946	433,654	0.2646	99.7354	0.9878
5.5	152,164,163	377,485	0.2481	99.7519	0.9852
6.5	137,478,786	381,891	0.2778	99.7222	0.9828
7.5	131,315,633	370,124	0.2819	99.7181	0.9801
8.5	126,992,465	363,982	0.2866	99.7134	0.9773
9.5	119,830,089	357,911	0.2987	99.7013	0.9745
10.5	115,587,390	392,727	0.3398	99.6602	0.9716
11.5	111,546,637	407,883	0.3657	99.6343	0.9683
12.5	104,239,955	491,527	0.4715	99.5285	0.9647
13.5	99,947,899	481,071	0.4813	99.5187	0.9602
14.5	93,180,437	365,224	0.3920	99.6080	0.9556
15.5	87,253,237	443,000	0.5077	99.4923	0.9518
16.5	83,769,559	388,551	0.4638	99.5362	0.9470
17.5	80,380,193	411,508	0.5120	99.4880	0.9426
18.5	77,440,480	352,675	0.4554	99.5446	0.9378
19.5	74,688,416	322,180	0.4314	99.5686	0.9335
20.5	71,783,486	302,722	0.4217	99.5783	0.9295
21.5	67,315,809	301,586	0.4480	99.5520	0.9256
22.5	63,483,816	349,668	0.5508	99.4492	0.9214
23.5	59,177,746	377,890	0.6386	99.3614	0.9163
24.5	55,405,009	316,890	0.5720	99.4280	0.9105
25.5	51,604,398	322,399	0.6248	99.3752	0.9053
26.5	47,467,584	320,156	0.6745	99.3255	0.8996
27.5	44,868,078	302,211	0.6736	99.3264	0.8936
28.5	41,673,602	299,005	0.7175	99.2825	0.8875
29.5	36,987,438	288,190	0.7792	99.2208	0.8812
30.5	35,291,516	296,507	0.8402	99.1598	0.8743
31.5	32,219,955	273,234	0.8480	99.1520	0.8670
32.5	30,088,625	262,977	0.8740	99.1260	0.8596
33.5	28,873,965	296,280	1.0261	98.9739	0.8521
34.5	27,298,042	291,764	1.0688	98.9312	0.8433
35.5	25,087,375	298,952	1.1916	98.8084	0.8343
36.5	23,680,887	323,239	1.3650	98.6350	0.8244
37.5	22,075,230	358,013	1.6218	98.3782	0.8131
38.5	19,982,825	222,626	1.1141	98.8859	0.7999
39.5	18,768,735	202,087	1.0767	98.9233	0.7910
40.5	16,859,506	234,533	1.3911	98.6089	0.7825
41.5	15,209,075	187,010	1.2296	98.7704	0.7716
42.5	13,792,779	163,162	1.1830	98.8170	0.7621
43.5	12,727,983	178,274	1.4006	98.5994	0.7531
44.5	12,421,448	183,171	1.4746	98.5254	0.7426
45.5	11,385,592	180,041	1.5813	98.4187	0.7316
46.5	10,749,791	161,290	1.5004	98.4996	0.7201
47.5	10,177,758	198,756	1.9528	98.0472	0.7093
48.5	9,416,701	170,523	1.8109	98.1891	0.6954
49.5	8,643,392	162,700	1.8824	98.1176	0.6828
50.5	8,069,824	172,114	2.1328	97.8672	0.6700
51.5	7,554,037	134,841	1.7850	98.2150	0.6557
52.5	6,897,343	131,595	1.9079	98.0921	0.6440
53.5	6,368,323	109,167	1.7142	98.2858	0.6317
54.5	5,805,367	97,933	1.6869	98.3131	0.6209
55.5	4,980,020	84,749	1.7018	98.2982	0.6104
56.5	4,334,303	82,636	1.9065	98.0935	0.6000
57.5	3,904,586	79,931	2.0471	97.9529	0.5886
58.5	3,610,180	78,659	2.1788	97.8212	0.5765
59.5	3,145,305	68,121	2.1658	97.8342	0.5639
60.5	2,969,638	60,467	2.0362	97.9638	0.5517
61.5	2,780,006	53,050	1.9083	98.0917	0.5405
62.5	2,670,361	45,638	1.7091	98.2909	0.5302
63.5	2,405,103	80,100	3.3304	96.6696	0.5211
64.5	2,178,800	36,685	1.6837	98.3163	0.5038
65.5	1,922,719	33,136	1.7234	98.2766	0.4953
66.5	1,789,406	35,996	2.0116	97.9884	0.4867
67.5	1,713,181	22,756	1.3283	98.6717	0.4770
68.5	1,616,323	25,206	1.5595	98.4405	0.4706
69.5	1,512,049	24,506	1.6207	98.3793	0.4633
70.5	1,044,517	18,096	1.7324	98.2676	0.4558
71.5	1,000,008	30,530	3.0530	96.9470	0.4479
72.5	947,919	31,637	3.3376	96.6624	0.4342
73.5	904,375	25,603	2.8310	97.1690	0.4197
74.5	810,476	53,088	6.5502	93.4498	0.4078
75.5	749,012	26,629	3.5552	96.4448	0.3811
76.5	670,097	66,539	9.9297	90.0703	0.3676
77.5	589,991	26,106	4.4248	95.5752	0.3311
78.5	515,522	19,201	3.7245	96.2755	0.3164
79.5	443,695	24,802	5.5898	94.4102	0.3046
80.5	418,893	12,265	2.9280	97.0720	0.2876
81.5	291,123	27,657	9.5000	90.5000	0.2792
82.5	263,169	10,817	4.1104	95.8896	0.2527
83.5	299,130	63,707	21.2974	78.7026	0.2423
84.5	235,423	16,381	6.9581	93.0419	0.1907
85.5	219,042	5,470	2.4971	97.5029	0.1774
86.5	208,111	6,438	3.0934	96.9066	0.1730
87.5	201,673	1,590	0.7884	99.2116	0.1676
88.5	29,553	2,161	7.3128	92.6872	0.1663
89.5	27,392	265	0.9685	99.0315	0.1541
90.5	15	15	100.0000	0.0000	0.1527
91.5	0	0	0.0000	100.0000	0.0000

Best Fit Curve Results
Atmos
Account: 376.00 - Mains - Combined

Curve	Life	Sum of Squared Differences
BAND	**1926 - 2018**	
R1.5	63.0	236.707
S0.5	64.0	386.793
S1	64.0	603.824
R1	62.0	726.040
L1.5	67.0	875.992
R2	63.0	969.316
S0	64.0	1,025.349
L2	67.0	1,300.272
L1	67.0	1,497.447
S1.5	65.0	1,600.017
L0.5	69.0	2,607.748
R0.5	63.0	2,633.032
S-0.5	64.0	2,825.935
R2.5	64.0	2,906.606
S2	65.0	3,387.369
L0	70.0	4,397.154
L3	66.0	4,687.125
O1	64.0	5,896.737
R3	65.0	6,007.127
O2	72.0	6,149.197
S3	66.0	8,891.087
O3	97.0	9,990.436
L4	66.0	12,359.732
R4	66.0	14,277.738
O4	100.0	17,325.877
S4	67.0	18,935.708
L5	67.0	22,795.439
R5	67.0	27,288.505
S5	67.0	30,870.264
S6	67.0	42,768.420
SQ	65.0	66,717.666

Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter:	1
Maximum Life Parameter:	100
Life Increment Parameter:	1
Max Age (T-Cut):	90.5



Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter:	1
Maximum Life Parameter:	100
Life Increment Parameter:	1
Max Age (T-Cut):	90.5

Atmos

376.00 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 63 R1.5

Year (1)	Age (2)	Surviving Investment (3)	BG/VG Average Service Life (4)	BG/VG Average Remaining Life (5)	ASL Weights (6)=(3)/(4)	RL Weights (7)=(6)*(5)
2018	0.5	36,124	63.00	62.59	573	35,887
2017	1.5	72,620	63.00	61.76	1,153	71,196
2016	2.5	138,527	63.00	60.95	2,199	134,012
2015	3.5	90,987	63.00	60.13	1,444	86,845
2014	4.5	203,513	63.00	59.32	3,230	191,631
2013	5.5	59,250	63.00	58.51	940	55,032
2012	6.5	41,748	63.00	57.71	663	38,243
2011	7.5	236,913	63.00	56.91	3,761	214,018
2010	8.5	39,161	63.00	56.12	622	34,882
2009	9.5	332,246	63.00	55.32	5,274	291,762
2008	10.5	12,251	63.00	54.54	194	10,605
2007	11.5	55,400	63.00	53.75	879	47,266
2006	12.5	127,228	63.00	52.97	2,019	106,971
2005	13.5	69,321	63.00	52.19	1,100	57,428
2004	14.5	50,048	63.00	51.42	794	40,847
2003	15.5	171,885	63.00	50.65	2,728	138,187
2002	16.5	264,933	63.00	49.88	4,205	209,771
2001	17.5	364,414	63.00	49.12	5,784	284,131
2000	18.5	108,178	63.00	48.36	1,717	83,044
1999	19.5	167,995	63.00	47.61	2,667	126,950
1998	20.5	945,405	63.00	46.86	15,006	703,160
1997	21.5	192,464	63.00	46.11	3,055	140,867
1996	22.5	267,562	63.00	45.37	4,247	192,679
1995	23.5	951	63.00	44.63	15	674
1994	24.5	26,940	63.00	43.90	428	18,770
1993	25.5	83,099	63.00	43.17	1,319	56,938
1992	26.5	39,152	63.00	42.44	621	26,376
1991	27.5	6,228	63.00	41.72	99	4,124
1990	28.5	7,186	63.00	41.01	114	4,677
1989	29.5	5,578	63.00	40.30	89	3,568
1988	30.5	4,859	63.00	39.59	77	3,054
1987	31.5	1,666	63.00	38.89	26	1,028
1986	32.5	11,328	63.00	38.20	180	6,868
1985	33.5	18,592	63.00	37.51	295	11,068
1984	34.5	9,452	63.00	36.82	150	5,524
1983	35.5	8,100	63.00	36.14	129	4,647
1982	36.5	29,956	63.00	35.47	475	16,867
1981	37.5	35,611	63.00	34.81	565	19,675
1980	38.5	17,489	63.00	34.15	278	9,480
1979	39.5	11,235	63.00	33.50	178	5,973
1978	40.5	13,729	63.00	32.85	218	7,158
1977	41.5	15,882	63.00	32.21	252	8,120
1976	42.5	7,967	63.00	31.58	126	3,993
1975	43.5	69,300	63.00	30.95	1,100	34,044
1974	44.5	2,579	63.00	30.33	41	1,241
1973	45.5	0	63.00	29.72	0	0
1972	46.5	452	63.00	29.11	7	209
		4,475,503			71,040	3,549,491

AVERAGE SERVICE LIFE 63.00
AVERAGE REMAINING LIFE 49.96

Atmos

376.10 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 63 R1.5

			BG/VG Average			
		Surviving	Service	Remaining	ASL	RL
Year	Age	Investment	Life	Life	Weights	Weights
(1)	(2)	(3)	(4)	(5)	(6)=(3)/(4)	(7)=(6)*(5)
2018	0.5	1,793,608	63.00	62.59	28,470	1,781,834
2017	1.5	1,036,192	63.00	61.76	16,447	1,015,877
2016	2.5	4,065,004	63.00	60.95	64,524	3,932,515
2015	3.5	6,782,617	63.00	60.13	107,661	6,473,910
2014	4.5	1,147,197	63.00	59.32	18,209	1,080,217
2013	5.5	7,252,645	63.00	58.51	115,121	6,736,301
2012	6.5	9,085,534	63.00	57.71	144,215	8,322,851
2011	7.5	941,611	63.00	56.91	14,946	850,614
2010	8.5	379,996	63.00	56.12	6,032	338,473
2009	9.5	444,197	63.00	55.32	7,051	390,071
2008	10.5	367,458	63.00	54.54	5,833	318,085
2007	11.5	45,478	63.00	53.75	722	38,801
2006	12.5	341,422	63.00	52.97	5,419	287,061
2005	13.5	213,005	63.00	52.19	3,381	176,463
2004	14.5	428,399	63.00	51.42	6,800	349,643
2003	15.5	238,646	63.00	50.65	3,788	191,859
2002	16.5	253,428	63.00	49.88	4,023	200,662
2001	17.5	4,678	63.00	49.12	74	3,647
2000	18.5	217,793	63.00	48.36	3,457	167,190
1999	19.5	247,975	63.00	47.61	3,936	187,389
1998	20.5	15,638,563	63.00	46.86	248,231	11,631,432
1997	21.5	257,436	63.00	46.11	4,086	188,421
1996	22.5	92,054	63.00	45.37	1,461	66,291
1995	23.5	87	63.00	44.63	1	62
1994	24.5	213,146	63.00	43.90	3,383	148,511
1993	25.5	308,743	63.00	43.17	4,901	211,545
1992	26.5	379,303	63.00	42.44	6,021	255,525
1991	27.5	163,070	63.00	41.72	2,588	107,992
1990	28.5	88,754	63.00	41.01	1,409	57,769
1989	29.5	395,317	63.00	40.30	6,275	252,847
1988	30.5	74,605	63.00	39.59	1,184	46,882
1987	31.5	505,935	63.00	38.89	8,031	312,311
1986	32.5	264,969	63.00	38.20	4,206	160,644
1985	33.5	151,343	63.00	37.51	2,402	90,099
1984	34.5	152,953	63.00	36.82	2,428	89,399
1983	35.5	285,362	63.00	36.14	4,530	163,720
1982	36.5	95,555	63.00	35.47	1,517	53,803
1981	37.5	101,095	63.00	34.81	1,605	55,855
1980	38.5	158,963	63.00	34.15	2,523	86,163
1979	39.5	145,134	63.00	33.50	2,304	77,163
1978	40.5	277,207	63.00	32.85	4,400	144,537
1977	41.5	104,123	63.00	32.21	1,653	53,232
1976	42.5	205,267	63.00	31.58	3,258	102,879
1975	43.5	264,553	63.00	30.95	4,199	129,961
1974	44.5	76,886	63.00	30.33	1,220	37,014
1973	45.5	215,416	63.00	29.72	3,419	101,612
1972	46.5	119,595	63.00	29.11	1,898	55,265
1971	47.5	167,168	63.00	28.51	2,653	75,662
1970	48.5	198,501	63.00	27.92	3,151	87,982
1969	49.5	416,464	63.00	27.34	6,611	180,740
1968	50.5	154,149	63.00	26.77	2,447	65,491
1967	51.5	135,790	63.00	26.20	2,155	56,468
1966	52.5	195,815	63.00	25.64	3,108	79,690
1965	53.5	153,646	63.00	25.09	2,439	61,183
1964	54.5	218,881	63.00	24.54	3,474	85,272
1963	55.5	241,206	63.00	24.01	3,829	91,917
1962	56.5	211,363	63.00	23.48	3,355	78,776
1961	57.5	120,761	63.00	22.96	1,917	44,012
1960	58.5	84,833	63.00	22.45	1,347	30,230
1959	59.5	151,626	63.00	21.95	2,407	52,821
1958	60.5	39,260	63.00	21.45	623	13,368
1957	61.5	52,654	63.00	20.97	836	17,523
1956	62.5	20,740	63.00	20.49	329	6,745
1955	63.5	96,533	63.00	20.02	1,532	30,674
1954	64.5	88,166	63.00	19.56	1,399	27,370
1953	65.5	84,754	63.00	19.10	1,345	25,702
1952	66.5	39,340	63.00	18.66	624	11,652
1951	67.5	15,410	63.00	18.22	245	4,458
1950	68.5	28,850	63.00	17.80	458	8,149
1949	69.5	63,875	63.00	17.38	1,014	17,617
1948	70.5	187,744	63.00	16.96	2,980	50,552
1947	71.5	11,235	63.00	16.56	178	2,953
1946	72.5	9,348	63.00	16.16	148	2,398
1945	73.5	4,678	63.00	15.77	74	1,171
1944	74.5	15,834	63.00	15.39	251	3,868
1943	75.5	3,730	63.00	15.02	59	889
1942	76.5	24,276	63.00	14.65	385	5,645
1941	77.5	5,429	63.00	14.29	86	1,231
1940	78.5	24,687	63.00	13.94	392	5,460
1939	79.5	26,202	63.00	13.59	416	5,651
1938	80.5	0	63.00	13.25	0	0
1937	81.5	59,892	63.00	12.91	951	12,272
1936	82.5	164	63.00	12.58	3	33
1935	83.5	47,293	63.00	12.25	751	9,198
1934	84.5	0	63.00	11.93	0	0
1933	85.5	0	63.00	11.62	0	0
1932	86.5	3,267	63.00	11.30	52	586
1931	87.5	0	63.00	11.00	0	0
1930	88.5	164,089	63.00	10.69	2,605	27,851
1929	89.5	0	63.00	10.39	0	0
1928	90.5	30,530	63.00	10.10	485	4,893
1927	91.5	605	63.00	9.80	10	94
		59,621,101			946,367	48,812,648

AVERAGE SERVICE LIFE 63.00
AVERAGE REMAINING LIFE 51.58

Atmos

376.20 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 63 R1.5

			BG/VG Average			
Year	Age	Surviving Investment	Service Life	Remaining Life	ASL Weights	RL Weights
(1)	(2)	(3)	(4)	(5)	(6)=(3)/(4)	(7)=(6)*(5)
2018	0.5	5,134,779	63.00	62.59	81,504	5,101,071
2017	1.5	6,818,686	63.00	61.76	108,233	6,685,005
2016	2.5	6,750,352	63.00	60.95	107,148	6,530,341
2015	3.5	5,577,729	63.00	60.13	88,535	5,323,862
2014	4.5	4,830,564	63.00	59.32	76,676	4,548,529
2013	5.5	5,201,381	63.00	58.51	82,562	4,831,075
2012	6.5	5,265,028	63.00	57.71	83,572	4,823,056
2011	7.5	4,511,032	63.00	56.91	71,604	4,075,086
2010	8.5	2,611,077	63.00	56.12	41,446	2,325,761
2009	9.5	3,839,393	63.00	55.32	60,943	3,371,563
2008	10.5	2,254,632	63.00	54.54	35,788	1,951,693
2007	11.5	3,272,409	63.00	53.75	51,943	2,791,951
2006	12.5	5,426,879	63.00	52.97	86,141	4,562,817
2005	13.5	3,287,593	63.00	52.19	52,184	2,723,589
2004	14.5	4,428,867	63.00	51.42	70,299	3,614,676
2003	15.5	4,238,749	63.00	50.65	67,282	3,407,737
2002	16.5	1,363,068	63.00	49.88	21,636	1,079,262
2001	17.5	1,187,261	63.00	49.12	18,845	925,698
2000	18.5	1,296,476	63.00	48.36	20,579	995,247
1999	19.5	1,290,077	63.00	47.61	20,477	974,880
1998	20.5	29,961,511	63.00	46.86	475,580	22,284,355
1997	21.5	621,354	63.00	46.11	9,863	454,777
1996	22.5	533,689	63.00	45.37	8,471	384,325
1995	23.5	808,304	63.00	44.63	12,830	572,611
1994	24.5	561,331	63.00	43.90	8,910	391,112
1993	25.5	400,332	63.00	43.17	6,354	274,300
1992	26.5	558,871	63.00	42.44	8,871	376,494
1991	27.5	388,012	63.00	41.72	6,159	256,958
1990	28.5	584,299	63.00	41.01	9,275	380,311
1989	29.5	682,550	63.00	40.30	10,834	436,563
1988	30.5	290,203	63.00	39.59	4,606	182,367
1987	31.5	259,604	63.00	38.89	4,121	160,252
1986	32.5	214,691	63.00	38.20	3,408	130,161
1985	33.5	111,954	63.00	37.51	1,777	66,650
1984	34.5	162,279	63.00	36.82	2,576	94,850
1983	35.5	236,081	63.00	36.14	3,747	135,447
1982	36.5	171,158	63.00	35.47	2,717	96,372
1981	37.5	216,272	63.00	34.81	3,433	119,491
1980	38.5	335,284	63.00	34.15	5,322	181,734
1979	39.5	110,841	63.00	33.50	1,759	58,930
1978	40.5	246,218	63.00	32.85	3,908	128,379
1977	41.5	253,533	63.00	32.21	4,024	129,617
1976	42.5	162,959	63.00	31.58	2,587	81,674
1975	43.5	70,395	63.00	30.95	1,117	34,581
1974	44.5	39,161	63.00	30.33	622	18,853
1973	45.5	54,741	63.00	29.72	869	25,821
1972	46.5	25,611	63.00	29.11	407	11,835
1971	47.5	413	63.00	28.51	7	187
1970	48.5	0	63.00	27.92	0	0
1969	49.5	0	63.00	27.34	0	0
1968	50.5	1,549	63.00	26.77	25	658
1967	51.5	0	63.00	26.20	0	0
1966	52.5	0	63.00	25.64	0	0
1965	53.5	0	63.00	25.09	0	0
1964	54.5	0	63.00	24.54	0	0
1963	55.5	13,531	63.00	24.01	215	5,156
1962	56.5	843	63.00	23.48	13	314
1961	57.5	0	63.00	22.96	0	0
1960	58.5	0	63.00	22.45	0	0
1959	59.5	0	63.00	21.95	0	0
1958	60.5	2,479	63.00	21.45	39	844
		116,666,085			1,851,843	98,118,882

AVERAGE SERVICE LIFE 63.00
AVERAGE REMAINING LIFE 52.98

Observed Life Table Results
Atmos
Account: 378.00 - Meas. and Reg. Station Eqpmt

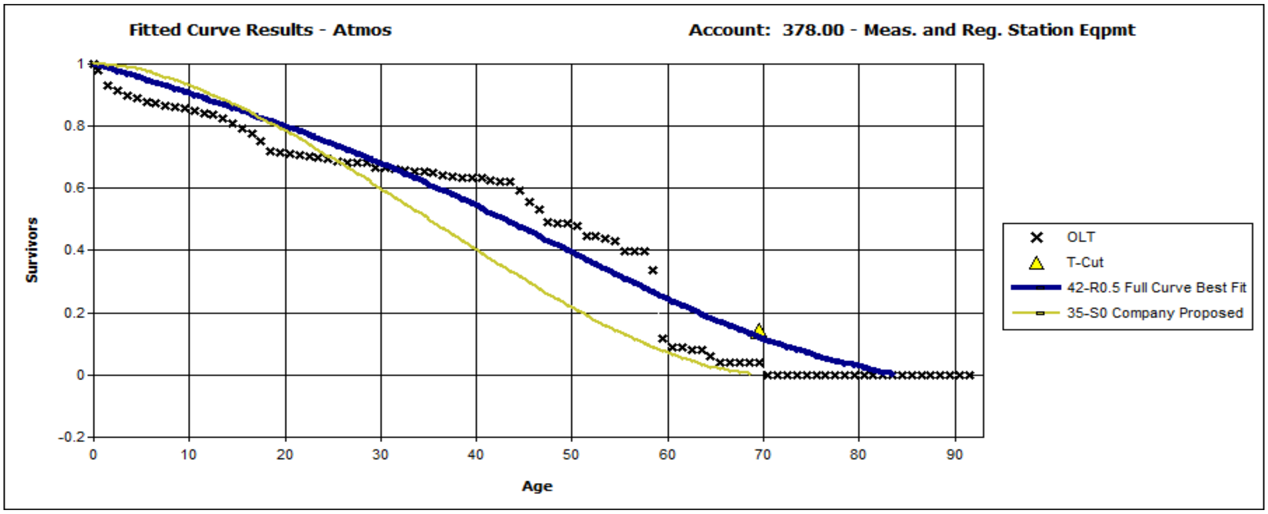
Age	Exposures	Retirements	Retirement Ratio (%)	Survivor Ratio (%)	Cumulative Survivors
BAND		1926 - 2017			
0	6,605,042	141,041	2.1353	97.8647	1.0000
0.5	6,874,630	322,727	4.6945	95.3055	0.9786
1.5	6,274,321	128,513	2.0482	97.9518	0.9327
2.5	6,115,864	93,286	1.5253	98.4747	0.9136
3.5	5,191,390	61,577	1.1861	98.8139	0.8997
4.5	4,968,035	58,604	1.1796	98.8204	0.8890
5.5	4,796,447	33,361	0.6955	99.3045	0.8785
6.5	4,547,318	26,218	0.5766	99.4234	0.8724
7.5	3,848,990	20,256	0.5263	99.4737	0.8674
8.5	3,821,829	21,272	0.5566	99.4434	0.8628
9.5	3,622,807	31,164	0.8602	99.1398	0.8580
10.5	3,562,202	33,001	0.9264	99.0736	0.8506
11.5	3,406,511	27,522	0.8079	99.1921	0.8427
12.5	3,285,914	49,955	1.5203	98.4797	0.8359
13.5	3,212,709	57,302	1.7836	98.2164	0.8232
14.5	3,117,928	56,747	1.8200	98.1800	0.8085
15.5	2,999,091	68,190	2.2737	97.7263	0.7938
16.5	2,905,664	88,964	3.0618	96.9382	0.7758
17.5	2,679,886	111,742	4.1697	95.8303	0.7520
18.5	2,550,382	23,772	0.9321	99.0679	0.7207
19.5	2,518,020	12,094	0.4803	99.5197	0.7139
20.5	2,407,279	13,777	0.5723	99.4277	0.7105
21.5	2,296,579	14,882	0.6480	99.3520	0.7065
22.5	2,241,688	13,072	0.5831	99.4169	0.7019
23.5	2,144,530	13,627	0.6354	99.3646	0.6978
24.5	1,964,963	20,789	1.0580	98.9420	0.6933
25.5	1,793,096	3,963	0.2210	99.7790	0.6860
26.5	1,542,347	3,539	0.2295	99.7705	0.6845
27.5	1,475,316	1,736	0.1177	99.8823	0.6829
28.5	1,375,907	29,991	2.1797	97.8203	0.6821
29.5	1,237,719	2,923	0.2361	99.7639	0.6673
30.5	1,041,659	6,949	0.6671	99.3329	0.6657
31.5	905,117	1,927	0.2129	99.7871	0.6612
32.5	778,725	5,715	0.7339	99.2661	0.6598
33.5	763,707	2,589	0.3390	99.6610	0.6550
34.5	679,255	2,807	0.4133	99.5867	0.6528
35.5	654,185	8,332	1.2737	98.7263	0.6501
36.5	629,860	4,228	0.6712	99.3288	0.6418
37.5	645,463	2,433	0.3770	99.6230	0.6375
38.5	562,107	1,460	0.2597	99.7403	0.6351
39.5	535,336	1,298	0.2425	99.7575	0.6334
40.5	481,076	4,170	0.8668	99.1332	0.6319
41.5	457,073	2,183	0.4777	99.5223	0.6264
42.5	241,056	863	0.3579	99.6421	0.6234
43.5	233,051	10,161	4.3599	95.6401	0.6212
44.5	193,113	12,400	6.4213	93.5787	0.5941
45.5	179,398	7,269	4.0521	95.9479	0.5560
46.5	171,220	12,926	7.5493	92.4507	0.5334
47.5	147,721	1,339	0.9066	99.0934	0.4932
48.5	132,628	53	0.0400	99.9600	0.4887
49.5	107,538	1,999	1.8587	98.1413	0.4885
50.5	86,609	5,644	6.5162	93.4838	0.4794
51.5	69,153	38	0.0546	99.9454	0.4482
52.5	59,244	1,362	2.2988	97.7012	0.4479
53.5	49,368	992	2.0097	97.9903	0.4376
54.5	42,475	3,194	7.5200	92.4800	0.4288
55.5	36,878	4	0.0101	99.9899	0.3966
56.5	33,086	1	0.0035	99.9965	0.3965
57.5	29,540	4,416	14.9494	85.0506	0.3965
58.5	24,274	15,872	65.3864	34.6136	0.3373
59.5	7,197	1,824	25.3454	74.6546	0.1167
60.5	7,127	0	0.0000	100.0000	0.0871
61.5	5,517	447	8.0986	91.9014	0.0871
62.5	4,687	12	0.2503	99.7497	0.0801
63.5	4,675	1,109	23.7241	76.2759	0.0799
64.5	3,806	1,193	31.3498	68.6502	0.0609
65.5	659	0	0.0000	100.0000	0.0418
66.5	659	0	0.0000	100.0000	0.0418
67.5	659	0	0.0000	100.0000	0.0418
68.5	659	0	0.0000	100.0000	0.0418
69.5	431	431	100.0000	0.0000	0.0418
70.5	0	0	0.0000	100.0000	0.0000
71.5	0	0	0.0000	100.0000	0.0000
72.5	0	0	0.0000	100.0000	0.0000
73.5	0	0	0.0000	100.0000	0.0000
74.5	0	0	0.0000	100.0000	0.0000
75.5	0	0	0.0000	100.0000	0.0000
76.5	0	0	0.0000	100.0000	0.0000
77.5	0	0	0.0000	100.0000	0.0000
78.5	0	0	0.0000	100.0000	0.0000
79.5	0	0	0.0000	100.0000	0.0000
80.5	0	0	0.0000	100.0000	0.0000
81.5	0	0	0.0000	100.0000	0.0000
82.5	0	0	0.0000	100.0000	0.0000
83.5	0	0	0.0000	100.0000	0.0000
84.5	0	0	0.0000	100.0000	0.0000
85.5	0	0	0.0000	100.0000	0.0000
86.5	0	0	0.0000	100.0000	0.0000
87.5	0	0	0.0000	100.0000	0.0000
88.5	0	0	0.0000	100.0000	0.0000
89.5	0	0	0.0000	100.0000	0.0000
90.5	0	0	0.0000	100.0000	0.0000
91.5	0	0	0.0000	100.0000	0.0000

Best Fit Curve Results
Atmos
Account: 378.00 - Meas. and Reg. Station Eqpmt

Curve	Life	Sum of Squared Differences
BAND	**1926 - 2018**	
R0.5	42.0	4,640.306
R1	43.0	5,006.938
S-0.5	42.0	5,433.005
O1	41.0	5,447.313
S0	43.0	6,326.088
O2	47.0	6,464.160
R1.5	44.0	6,489.132
L0	45.0	7,019.961
L0.5	45.0	7,185.215
S0.5	44.0	7,550.697
L1	45.0	7,951.431
R2	45.0	8,767.406
S1	45.0	9,401.660
L1.5	45.0	9,447.856
O3	58.0	9,947.293
S1.5	45.0	11,451.595
O4	76.0	11,530.945
R2.5	46.0	11,647.461
L2	46.0	11,679.076
S2	46.0	14,058.155
R3	47.0	15,267.734
L3	47.0	16,639.831
S3	47.0	19,607.491
R4	48.0	22,701.577
L4	48.0	22,902.770
S4	49.0	27,432.395
L5	49.0	30,439.210
R5	49.0	32,848.079
S5	49.0	35,674.217
S6	50.0	43,997.960
SQ	47.0	62,716.986

Analytical Parameters

OLT Placement Band:	1926 - 2017
OLT Experience Band:	1926 - 2018
Minimum Life Parameter	1
Maximum Life Paramete	100
Life Increment Paramete	1
Max Age (T-Cut):	69.5



Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter:	1
Maximum Life Parameter:	100
Life Increment Parameter:	1
Max Age (T-Cut):	71.0

Atmos

378.00 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 42 R0.5

Year	Age	Surviving Investment	BG/VG Average Service Life	BG/VG Average Remaining Life	ASL Weights	RL Weights
(1)	(2)	(3)	(4)	(5)	(6)=(3)/(4)	(7)=(6)*(5)
2018	0.5	0	42.00	41.69	0	0
2017	1.5	112,897	42.00	41.07	2,688	110,399
2016	2.5	23,437	42.00	40.45	558	22,574
2015	3.5	919,888	42.00	39.84	21,902	872,522
2014	4.5	161,785	42.00	39.22	3,852	151,091
2013	5.5	113,065	42.00	38.61	2,692	103,945
2012	6.5	218,962	42.00	38.00	5,213	198,122
2011	7.5	673,229	42.00	37.39	16,029	599,409
2010	8.5	6,919	42.00	36.79	165	6,060
2009	9.5	180,246	42.00	36.18	4,292	155,288
2008	10.5	70,354	42.00	35.58	1,675	59,603
2007	11.5	124,275	42.00	34.98	2,959	103,505
2006	12.5	93,369	42.00	34.38	2,223	76,432
2005	13.5	32,471	42.00	33.78	773	26,119
2004	14.5	37,662	42.00	33.19	897	29,759
2003	15.5	63,200	42.00	32.59	1,505	49,043
2002	16.5	51,946	42.00	32.00	1,237	39,576
2001	17.5	139,394	42.00	31.41	3,319	104,239
2000	18.5	26,585	42.00	30.82	633	19,508
1999	19.5	8,667	42.00	30.23	206	6,239
1998	20.5	1,818,547	42.00	29.65	43,299	1,283,761
1997	21.5	37,565	42.00	29.07	894	25,999
1996	22.5	7,683	42.00	28.49	183	5,211
1995	23.5	20,621	42.00	27.92	491	13,706
1994	24.5	25,419	42.00	27.35	605	16,550
1993	25.5	24,113	42.00	26.78	574	15,375
1992	26.5	39,482	42.00	26.22	940	24,646
1991	27.5	10,185	42.00	25.66	242	6,222
1990	28.5	15,829	42.00	25.11	377	9,462
1989	29.5	22,131	42.00	24.56	527	12,940
1988	30.5	32,928	42.00	24.01	784	18,826
1987	31.5	24,380	42.00	23.47	580	13,626
1986	32.5	24,385	42.00	22.94	581	13,319
1985	33.5	8,382	42.00	22.41	200	4,473
1984	34.5	38,153	42.00	21.89	908	19,883
1983	35.5	20,112	42.00	21.37	479	10,233
1982	36.5	21,519	42.00	20.86	512	10,686
1981	37.5	25,009	42.00	20.35	595	12,118
1980	38.5	47,594	42.00	19.85	1,133	22,492
1979	39.5	7,537	42.00	19.35	179	3,473
1978	40.5	48,395	42.00	18.86	1,152	21,734
1977	41.5	13,997	42.00	18.38	333	6,125
1976	42.5	80,060	42.00	17.90	1,906	34,116
1975	43.5	7,940	42.00	17.42	189	3,294
1974	44.5	10,732	42.00	16.95	256	4,332
1973	45.5	5,796	42.00	16.49	138	2,276
1972	46.5	2,359	42.00	16.03	56	901
1971	47.5	12,790	42.00	15.58	305	4,745
1970	48.5	14,107	42.00	15.13	336	5,083
1969	49.5	11,539	42.00	14.69	275	4,036
1968	50.5	12,205	42.00	14.25	291	4,142
1967	51.5	13,042	42.00	13.82	311	4,291
1966	52.5	7,913	42.00	13.39	188	2,522
1965	53.5	7,291	42.00	12.96	174	2,251
1964	54.5	3,522	42.00	12.54	84	1,052
1963	55.5	939	42.00	12.13	22	271
1962	56.5	5,168	42.00	11.71	123	1,441
1961	57.5	1,860	42.00	11.30	44	500
1960	58.5	1,648	42.00	10.90	39	428
1959	59.5	2,337	42.00	10.49	56	584
1958	60.5	2,221	42.00	10.09	53	534
1957	61.5	1,777	42.00	9.69	42	410
1956	62.5	383	42.00	9.29	9	85
1955	63.5	310	42.00	8.90	7	66
1954	64.5	878	42.00	8.50	21	178
1953	65.5	1,954	42.00	8.11	47	377
1952	66.5	212	42.00	7.71	5	39
1951	67.5	155	42.00	7.31	4	27
1950	68.5	501	42.00	6.92	12	82
1949	69.5	240	42.00	6.52	6	37
1948	70.5	0	42.00	6.11	0	0
1947	71.5	680	42.00	5.70	16	92
1946	72.5	2,487	42.00	5.29	59	313
1945	73.5	286	42.00	4.87	7	33
1944	74.5	0	42.00	4.45	0	0
1943	75.5	70	42.00	4.02	2	7
1942	76.5	0	42.00	3.58	0	0
1941	77.5	174	42.00	3.13	4	13
1940	78.5	187	42.00	2.67	4	12
1939	79.5	0	42.00	2.21	0	0
1938	80.5	0	42.00	1.74	0	0
1937	81.5	0	42.00	1.28	0	0
1936	82.5	0	42.00	0.83	0	0
1935	83.5	68	42.00	0.50	2	1
		5,606,146			133,480	4,382,865

AVERAGE SERVICE LIFE 42.00
AVERAGE REMAINING LIFE 32.84

Observed Life Table Results
Atmos
Account: 379.00 - Meas. and Reg. Station Eqpmt - City Gate

Age	Exposures	Retirements	Retirement Ratio (%)	Survivor Ratio (%)	Cumulative Survivors
BAND		1926 - 2018			
0	2,854,690	25,413	0.8902	99.1098	1.0000
0.5	3,688,018	43,300	1.1741	98.8259	0.9911
1.5	3,718,000	39,406	1.0599	98.9401	0.9795
2.5	3,588,786	37,758	1.0521	98.9479	0.9691
3.5	2,593,580	32,415	1.2498	98.7502	0.9589
4.5	2,470,987	25,295	1.0237	98.9763	0.9469
5.5	2,381,884	18,318	0.7691	99.2309	0.9372
6.5	2,392,150	10,329	0.4318	99.5682	0.9300
7.5	2,314,501	12,130	0.5241	99.4759	0.9260
8.5	2,295,418	9,590	0.4178	99.5822	0.9211
9.5	2,260,960	8,051	0.3561	99.6439	0.9173
10.5	2,044,750	8,829	0.4318	99.5682	0.9140
11.5	2,013,420	13,125	0.6519	99.3481	0.9101
12.5	1,984,137	7,705	0.3883	99.6117	0.9041
13.5	1,918,081	10,358	0.5400	99.4600	0.9006
14.5	1,881,066	4,886	0.2598	99.7402	0.8958
15.5	1,861,042	8,071	0.4337	99.5663	0.8934
16.5	1,833,495	4,890	0.2667	99.7333	0.8896
17.5	1,746,860	10,259	0.5873	99.4127	0.8872
18.5	1,725,663	3,472	0.2012	99.7988	0.8820
19.5	1,669,661	1,428	0.0855	99.9145	0.8802
20.5	1,637,115	1,076	0.0657	99.9343	0.8795
21.5	1,552,663	944	0.0608	99.9392	0.8789
22.5	1,516,125	2,856	0.1884	99.8116	0.8783
23.5	1,500,938	3,583	0.2387	99.7613	0.8767
24.5	1,472,214	2,362	0.1604	99.8396	0.8746
25.5	1,138,796	2,138	0.1877	99.8123	0.8732
26.5	942,347	550	0.0584	99.9416	0.8715
27.5	766,855	451	0.0588	99.9412	0.8710
28.5	679,959	588	0.0864	99.9136	0.8705
29.5	517,159	170	0.0329	99.9671	0.8698
30.5	511,332	530	0.1037	99.8963	0.8695
31.5	389,475	222	0.0570	99.9430	0.8686
32.5	293,009	6	0.0019	99.9981	0.8681
33.5	280,198	124	0.0442	99.9558	0.8681
34.5	277,050	957	0.3454	99.6546	0.8677
35.5	272,359	19	0.0068	99.9932	0.8647
36.5	231,614	178	0.0766	99.9234	0.8646
37.5	167,119	23	0.0137	99.9863	0.8640
38.5	118,390	20	0.0170	99.9830	0.8639
39.5	75,645	2,053	2.7139	97.2861	0.8637
40.5	64,338	991	1.5409	98.4591	0.8403
41.5	56,022	351	0.6272	99.3728	0.8273
42.5	47,817	315	0.6583	99.3417	0.8221
43.5	45,064	0	0.0000	100.0000	0.8167
44.5	45,064	0	0.0006	99.9994	0.8167
45.5	44,711	0	0.0000	100.0000	0.8167
46.5	44,711	1	0.0014	99.9986	0.8167
47.5	43,505	2	0.0046	99.9954	0.8167
48.5	40,203	511	1.2714	98.7286	0.8167
49.5	39,692	265	0.6675	99.3325	0.8063
50.5	38,336	360	0.9382	99.0618	0.8009
51.5	37,976	71	0.1874	99.8126	0.7934
52.5	37,905	3,835	10.1183	89.8817	0.7919
53.5	22,564	762	3.3766	96.6234	0.7118
54.5	16,744	1,145	6.8391	93.1609	0.6877
55.5	14,254	2,790	19.5733	80.4267	0.6407
56.5	10,142	1,133	11.1704	88.8296	0.5153
57.5	9,010	156	1.7295	98.2705	0.4577
58.5	8,854	0	0.0000	100.0000	0.4498
59.5	8,854	77	0.8691	99.1309	0.4498
60.5	8,777	364	4.1474	95.8526	0.4459
61.5	8,413	126	1.4927	98.5073	0.4274
62.5	7,394	632	8.5425	91.4575	0.4210
63.5	6,403	0	0.0034	99.9966	0.3851
64.5	6,054	1,800	29.7420	70.2580	0.3851
65.5	4,209	1,193	28.3545	71.6455	0.2705
66.5	1,979	0	0.0000	100.0000	0.1938
67.5	1,979	1,979	100.0000	0.0000	0.1938
68.5	0	0	0.0000	100.0000	0.0000
69.5	0	0	0.0000	100.0000	0.0000
70.5	0	0	0.0000	100.0000	0.0000
71.5	0	0	0.0000	100.0000	0.0000
72.5	0	0	0.0000	100.0000	0.0000
73.5	0	0	0.0000	100.0000	0.0000
74.5	0	0	0.0000	100.0000	0.0000
75.5	0	0	0.0000	100.0000	0.0000
76.5	0	0	0.0000	100.0000	0.0000
77.5	0	0	0.0000	100.0000	0.0000
78.5	0	0	0.0000	100.0000	0.0000
79.5	0	0	0.0000	100.0000	0.0000
80.5	0	0	0.0000	100.0000	0.0000
81.5	0	0	0.0000	100.0000	0.0000
82.5	0	0	0.0000	100.0000	0.0000
83.5	0	0	0.0000	100.0000	0.0000
84.5	0	0	0.0000	100.0000	0.0000
85.5	0	0	0.0000	100.0000	0.0000
86.5	0	0	0.0000	100.0000	0.0000
87.5	0	0	0.0000	100.0000	0.0000
88.5	0	0	0.0000	100.0000	0.0000
89.5	0	0	0.0000	100.0000	0.0000
90.5	0	0	0.0000	100.0000	0.0000
91.5	0	0	0.0000	100.0000	0.0000

Best Fit Curve Results

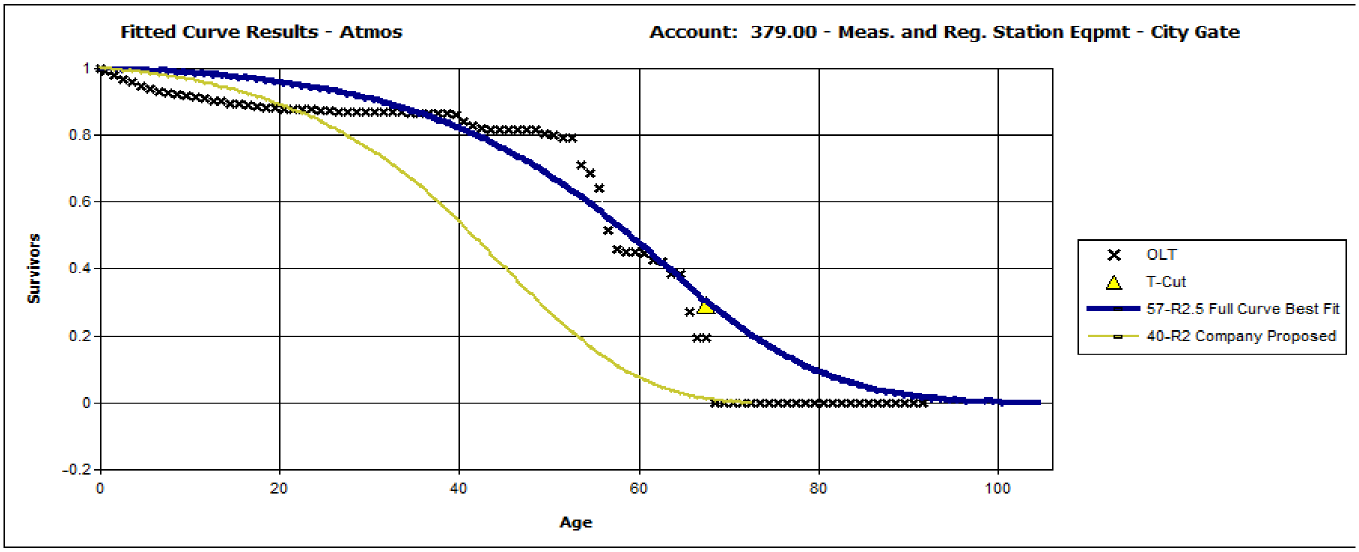
Atmos

Account: 379.00 - Meas. and Reg. Station Eqpmt - City Gate

Curve	Life	Sum of Squared Differences
BAND	**1926 - 2018**	
R2.5	57.0	3,158.834
R3	57.0	3,219.594
R2	58.0	3,715.342
R4	57.0	4,189.217
R1.5	59.0	4,473.145
S2	59.0	4,479.431
S1.5	60.0	4,545.089
S3	59.0	4,594.056
L3	62.0	4,613.342
L4	59.0	4,820.112
S1	61.0	5,059.790
L2	65.0	5,237.826
S0.5	62.0	5,503.363
L1.5	66.0	5,609.457
R1	60.0	5,770.008
S4	59.0	5,812.336
S0	64.0	6,367.865
L1	69.0	6,595.798
L5	59.0	6,646.269
L0.5	72.0	7,151.671
R5	58.0	7,165.867
R0.5	65.0	7,447.064
S-0.5	67.0	7,457.877
L0	77.0	8,091.559
S5	59.0	8,430.173
O1	72.0	9,061.157
O2	81.0	9,062.225
O3	100.0	10,884.196
S6	59.0	13,035.545
O4	100.0	20,299.686
SQ	57.0	29,968.866

Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter:	1
Maximum Life Parametei	100
Life Increment Paramete	1
Max Age (T-Cut):	67.5



Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter:	1
Maximum Life Parameter:	100
Life Increment Parameter:	1
Max Age (T-Cut):	67.5

Atmos

379.00 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 57 R2.5

Year	Age	Surviving Investment	BG/VG Average Service Life	BG/VG Average Remaining Life	ASL Weights	RL Weights
(1)	(2)	(3)	(4)	(5)	(6)=(3)/(4)	(7)=(6)*(5)
2018	0.5	33,529	57.00	56.53	588	33,250
2017	1.5	6,859	57.00	55.58	120	6,689
2016	2.5	85,982	57.00	54.64	1,508	82,428
2015	3.5	973,218	57.00	53.71	17,074	917,003
2014	4.5	89,626	57.00	52.78	1,572	82,983
2013	5.5	63,828	57.00	51.85	1,120	58,057
2012	6.5	23,114	57.00	50.92	406	20,650
2011	7.5	67,340	57.00	50.00	1,181	59,072
2010	8.5	6,954	57.00	49.08	122	5,989
2009	9.5	24,877	57.00	48.17	436	21,025
2008	10.5	208,232	57.00	47.27	3,653	172,673
2007	11.5	22,509	57.00	46.36	395	18,309
2006	12.5	16,163	57.00	45.47	284	12,893
2005	13.5	58,465	57.00	44.58	1,026	45,721
2004	14.5	26,766	57.00	43.69	470	20,515
2003	15.5	15,203	57.00	42.81	267	11,418
2002	16.5	19,496	57.00	41.93	342	14,342
2001	17.5	82,183	57.00	41.06	1,442	59,206
2000	18.5	11,003	57.00	40.20	193	7,760
1999	19.5	52,536	57.00	39.34	922	36,264
1998	20.5	1,194,986	57.00	38.49	20,965	807,020
1997	21.5	19,348	57.00	37.65	339	12,780
1996	22.5	8,424	57.00	36.82	148	5,441
1995	23.5	3,236	57.00	35.99	57	2,043
1994	24.5	6,605	57.00	35.16	116	4,075
1993	25.5	84,933	57.00	34.35	1,490	51,182
1992	26.5	51,164	57.00	33.54	898	30,108
1991	27.5	45,106	57.00	32.74	791	25,910
1990	28.5	22,825	57.00	31.95	400	12,794
1989	29.5	42,897	57.00	31.17	753	23,456
1988	30.5	1,498	57.00	30.39	26	799
1987	31.5	32,203	57.00	29.62	565	16,736
1986	32.5	25,599	57.00	28.86	449	12,963
1985	33.5	3,414	57.00	28.12	60	1,684
1984	34.5	808	57.00	27.37	14	388
1983	35.5	1,001	57.00	26.64	18	468
1982	36.5	10,952	57.00	25.92	192	4,980
1981	37.5	17,355	57.00	25.21	304	7,674
1980	38.5	13,193	57.00	24.50	231	5,671
1979	39.5	11,622	57.00	23.81	204	4,854
1978	40.5	2,529	57.00	23.12	44	1,026
1977	41.5	2,012	57.00	22.45	35	792
1976	42.5	1,824	57.00	21.79	32	697
1975	43.5	677	57.00	21.14	12	251
1974	44.5	0	57.00	20.50	0	0
1973	45.5	0	57.00	19.87	0	0
1972	46.5	0	57.00	19.26	0	0
1971	47.5	345	57.00	18.65	6	113
1970	48.5	580	57.00	18.06	10	184
1969	49.5	0	57.00	17.49	0	0
1968	50.5	322	57.00	16.92	6	96
1967	51.5	0	57.00	16.38	0	0
1966	52.5	0	57.00	15.84	0	0
1965	53.5	3,525	57.00	15.32	62	947
1964	54.5	1,572	57.00	14.82	28	409
1963	55.5	238	57.00	14.33	4	60
1962	56.5	425	57.00	13.85	7	103
1961	57.5	0	57.00	13.39	0	0
1960	58.5	0	57.00	12.95	0	0
1959	59.5	0	57.00	12.52	0	0
1958	60.5	0	57.00	12.11	0	0
1957	61.5	0	57.00	11.71	0	0
1956	62.5	365	57.00	11.33	6	73
1955	63.5	162	57.00	10.96	3	31
1954	64.5	184	57.00	10.61	3	34
1953	65.5	30	57.00	10.26	1	5
1952	66.5	1,194	57.00	9.94	21	208
1951	67.5	197	57.00	9.62	3	33
1950	68.5	297	57.00	9.31	5	49
1949	69.5	725	57.00	9.02	13	115
1948	70.5	294	57.00	8.73	5	45
1947	71.5	41	57.00	8.46	1	6
1946	72.5	0	57.00	8.19	0	0
1945	73.5	20	57.00	7.93	0	3
1944	74.5	95	57.00	7.67	2	13
1943	75.5	33	57.00	7.42	1	4
1942	76.5	164	57.00	7.18	3	21
1941	77.5	0	57.00	6.94	0	0
1940	78.5	468	57.00	6.70	8	55
1939	79.5	310	57.00	6.46	5	35
1938	80.5	0	57.00	6.23	0	0
1937	81.5	514	57.00	6.01	9	54
		3,504,196			61,477	2,722,732

AVERAGE SERVICE LIFE	57.00
AVERAGE REMAINING LIFE	44.29

Observed Life Table Results
Atmos
Account: 381.00 - Meters

Age	Exposures	Retirements	Retirement Ratio (%)	Survivor Ratio (%)	Cumulative Survivors
BAND		**1926 - 2018**			
0	24,725,777	648,843	2.6242	97.3758	1.0000
0.5	24,527,697	1,599,803	6.5224	93.4776	0.9738
1.5	19,875,702	512,082	2.5764	97.4236	0.9102
2.5	18,315,141	307,531	1.6791	98.3209	0.8868
3.5	16,633,811	213,152	1.2814	98.7186	0.8719
4.5	12,693,455	187,012	1.4733	98.5267	0.8607
5.5	11,991,879	185,080	1.5434	98.4566	0.8480
6.5	10,810,631	173,331	1.6033	98.3967	0.8350
7.5	10,871,448	185,710	1.7082	98.2918	0.8216
8.5	10,246,989	113,467	1.1073	98.8927	0.8075
9.5	9,555,926	89,937	0.9412	99.0588	0.7986
10.5	9,412,456	103,271	1.0972	98.9028	0.7911
11.5	8,915,524	103,625	1.1623	98.8377	0.7824
12.5	8,768,238	101,356	1.1559	98.8441	0.7733
13.5	9,462,822	41,858	0.4423	99.5577	0.7644
14.5	9,254,673	19,090	0.2063	99.7937	0.7610
15.5	9,336,046	31,740	0.3400	99.6600	0.7594
16.5	8,849,041	53,443	0.6039	99.3961	0.7568
17.5	8,885,184	61,347	0.6904	99.3096	0.7523
18.5	8,659,339	13,759	0.1589	99.8411	0.7471
19.5	8,687,439	20,368	0.2345	99.7655	0.7459
20.5	8,233,641	38,581	0.4686	99.5314	0.7441
21.5	8,260,580	85,964	1.0406	98.9594	0.7406
22.5	8,049,980	61,518	0.7642	99.2358	0.7329
23.5	7,615,849	81,310	1.0676	98.9324	0.7273
24.5	6,541,957	119,014	1.8192	98.1808	0.7196
25.5	6,138,773	105,756	1.7227	98.2773	0.7065
26.5	3,920,329	17,916	0.4570	99.5430	0.6943
27.5	3,646,159	63,229	1.7341	98.2659	0.6911
28.5	3,254,271	55,294	1.6991	98.3009	0.6792
29.5	3,037,881	72,545	2.3880	97.6120	0.6676
30.5	2,161,087	54,374	2.5160	97.4840	0.6517
31.5	1,085,101	7,069	0.6515	99.3485	0.6353
32.5	901,447	16,503	1.8308	98.1692	0.6311
33.5	644,204	14,168	2.1992	97.8008	0.6196
34.5	577,990	9,709	1.6798	98.3202	0.6060
35.5	517,226	31,104	6.0136	93.9864	0.5958
36.5	429,752	10,692	2.4878	97.5122	0.5599
37.5	326,827	5,501	1.6833	98.3167	0.5460
38.5	247,553	3,156	1.2750	98.7250	0.5368
39.5	209,472	10,674	5.0959	94.9041	0.5300
40.5	137,511	5,140	3.7379	96.2621	0.5030
41.5	100,968	476	0.4712	99.5288	0.4842
42.5	85,509	41	0.0483	99.9517	0.4819
43.5	76,604	297	0.3880	99.6120	0.4817
44.5	56,047	3,436	6.1298	93.8702	0.4798
45.5	52,612	136	0.2587	99.7413	0.4504
46.5	52,476	811	1.5448	98.4552	0.4492
47.5	51,665	1,454	2.8150	97.1850	0.4423
48.5	50,211	4,455	8.8724	91.1276	0.4298
49.5	0	0	0.0000	100.0000	0.3917
50.5	0	0	0.0000	100.0000	0.3917
51.5	0	0	0.0000	100.0000	0.3917
52.5	0	0	0.0000	100.0000	0.3917
53.5	0	0	0.0000	100.0000	0.3917
54.5	0	0	0.0000	100.0000	0.3917
55.5	0	0	0.0000	100.0000	0.3917
56.5	0	0	0.0000	100.0000	0.3917
57.5	0	0	0.0000	100.0000	0.3917
58.5	0	0	0.0000	100.0000	0.3917
59.5	0	0	0.0000	100.0000	0.3917
60.5	0	0	0.0000	100.0000	0.3917
61.5	0	0	0.0000	100.0000	0.3917
62.5	0	0	0.0000	100.0000	0.3917
63.5	0	0	0.0000	100.0000	0.3917
64.5	0	0	0.0000	100.0000	0.3917
65.5	0	0	0.0000	100.0000	0.3917
66.5	0	0	0.0000	100.0000	0.3917
67.5	0	0	0.0000	100.0000	0.3917
68.5	0	0	0.0000	100.0000	0.3917
69.5	0	0	0.0000	100.0000	0.3917
70.5	0	0	0.0000	100.0000	0.3917
71.5	0	0	0.0000	100.0000	0.3917
72.5	0	0	0.0000	100.0000	0.3917
73.5	0	0	0.0000	100.0000	0.3917
74.5	0	0	0.0000	100.0000	0.3917
75.5	0	0	0.0000	100.0000	0.3917
76.5	0	0	0.0000	100.0000	0.3917
77.5	0	0	0.0000	100.0000	0.3917
78.5	0	0	0.0000	100.0000	0.3917
79.5	0	0	0.0000	100.0000	0.3917
80.5	0	0	0.0000	100.0000	0.3917
81.5	0	0	0.0000	100.0000	0.3917
82.5	0	0	0.0000	100.0000	0.3917
83.5	0	0	0.0000	100.0000	0.3917
84.5	0	0	0.0000	100.0000	0.3917
85.5	0	0	0.0000	100.0000	0.3917
86.5	0	0	0.0000	100.0000	0.3917
87.5	0	0	0.0000	100.0000	0.3917
88.5	0	0	0.0000	100.0000	0.3917
89.5	0	0	0.0000	100.0000	0.3917
90.5	0	0	0.0000	100.0000	0.3917
91.5	0	0	0.0000	100.0000	0.3917

Best Fit Curve Results
Atmos
Account: 381.00 - Meters

Curve	Life	Sum of Squared Differences
BAND	**1926 - 2018**	
O4	82.0	920.456
O3	61.0	935.949
O2	46.0	1,072.417
O1	41.0	1,072.528
R0.5	40.0	1,692.935
L0	44.0	1,980.243
S-0.5	40.0	2,020.324
L0.5	43.0	2,881.907
R1	39.0	2,898.424
S0	40.0	3,580.680
L1	42.0	4,175.357
R1.5	39.0	4,534.184
S0.5	40.0	5,017.029
L1.5	41.0	5,757.544
R2	39.0	6,699.149
S1	39.0	6,859.440
L2	41.0	7,877.046
S1.5	40.0	8,716.094
R2.5	39.0	9,190.427
S2	40.0	10,952.538
R3	40.0	12,194.840
L3	41.0	12,488.421
S3	40.0	15,485.947
R4	40.0	18,197.040
L4	40.0	18,287.806
S4	41.0	21,933.225
L5	41.0	24,736.833
R5	42.0	26,463.904
S5	42.0	28,973.640
S6	42.0	36,238.590
SQ	41.0	52,744.066

Analytical Parameters

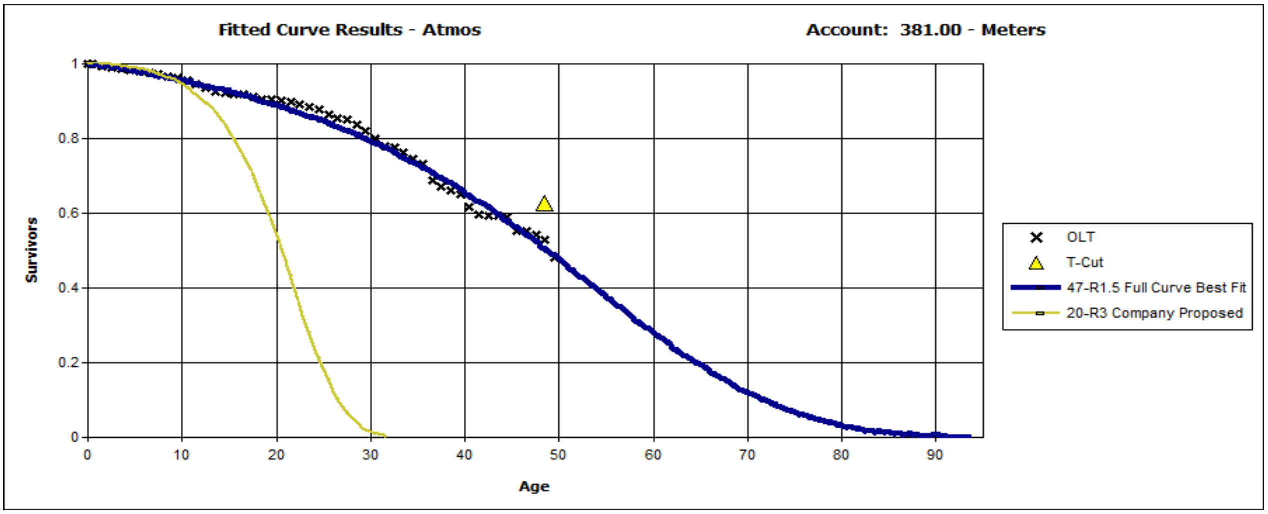
OLT Placement Band:	1926 - 2018
OLT Experience Band:	1926 - 2018
Minimum Life Parameter	1
Maximum Life Parameter	100
Life Increment Paramete	1
Max Age (T-Cut):	48.5

Best Fit Curve Results
Atmos
Account: 381.00 - Meters

Curve	Life	Sum of Squared Differences
BAND	**2000 - 2018**	
R1.5	47.0	129.256
S0.5	49.0	136.251
L1	55.0	172.015
L1.5	52.0	173.901
R2	46.0	179.339
S0	52.0	231.077
S1	48.0	262.526
L0.5	59.0	324.995
R1	50.0	383.996
L2	50.0	516.050
R2.5	45.0	557.514
S1.5	47.0	563.065
S-0.5	56.0	635.402
L0	64.0	659.752
R0.5	54.0	852.400
S2	46.0	1,129.688
O2	70.0	1,279.012
O1	62.0	1,280.581
R3	44.0	1,330.546
O3	100.0	1,477.676
L3	47.0	1,881.025
S3	45.0	2,730.594
R4	44.0	3,524.458
O4	100.0	4,105.881
L4	46.0	4,271.016
S4	45.0	5,765.810
L5	45.0	7,576.362
R5	45.0	7,789.596
S5	45.0	9,680.507
S6	46.0	14,157.680
SQ	49.0	26,554.499

Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	2000 - 2018
Minimum Life Paramet	1
Maximum Life Paramet	100
Life Increment Parame	1
Max Age (T-Cut):	48.5



Analytical Parameters

OLT Placement Band:	1926 - 2018
OLT Experience Band:	2000 - 2018
Minimum Life Parameter:	1
Maximum Life Parameter:	100
Life Increment Parameter:	1
Max Age (T-Cut):	50.0

Atmos

381.00 Gen Arm -

Calculation of Remaining Life
Based Upon Broad Group/Vintage Group Procedures
Related to Original Cost as of December 31, 2018

Survivor Curve .. IOWA: 30 R3

			BG/VG Average			
		Surviving	Service	Remaining	ASL	RL
Year	Age	Investment	Life	Life	Weights	Weights
(1)	(2)	(3)	(4)	(5)	(6)=(3)/(4)	(7)=(6)*(5)
2018	0.5	2,327,354	30.00	29.51	77,578	2,289,131
2017	1.5	3,000,491	30.00	28.53	100,016	2,853,093
2016	2.5	1,294,419	30.00	27.55	43,147	1,188,718
2015	3.5	1,874,907	30.00	26.58	62,497	1,661,163
2014	4.5	3,843,675	30.00	25.62	128,122	3,282,007
2013	5.5	1,096,138	30.00	24.66	36,538	901,033
2012	6.5	1,179,402	30.00	23.71	39,313	932,229
2011	7.5	135,736	30.00	22.77	4,525	103,045
2010	8.5	497,789	30.00	21.85	16,593	362,515
2009	9.5	811,685	30.00	20.93	27,056	566,331
2008	10.5	514,301	30.00	20.03	17,143	343,348
2007	11.5	495,516	30.00	19.14	16,517	316,108
2006	12.5	536,063	30.00	18.26	17,869	326,320
2005	13.5	383,240	30.00	17.40	12,775	222,287
2004	14.5	555,681	30.00	16.56	18,523	306,644
2003	15.5	346,439	30.00	15.73	11,548	181,596
2002	16.5	700,783	30.00	14.91	23,359	348,342
2001	17.5	0	30.00	14.12	0	0
2000	18.5	281,604	30.00	13.34	9,387	125,215
1999	19.5	148,379	30.00	12.58	4,946	62,223
1998	20.5	4,239,918	30.00	11.84	141,331	1,673,614
1997	21.5	4,240	30.00	11.12	141	1,572
1996	22.5	208,672	30.00	10.43	6,956	72,529
1995	23.5	438,328	30.00	9.76	14,611	142,531
1994	24.5	80,409	30.00	9.11	2,680	24,411
1993	25.5	432,072	30.00	8.49	14,402	122,223
1992	26.5	1,089,185	30.00	7.89	36,306	286,602
1991	27.5	345,967	30.00	7.33	11,532	84,543
1990	28.5	412,314	30.00	6.80	13,744	93,436
1989	29.5	205,791	30.00	6.30	6,860	43,203
1988	30.5	69,276	30.00	5.83	2,309	13,461
1987	31.5	107,581	30.00	5.39	3,586	19,336
1986	32.5	176,584	30.00	4.99	5,886	29,348
1985	33.5	116,684	30.00	4.61	3,889	17,927
1984	34.5	52,046	30.00	4.26	1,735	7,391
1983	35.5	51,055	30.00	3.94	1,702	6,697
1982	36.5	56,371	30.00	3.63	1,879	6,825
1981	37.5	92,234	30.00	3.35	3,074	10,292
1980	38.5	73,772	30.00	3.07	2,459	7,561
1979	39.5	34,926	30.00	2.81	1,164	3,274
1978	40.5	61,286	30.00	2.56	2,043	5,221
1977	41.5	31,403	30.00	2.30	1,047	2,407
1976	42.5	14,983	30.00	2.05	499	1,021
1975	43.5	8,864	30.00	1.79	295	530
1974	44.5	20,259	30.00	1.54	675	1,041
		28,447,818			948,261	19,048,344

AVERAGE SERVICE LIFE	30.00
AVERAGE REMAINING LIFE	20.09

CERTIFICATE OF SERVICE

19-ATMG-525-RTS

I, the undersigned, hereby certify that a true and correct copy of the above and foregoing document was served by electronic service on this 31st day of October, 2019, to the following:

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