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September 17, 2021

Via Electronic Filing

Public Utility Commission of Oregon
Attn: Filing Center
201 High St. SE, Suite 100
Salem OR 97301

Re: In the Matter of PORTLAND GENERAL ELECTRIC CO.
Detailed Depreciation Study of Electric Utility Properties.
Docket No. UM 2152

Dear Filing Center:

Please find enclosed the redacted version of the Opening Testimony and Exhibits of Lance D. Kaufman (AWEC/100-110) on behalf of the Alliance of Western Energy Consumers ("AWEC") in the above-referenced docket.

Please note that Exhibits AWEC/106-107 contain Protected Information that is being handled in accordance with Order No. 21-017. The confidential portions of AWEC's filing have been encrypted with 7-zip software and are being transmitted electronically to the Commission and qualified persons.

Thank you for your assistance. If you have any questions, please do not hesitate to call.

Sincerely,

/s/ Jesse O. Gorsuch
Jesse O. Gorsuch

Enclosures

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I have this day served the **Confidential Opening Testimony and Exhibits of the Alliance of Western Energy Consumers** upon the parties shown below via electronic mail.

Dated at Portland, Oregon, this 17th day of September, 2021.

Sincerely,

/s/ Jesse O. Gorsuch
Jesse O. Gorsuch

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matter of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)

OPENING TESTIMONY OF

LANCE KAUFMAN, PH.D.

ON BEHALF OF

ALLIANCE OF WESTERN ENERGY CONSUMERS

September 17, 2021

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EXHIBIT LIST

I. INTRODUCTION AND SUMMARY

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. My name is Lance Kaufman. I am an economist with extensive experience with regulated utilities in the Western United States. I am also a Certified Depreciation Professional. My witness qualification statement can be found at Exhibit AWEC/101.

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

A. I am testifying on behalf of the Alliance of Western Energy Consumers ("AWEC"). AWEC is a non-profit trade association whose members are large energy users in the Western United States, including customers receiving electric services from Portland General Electric Company ("PGE" or "Company").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. This testimony presents my review and findings related to PGE's 2019 Depreciation Study and the Stipulation filed on July 29, 2021 by PGE, Commission Staff ("Staff"), and the Oregon Citizens' Utility Board ("CUB") (collectively, the "Stipulating Parties") in this case. I have provided general background on depreciation in Exhibit AWEC/103 to assist in understanding the bases for my recommendations in this testimony.

Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS.

A. My recommendations are summarized below.

> **DEPRECIATION FILINGS:** This case was filed without direct testimony. The Commission should require supporting testimony for all depreciation cases that, at a minimum, discusses the major changes from the previous depreciation study; any changes based on policy factors; and an explanation of specific judgments used when determining depreciation rates of individual accounts and why those judgments are reasonable.

EXCESS RESERVES: PGE's filing shows $685 million in excess reserves. I recommend that these reserves be used to fully depreciate Colstrip, that the remaining excess reserves be amortized over 10 years, and that amortization be revisited in PGE's next depreciation study.

COLSTRIP: One basis for accelerating the depreciation of Colstrip is that Colstrip may be uneconomic to operate after 2025. As part of accelerating the depreciation of Colstrip, PGE should be precluded from including costs of operating Colstrip, if such costs are not economic, more than five years after Colstrip is fully depreciated.

RETIREMENT CURVES AND LIVES: I recommend the following modifications to retirement curves and average lives:

Account	Parties	AWEC Recommendation
311.00	S1.5-90	R3-98
332.00	R3-105	R3-120
341.00	R3-70	R3-80
341.01	R4-40	S3-50
344.01	R3-30	R4-38
345.00	R2.5-50	R3-60
345.01	S2.5-30	S2-45
352.00	R2.5-70	R2.5-75
356.00	R2.5-65	R2.5-70

NET SALVAGE: I recommend the net salvage for Account 392.10, Helicopters, be increased to 30 percent and that the net salvage for remaining Account 392 transportation accounts be increased to 18 percent.

PROBABLE RETIREMENT DATE OF SULLIVAN: PGE expects to renew the Federal Energy Regulatory Commission ("FERC") license for Sullivan hydro facilities. I recommend the end of life for Sullivan assets be extended by 30 years to reflect relicensing.

DEPRECIATION RESERVE ROLLFORWARD: Two accounts are not likely to have material additions or retirements between December 31, 2019 and the date of rate changes. I recommend that the book reserve be rolled forward to May 1, 2022 when calculating rates for Accounts 373.07 and 392.10.

II. STIPULATION

Q. PLEASE SUMMARIZE THE STIPULATION IN THIS CASE AND YOUR CONCERNS REGARDING IT.

A. The Stipulating Parties agree to a number of parameter changes and modify the retirement date of Colstrip from 2027 to 2025.[1/] The Stipulating Parties find that, with their proposed changes alone, PGE's depreciation rates as a whole will be "fair, just and reasonable and, if approved, will meet the standard in ORS 756.040.[2/] I disagree with this conclusion for a number of reasons. First, while I generally agree that most of the modified lives, curves, and net salvage changes are appropriate, I disagree with the Stipulating Parties' recommendation of a 30-year life for wind generators. Second, I disagree with several depreciation rate calculations and with some lives, curves, and net salvage changes that were not specifically addressed in the Stipulation. Third, PGE's depreciation rates in the past have proven to be too conservative and, as a result, have created an extraordinarily large excess reserve balance of $685 million. This reserve should be returned to customers more quickly than the Stipulating Parties propose, and the Company's depreciation rates for several accounts should be revised in accordance with my recommendations.

I also agree that early retirement of Colstrip is reasonable given PGE's study demonstrating that it is not economic to continue operations past 2025. However, I am concerned that the retirement does not appear binding, and PGE may continue to include the ongoing net costs of Colstrip in customer rates until as late as 2030.

1/ Stipulating Parties Exhibit 102.
2/ Stipulation ¶ 13.

Finally, I take issue generally with the nature of PGE's filing in this docket. PGE filed its depreciation case with no supporting testimony, made non-transparent judgmental adjustments to plant lives, curves and net salvage without adequate documentation, and was unable to provide explanations for such judgements when asked.

III. PGE'S FILLING LACKS CONTEXT AND SUPPORT

Q. PLEASE SUMMARIZE THIS ISSUE.

A. PGE's filing requests authorization for rates that will recover $301 million per year from ratepayers in depreciation expense.[3/] However, the filing was presented with little to no context. No supporting testimony or exhibits were included. No descriptions of major system changes such as new technologies or facilities were included. There is no explanation of the rate treatment associated with early retirement of Colstrip, or the studies and rationale underlying the early retirement. Furthermore, the Deprecation Study itself is internally inconsistent and severely deficient in supporting material.

Q. IN WHAT WAYS IS THE STUDY DEFICIENT IN SUPPORTING MATERIAL?

A. Many accounts are mischaracterized as having survivor curves and average lives without significant departure from statistically indicated values.[4/] In response to AWEC DR 43, PGE admits that Account 341.00 deviates materially from the statistically indicated curve, a direct contradiction of the Deprecation Study and Response to AWEC DR 15. More importantly, the Depreciation Study contains no details on why or how recommendations deviated from

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3/ Depreciation Study VI at 14. This excludes impacts of Docket No. UE 394.

4/ 2019 Depreciation Report page III-3 provides a list of such accounts. The list is confirmed in AWEC/102 at 2 (PGE Response to AWEC DR 15) statistically indicated survival curves, and PGE was unable to provide these details in discovery.

PGE was asked to provide documentation of the specific basis for departures when they occurred.[5/] However, PGE's generic explanations provide no guidance to the Commission or parties as to what specific external information was considered,[6/] what judgments were made regarding that information, or how the information and judgements were integrated with PGE's actual retirement experience:

> "Assets that do not have robust retirement data with which to perform a representative statistical analysis require further information to develop a meaningful curve estimate. These sources of information include company plans or policies related to retirement as well as life estimates used by other companies within the industry for similar assets. Knowledge of industry trends for the assets being studied and informed judgment are also important factors that are considered more heavily when statistical data are limited or the stub curve is inconclusive."[7/]

While the above explanation provides a reasonable overview, it does not give specific insight into what data were relied on, what judgments were made for specific accounts, and why these judgments are reasonable. PGE confirmed that no data are available regarding external information and judgments made in Response to AWEC DRs 33 and 34.[8/]

As a final attempt to elicit information regarding the unprovided external information and judgments, AWEC asked for specific reasons for deviating from survivor curves for eight accounts in AWEC DR 43.[9/] In response, PGE provided additional variants of generic

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5/ AWEC/102 at 2-3 (PGE Response to AWEC DRs 15 and 16).
6/ Other than a summary of industry statistics, which is discussed in further in this section. AWEC/102 at 2 (PGE Response to AWEC DR 15).
7/ AWEC/102 at 2 (PGE Response to AWEC DR 15).
8/ AWEC/102 at 7-8 (PGE Response to AWEC DRs 33 and 34).
9/ AWEC/102 at 13 (PGE Response to AWEC DR 43).

explanations offered in earlier responses. None of the explanations are detailed enough to be relied on by the Commission as evidence. The most specific explanation for deviating from the historic data is for Account 352.00. PGE's response provides:

> For Account 352.00, Structure and Improvements, which relates to structures at transmission substations, the statistical data is consistent with the survivor curve for the first 40 ages which includes all types of structures in the account today. The assets that have exceeded age 50 are not a good indicator of the future as many of these assets will be retired when the older generation assets are retired in the short term. A 70-year average life is very long for these assets, particularly for the type of structures going into service today.[10/]

The response for Account 352.00 is the only example out of five discovery requests that provides an explanation of the underlying basis for the recommended curve. However, the explanation rests entirely on PGE's own assertions and has no external support.

Q. WHY ARE YOU CONCERNED ABOUT PGE'S LACK OF EXPLANATION AND DOCUMENTATION SUPPORTING ITS STUDY?

A. In Section IV I show that PGE's 2012 and 2015 depreciation studies tended to disregard statistical properties of PGE's retirement data in favor of judgment. Namely, persistent disregard for older aged plant retirement experiences in favor of conservatively low lives. These past studies have caused PGE to over collect $685 million in depreciation expense. Depreciation expense is one of the primary levers a utility has to bolster earnings between rate cases. This provides a corporate incentive to achieve high depreciation rates. Reliance on unsupported judgment can lead to biased results, even if unintended. PGE's 2019 Depreciation Study seems to apply a similar pattern of judgment as found in the 2012 and 2015 studies.[11/]

10/ AWEC/102 at 13 (PGE Response to AWEC DR 43).
11/ See Section IV for comparison of specific accounts across time.

PGE's lack of documentation regarding the judgment it employed when determining many deprecation rates makes impossible to establish how PGE arrived at proposed rates and whether PGE's judgement was appropriate. If PGE is unwilling to provide justifications for judgments made with respect to specific accounts, PGE should be precluded from elaborating on those judgements in rebuttal testimony.

Q. WHAT RECOMMENDATIONS DO YOU MAKE REGARDING LACK OF CONTEXT AND SUPPORTING DOCUMENTATION?

A. The Commission should require supporting testimony for all depreciation cases that, at a minimum, discusses the major changes from the previous depreciation study and any changes based on policy factors. In addition, the Commission should require that the Company is able to provide documentation of specific judgments used when determining depreciation rates of individual accounts, the data relied on for those judgments, and why those judgments are reasonable.

IV. EXCESS ACCUMULATED DEPRECIATION

Q. PLEASE SUMMARIZE YOUR CONCERN WITH PGE'S EXCESS ACCUMULATED DEPRECIATION.

A. PGE's depreciation study shows that book reserves are $685 million larger than calculated accumulated depreciation.[12/] This means that PGE's depreciation reserves are 20 percent greater than they would be had the proposed depreciation parameters been in effect over the life of existing assets. This is an abnormally large level of excess reserve.[13/] While there are

12/ AWEC/104

13/ In my review of depreciation cases where excess reserve issues were raised, I did not find any cases with reserves as high as PGE's. Cases included Florida Public Service Commission Docket Nos. 080677-IE/090130-EI, Arizona Corporation Commission Docket Nos. E-01933A-15-0239 and E-01933A-15-0322, Idaho Public Utilities Commission, Case No. PAC-E-13-02, Public Service Commission of Utah Docket No. 13-035-02, Public Utilities several factors that can lead to excess reserve, I believe that overly conservative historic depreciation rates are the dominant cause of PGE's current excess reserves.

While some level of excess reserves are reasonable, PGE's current level of excess reserves is unreasonable and should be considered over-collection of depreciation expense. An example that illustrates this point is Account 373.07, which has such an extreme reserve imbalance that future accruals are essentially zero. Future customers are expected to get free use of assets in the account over the next 30 years.[14/] This is clearly inequitable because the free use by future customers comes at the expense of existing and past customers.

I recommend that the Commission take three steps to correct this inequity. First, I propose that $180 million in excess reserve be transferred from production and transmission accounts with excess reserves to Colstrip accounts 311 through 316. Second, I recommend the remaining excess reserves be amortized over 10 years. Third, I recommend the Commission reevaluate PGE's excess reserves in PGE's next depreciation study to determine whether continued amortization is appropriate.

Q. HOW DO DEPRECIATION PARAMETERS AND MODELS RELATE TO EXCESS RESERVES?

A. Depreciation parameters and models define both historic depreciation book reserve and the calculation of reserve imbalances. Excess reserves are a specific type of reserve imbalance. A reserve imbalance is calculated by comparing calculated accumulated depreciation[15/] ("CAD")

Commission of Nevada Docket No. 11-06006, New York Public Service Commission Case 07-E-0949, and Public Service Commission of South Carolina Docket No. 2018-318-E.

14/ If my recommendation in Section VII to roll forward reserves for this account to May 2022 is adopted. If not, use of the assets will still be a fraction of the economic cost.

15/ Calculated accumulated depreciation can also be referred to as reserve requirement or theoretical reserve. Calculated accumulated depreciation is the amount of depreciation that would be accrued if a given set of depreciation parameters were used to accumulate historic depreciation.

with book reserves. CAD is the amount of depreciation that would be accumulated using current plant balances, proposed depreciation parameters, and the depreciation model. Book reserve is the actual accumulated depreciation reserve that resulted from historic depreciation rates and retirements.

Q. WHAT ARE EXCESS RESERVES AND WHAT FACTORS CONTRIBUTE TO THE EXISTENCE OF EXCESS RESERVES?

A. Excess depreciation reserves occur when CAD reserves exceed book reserves.[16/] PGE reports book reserves and CAD in Table IX of the Depreciation Study under columns 4 and 3, respectively.[17/] Excess reserves can occur as the result of changes in expectations regarding retirement and net salvage characteristics, or from deviations of actual retirements and salvage from expectations underlying depreciation rates.[18/] For example, if the average life used to set depreciation rates is 10 years, but the actual retirements of plant are more consistent with 20 years, an account will accrue excess reserve because retirements are lower than expected.

At any given time, book reserves are fixed. If book reserves are held constant, and the average life used to calculate reserve imbalances is increased, calculated accrued depreciation will decrease. This will change the size of the reserve imbalance. As a result, two different analysts may calculate two different reserve imbalances for the same utility given the same data.

16/ Public Utility Depreciation Practices NARUC, August 1996, at 63. NARUC refers to excess reserves as reserve excess. Other sources refer to excess reserve as reserve surplus.

17/ Exhibit AWEC/104 provides PGE's reserve imbalance by account for PGE's three most recent depreciation cases.

18/ Other factors, such as grouping procedure, can also affect reserve imbalances. However, the impact of these other factors is relatively minor compared to when investments are made evenly and continuously over time.

Q. HOW HAVE PGE'S EXCESS RESERVES CHANGED OVER TIME?

A. PGE's excess reserves have more than doubled in the last seven years, from $338 million in 2012 to $685 million in 2019. In 2012, PGE's excess reserves were 12 percent of CAD. This increased to 19 percent in 2019.

Q. HOW DO THE STIPULATING PARTIES PROPOSE ADDRESSING EXCESS RESERVES?

A. The Stipulation does not explicitly address excess reserves. Accordingly, the default recommendation to the Commission is to adopt PGE's proposal in the Depreciation Study, which is to amortize recovery of excess reserves across the remaining life of the plant of 34 years.[19/] This extended amortization period is a result of using the Remaining Life Technique to calculate depreciation accruals. In fact, the main advantage of using the Remaining Life Technique is that it automatically incorporates reserve adjustments. This automatic treatment of reserve imbalances is appropriate for small imbalances. However, NARUC recommends that "regulators should strive to ensure that the unrecovered dollars are reasonable in relationship to the property's remaining life."[20/]

When depreciation rates result in an unreasonable relationship between unrecovered dollars and remaining life, the Remaining Life Technique alone is an insufficient remedy.

Q. CAN YOU ILLUSTRATE WHY THE REMAINING LIFE TECHNIQUE ALONE IS NOT A RELIABLE SOLUTION TO RESERVE IMBALANCES?

A. In this case, the Remaining Life Technique has resulted in an unreasonably large reserve imbalance for Account 373.07. This account illustrates the failure of the Remaining Life

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19/ This varies by account from 2.7 years for Account 391.2 Computers to 64.6 years for Account 366.00 Underground Conduit. The weighted average of 34 years is calculated by weighting remaining life of the account by the account's percent of reserve imbalance. See Exhibit AWEC/104.

20/ Public Utility Depreciation Practices, NARUC, August 1996, at 187.

Technique to equitably resolve reserve imbalances. PGE's Account 373.07, Sentinel Lighting Equipment, has $8.5 million in existing assets, $10.6 million in book reserves, $4.2 million in excess reserves, and only $51,725 in future accruals. PGE has not added material assets to this account since 2011, possibly due to the obsolete nature of the assets in the account. In theory, because this account is not adding assets, and the assets in the account are rapidly approaching the end of their service life, the reserve imbalance should be diminishing. However, the reserve imbalance for this account grew 46 percent from 2012 to present and the depreciation rate has declined to four hundredths of a percent. Rather than spreading the reserve imbalance over the remaining life of the assets, the Remaining Life Technique has concentrated it in the final years of the assets.

The assets in this account have an average remaining life of 16.2 years. The depreciation expense annual accrual for this account is $3,198. A reasonable level of depreciation expense for this account would be $263,513.[21/] This means that for the next 16 years, the economic depreciation expense of the assets that serve certain customers will be 82 times greater than the cost included in rates. This is clearly neither equitable nor efficient.

It is not equitable because future customers are receiving nearly free use of these assets until retirement. It is not efficient because customers are not receiving appropriate price signals related to this asset.

This situation exists because the reserve imbalance for this account is so extreme that there can be little doubt that it should be characterized as a reserve excess associated with historic over-collection of depreciation expense. The lack of equity arises from this fact.

21/ Calculated as excess reserves, plus future accruals, divided by remaining life.

Accelerated amortization of the reserve imbalance will be more likely to return the excess reserves to the customers who paid for them. It will also return the cost to future customers to a reasonable level by increasing post-amortization depreciation expense and cost of capital.

Q. WHY DO YOU RECOMMEND REDUCING DEPRECIATION EXPENSE WHEN YOU THINK THE ECONOMICALLY REASONABLE LEVEL OF DEPRECIATION EXPENSE IS HIGHER?

A. The net impact of my recommendation reduces net depreciation expense in the short term and increases depreciation expense in the long term. This accomplishes two goals. First, it returns the reserve imbalance to customers on a timeline that is more likely to avoid generational cost shifting and minimize equity concerns. Second, it quickly moves long-term rates to an economically reasonable level.

Q. DO OTHER ACCOUNTS HAVE THE SAME PROBLEM AS ACCOUNT 373.07?

A. Account 373.07 is by far the most extreme example of excess reserves in terms of the reasonableness of resulting depreciation expense.[22/] However, several other accounts with much larger total balances face similar issues. For example, Account 356, Transmission Overhead Conductors, has $51.6 million in excess reserves. The annual depreciation expense proposed by the Stipulating Parties is $1.8 million per year while an economically reasonable amount is $2.9 million per year. This difference of $1.1 million is larger than Account 373.07. Across all PGE's accounts the economically reasonable level of depreciation expense is $27.8 million more than the amount recommended in the study.[23/]

[22/] This account is unique because PGE has stopped making plant additions and has made very few retirements in recent years. Also, PGE relies on the Equal Life Group Procedure. This procedure does not function properly when rates are fixed for extended times and no plant additions are made. This may explain why the Remaining Life Technique failed to return excess reserves to customers in this account.

[23/] The term economically reasonable is used under the assumption that the retirement curves and net salvage proposed in the filing are reasonable. I provide evidence elsewhere in this testimony that these parameters may not be reasonable.

Q. CAN YOU QUANTIFY THE AVERAGE EFFECT THAT PGE'S EXCESS RESERVES HAVE ON SHIFTING COSTS AWAY FROM FUTURE CUSTOMERS?

A. There are two primary impacts: reduced depreciation expense and reduced rate base related expenses. Depreciation expense is reduced on approximately $20 million per year for future customers.[24] Rate base related expense reductions start out at $68.5 million and decline over time.[25]

Q. WHAT ACCOUNTS CONTAIN THE LARGEST EXCESS RESERVES?

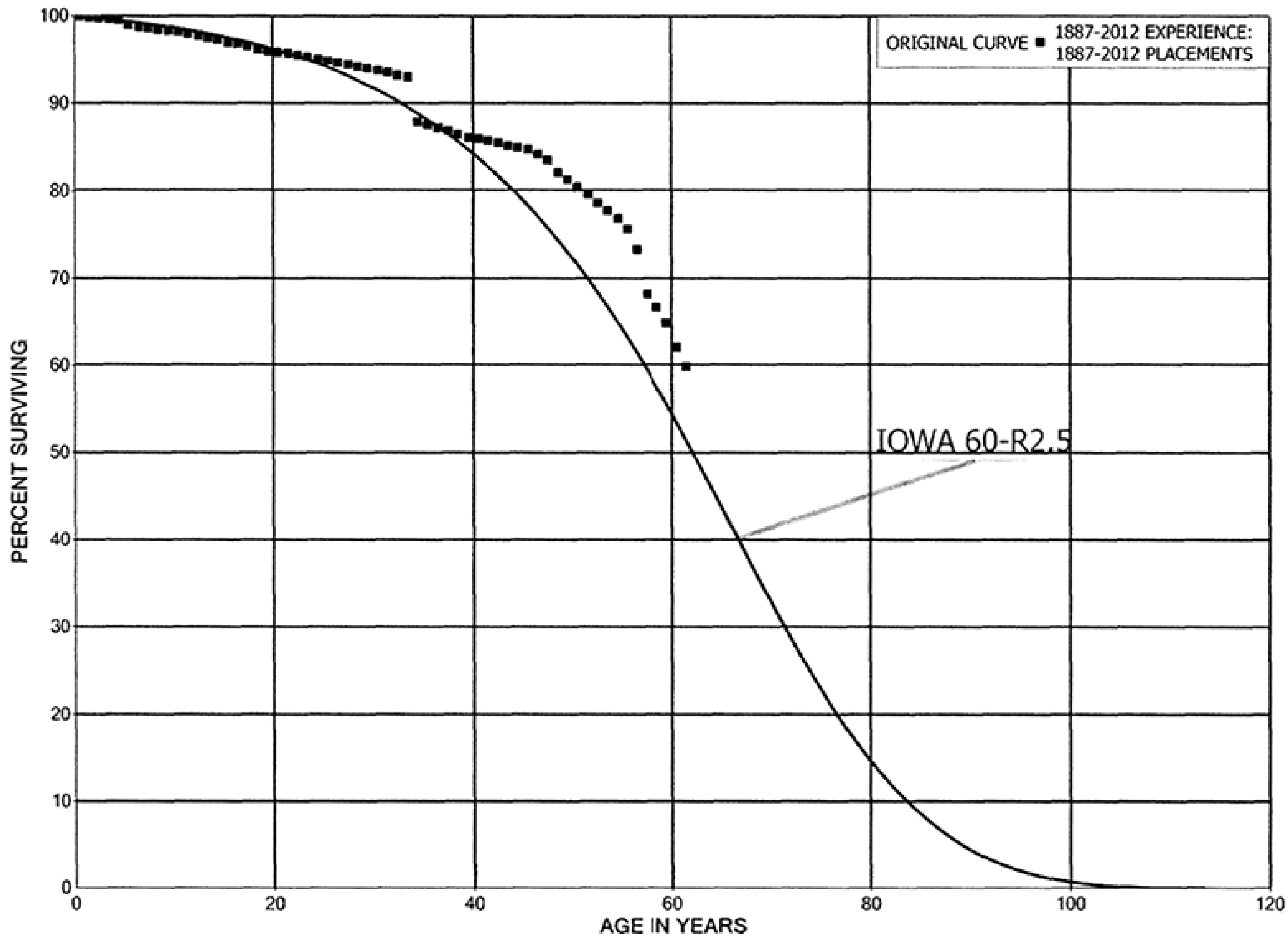
A. Account 356, Overhead Conductors and Devices, has the largest excess reserves as a percentage of calculated reserves, 177%, as well as a large total amount of excess reserves, $52 million. Accounts 365, 367, and 369.03 have the largest excess reserves in terms of total dollars, each with over $100 million. Account 373.07 has the largest excess reserves in terms of the ratio to future accruals and the impact on equity to customers.[26]

Q. HOW HAS THE RESERVE IMBALANCE FOR ACCOUNT 356 CHANGED OVER TIME?

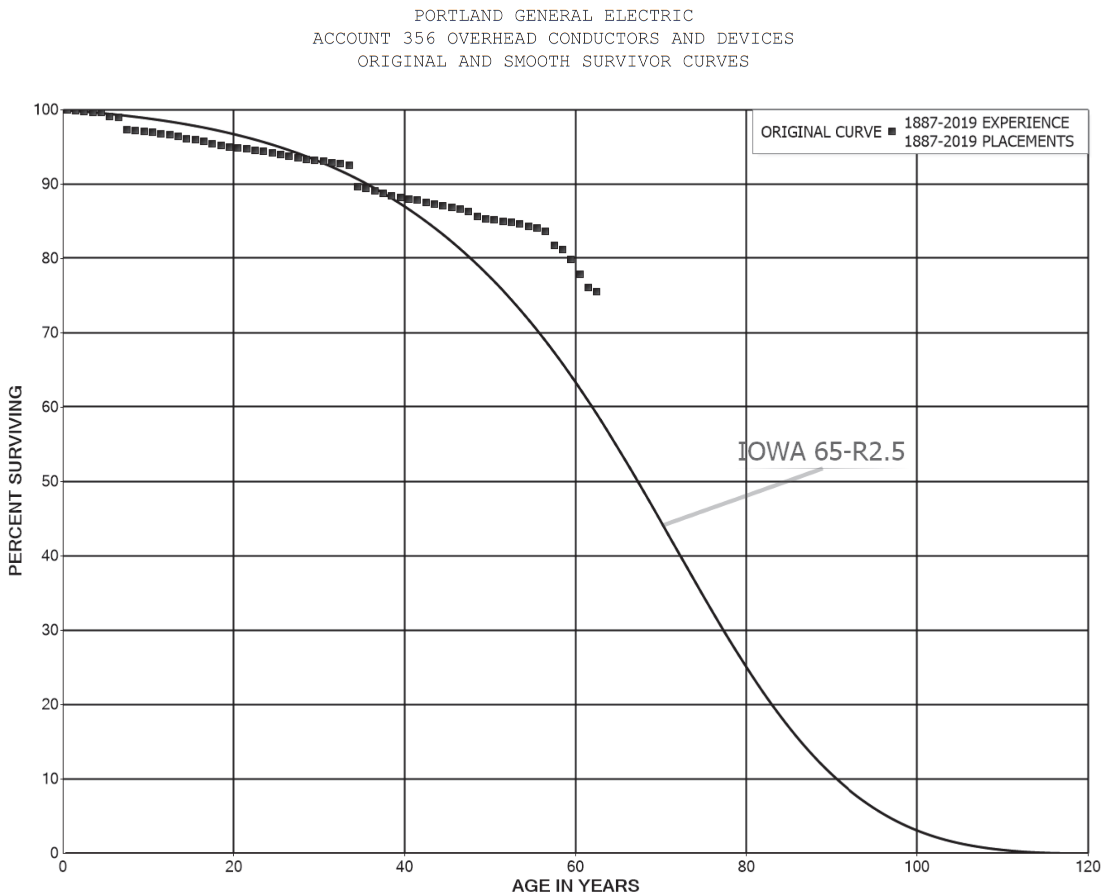
A. The figure below illustrates the original survivor curve and the smoothed curve used for rates. The 2013 depreciation study failed to place sufficient weight on ages 40 through 60. Excess reserves for this account in 2012 were $20 million, an increase of 156 percent from 2012 to 2019.

24/ Calculated as $685 million divided by 34 years.
25/ Calculated as $685 million times pre-tax return on rate base of approximately 10 percent.
26/ The 2012 Depreciation Study results for these accounts are provided in Exhibit AWEC/105.

PORTLAND GENERAL ELECTRIC
ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES

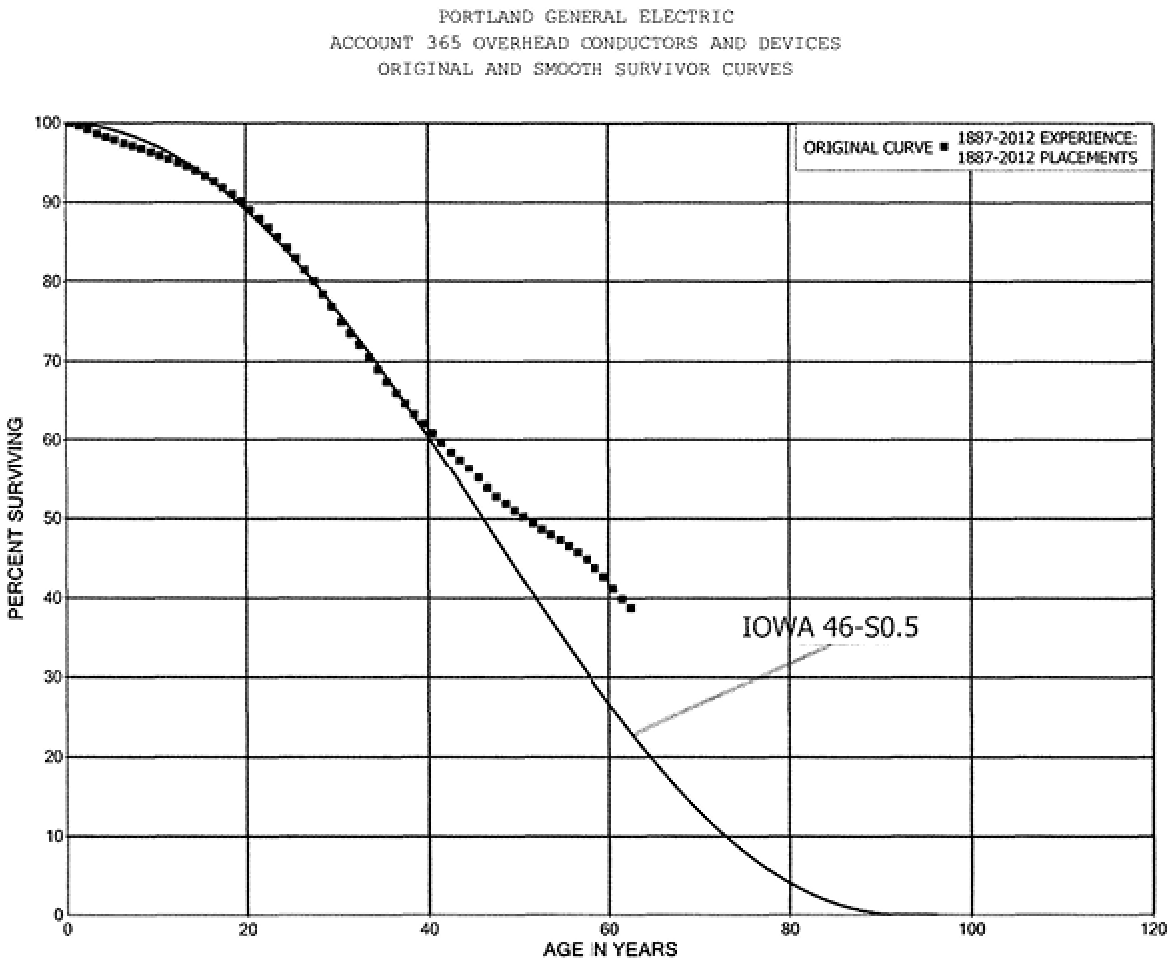


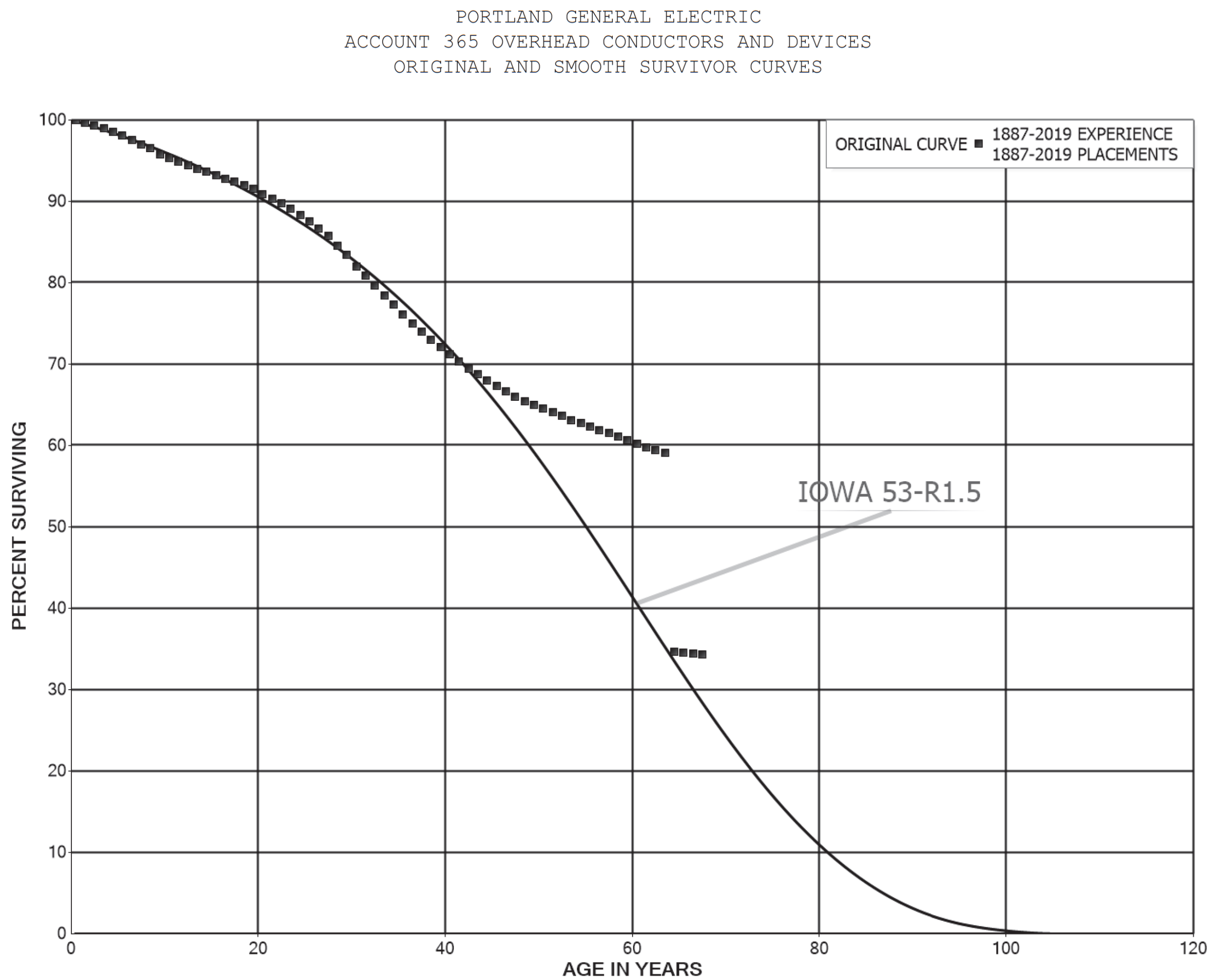
The increase in excess reserves from 2012 to 2019 was due in part to excess depreciation rates associated with under-weighting older ages of the survivor curve, in part due to few retirements over that period, and in part due to extended average lives proposed in the 2019 study. The 2019 study's original and smoothed survivor curves are reproduced in the table below. Note that Gannett Fleming continues to place low weight on the retirement experience from ages 40 to 60. In both the 2013 and the 2020 Study, Gannett Fleming truncated the original survivor curve after age 60. This truncation hides the fact that the original survivor curve diverges even more significantly from the proposed smooth survivor curve after age 60.



Q. HOW HAS THE RESERVE IMBALANCE FOR ACCOUNT 365 CHANGED OVER TIME?

A. Account 365 is tied for the second largest excess reserves. Excess reserves increased from $42 million in 2012 to $108 million in 2019. In 2012, Gannett Fleming placed little weight on the 40 to 60 age experience of the original survivor curve. After 2012, PGE experienced relatively few retirements while a large bulk of plant aged into older experience years. In 2019, Gannett Fleming placed greater weight on the older experience ages, increasing the average service life by 5 years and increasing salvage. Low retirements combined with updated retirement parameters increased the excess reserve by 160 percent. The discontinuity in the original survivor curve may be a data error as both the exposure and retirements in that year exceed the neighboring ages.

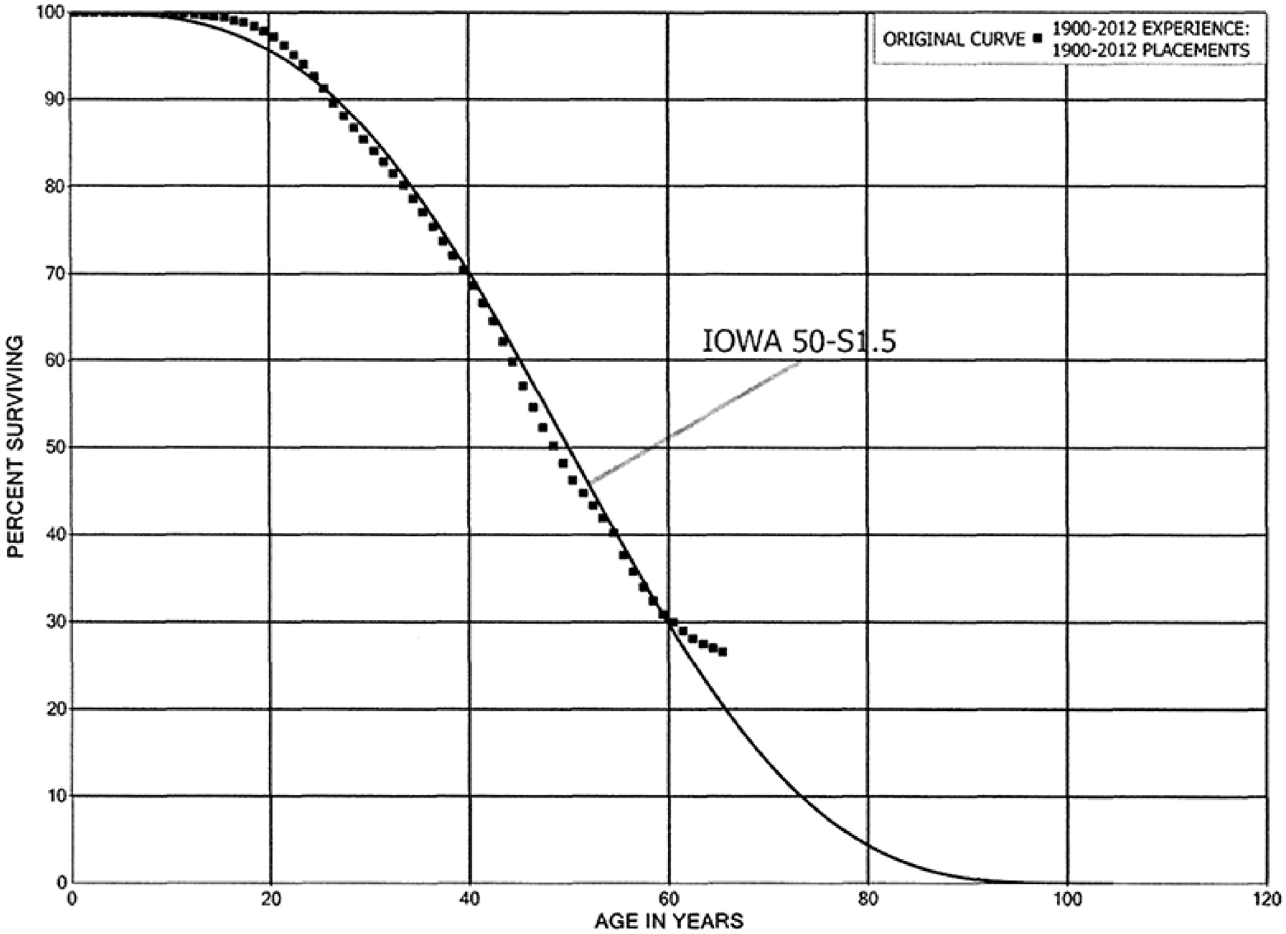




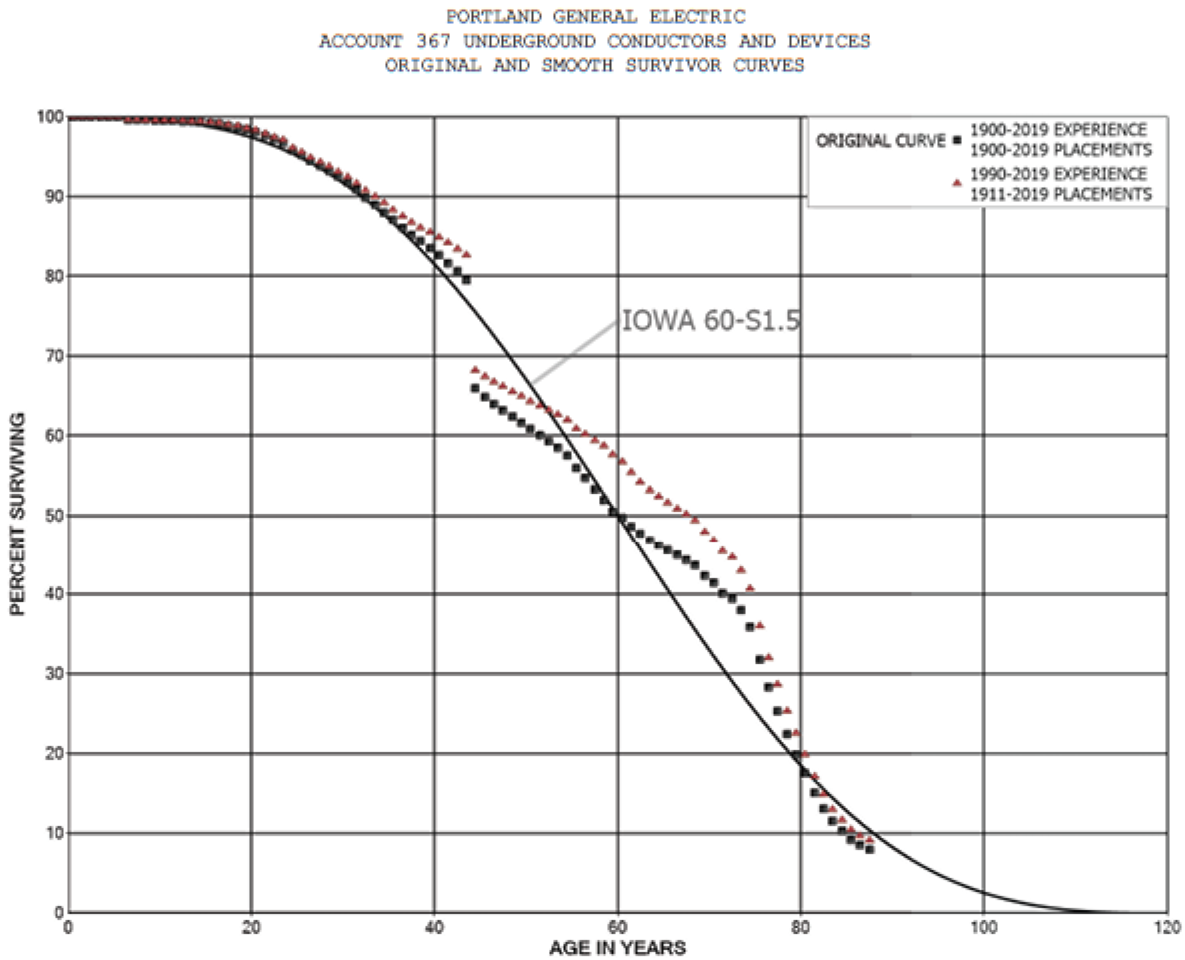
Q. HOW HAS THE RESERVE IMBALANCE FOR ACCOUNT 367 CHANGED OVER TIME?

A. Account 367, Underground Conductors, has the largest total excess reserve at $132 million. The figure below reproduces the original and smoothed survivor curve from PGE's 2013 Study. Gannett Fleming proposed a 50-year average life, as shown in the figure below. As with Account 356, Gannett Fleming truncated the older portions of the original survivor curve where it diverged significantly from its proposed smooth survivor curve. This resulted in an erroneously low average life for the Account and excess depreciation expense.

PORTLAND GENERAL ELECTRIC
ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



In the 2019 Study, Gannett Fleming includes the older portions of the original survivor curve and gives weight to these older years. In addition, a large number of vintages aged into the 20 to 60 age groups with minimal retirements, significantly shifting up the original percent surviving during this age bracket. These changes increase the average service life by 20 percent from 50 years to 60 years. The absence of retirement, combined with the updated survival curve, increased excess reserves for this account from $58 million to $132 million, an increase of 127 percent.[27]

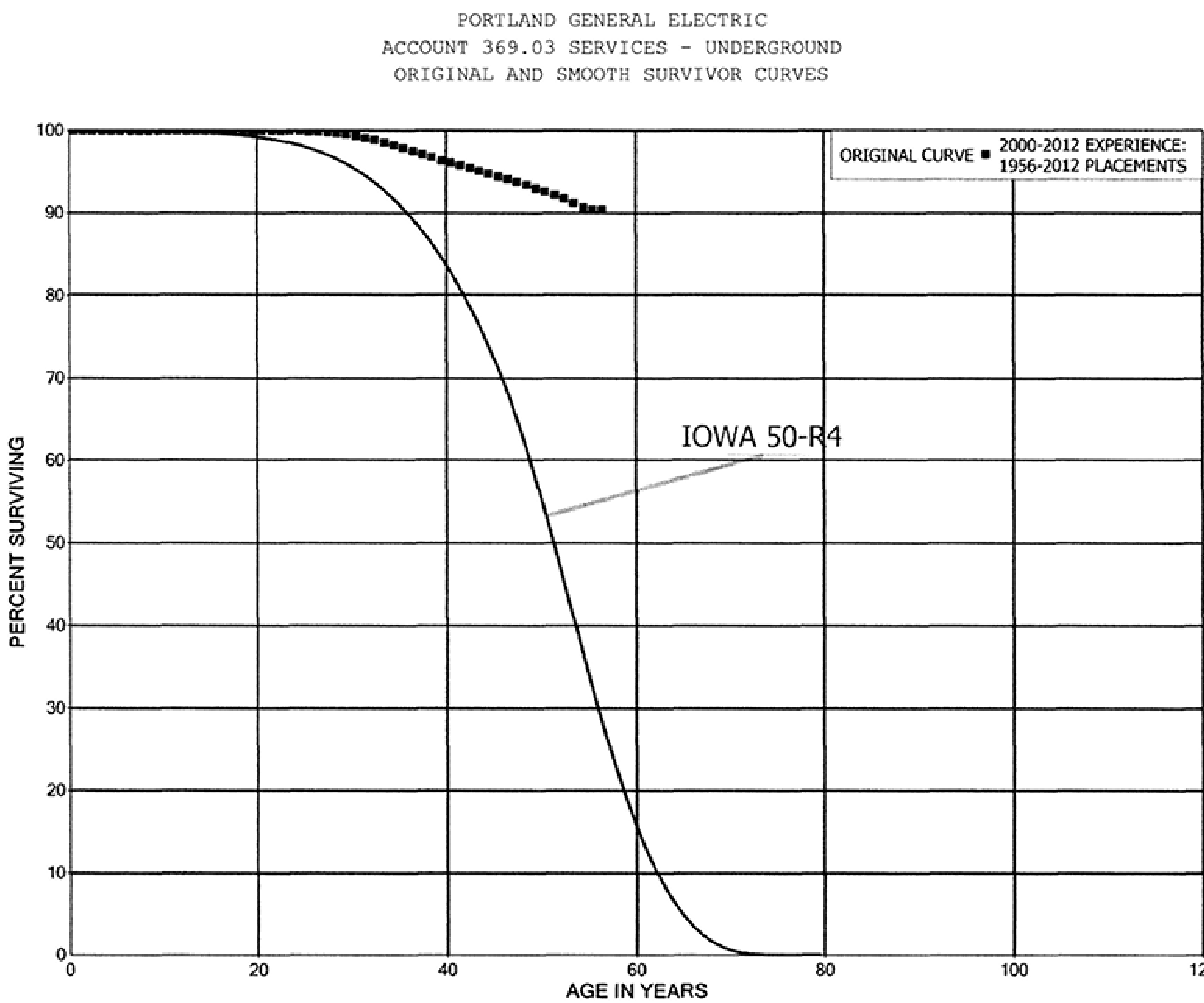


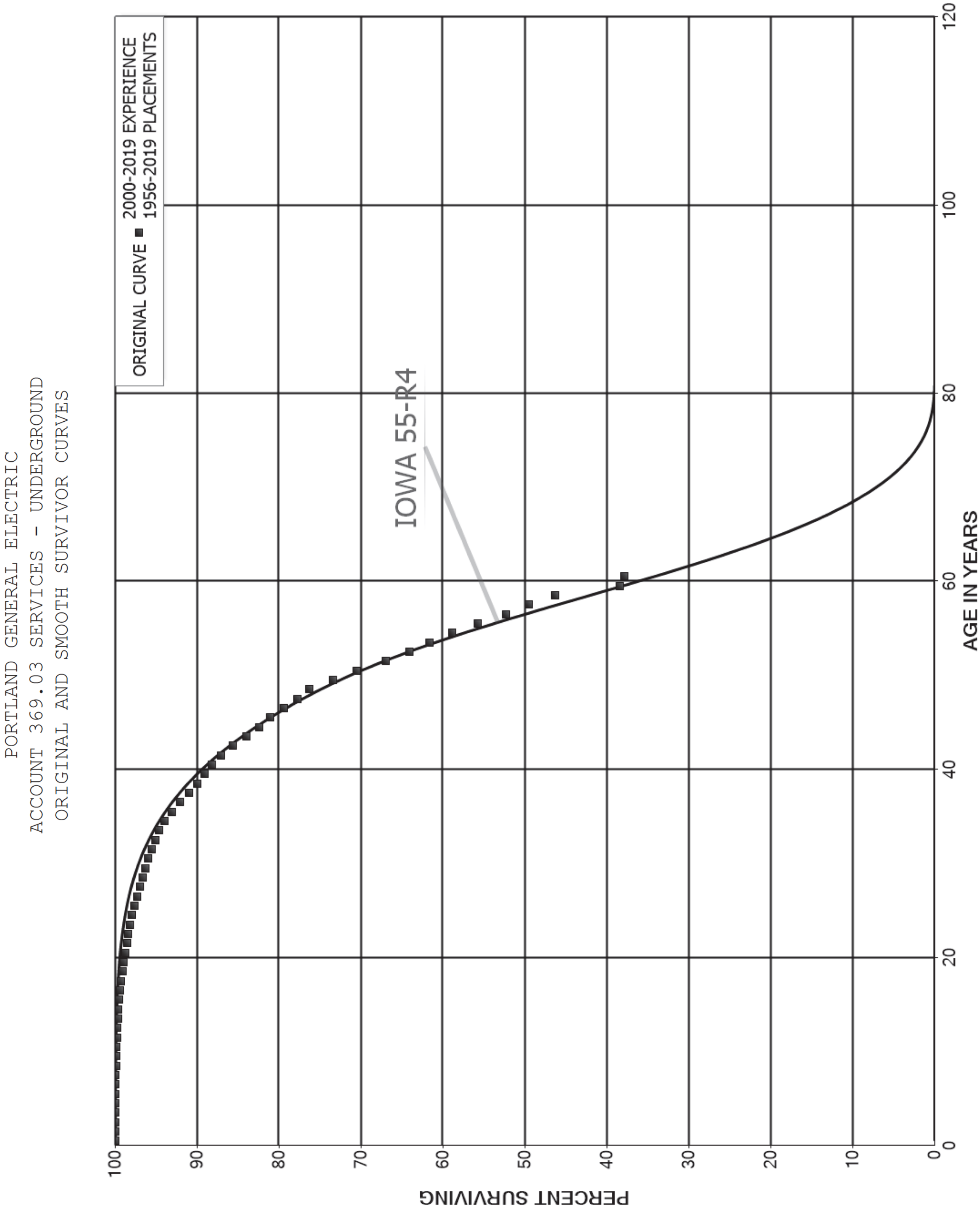
Q. HOW HAS THE RESERVE IMBALANCE FOR ACCOUNT 369.03 CHANGED OVER TIME?

A. Account 369.03 is tied for the second largest excess reserves. Excess reserves increased from $87 million in 2012 to $108 million in 2019. In 2012, Gannett Fleming placed little weight on the 40 to 60 age experience of the original survivor curve. In 2015, PGE performed a large-

[27] The Stipulating Parties increased the average service life farther, to 65 years, and increased salvage estimates. These stipulated changes will increase excess reserves even more for this account.

scale service retirement at a low cost. This retirement reduced salvage estimates from negative 70 percent to negative 30 percent. In 2019, Gannett Fleming placed greater weight on the older experience ages, increasing the average service life by 5 years and increasing salvage. The updated retirement parameters increased the excess reserve by 24 percent.




PORTLAND GENERAL ELECTRIC
ACCOUNT 369.03 SERVICES - UNDERGROUND
ORIGINAL AND SMOOTH SURVIVOR CURVES
ORIGINAL CURVE ■ 2000-2019 EXPERIENCE
1956-2019 PLACEMENTS
IOWA 55-R4
PERCENT SURVIVING
AGE IN YEARS
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100
120

Q. HOW HAS THE RESERVE IMBALANCE FOR ACCOUNT 373.07 CHANGED OVER TIME?

A. As mentioned previously, the excess reserves for Account 373.07 are extraordinarily high relative to future accruals. However, given the small size of the account, the total amount of excess reserves is only moderate. Excess reserves increased from $2.9 million in 2012 to $4.2 million in 2019, an increase of 46 percent.

Q. DOES THE EVIDENCE INDICATE THAT THE EXCESS RESERVES CONSTITUTE AN OVERCOLLECTION OF DEPRECIATION EXPENSE?

A. Yes. From 2012 to 2019, reserve imbalances increased by $347 million.[28] Over this period PGE collected approximately $2 billion in depreciation expense from customers.[29] PGE has also reduced depreciation rates, indicating that the monies recently collected from customers were too great.

Recommendation

Q. WHAT IS YOUR RECOMMENDATION REGARDING EXCESS RESERVES?

A. The Commission should take three steps to equitably address excess reserves:

1. Excess reserve should be transferred from accounts with excess reserves to Colstrip accounts 311 through 316, equal to the Colstrip future accruals of approximately $180 million. This transfer provides timely resolution of the historic overcollection of depreciation expense and prevents rate swings associated with the accelerated closure of Colstrip.
2. The remaining excess reserves should be amortized over 10 years for accounts with composite remaining lives greater than 10 years. This should have the effect of returning

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[28] See Exhibit AWEC/104.
[29] Estimated based on the total depreciation expense indicated in UM 1679 and UM 1807.

approximately half of PGE's remaining excess reserves to customers before PGE's next depreciation rate change.

3. Third, I recommend the Commission reevaluate PGE's excess reserves in its next depreciation study to determine whether continued amortization is appropriate. This will prevent over-amortization of reserves if PGE's trends reverse direction.

Q. ARE RESERVE ADJUSTMENTS A COMMON INDUSTRY PRACTICE?

A. Yes, reserve adjustments are clearly addressed as standard ratemaking tools in authoritative depreciation texts. According to NARUC, "[t]he use of an annual amortization over a short period of time or the setting of depreciation rates using the remaining life technique are two of the most common options for eliminating the imbalance."[30/]

Q. IS YOUR RECOMMENDATION SUPPORTED BY NARUC?

A. Yes. The NARUC guide "Public Utility Depreciation Practice" notes the importance of remedying reserve adjustments on a timely basis[31/] and explicitly calls out the necessity for commissions to approve depreciation reserve adjustments for utilities that rely on the Remaining Life Technique.[32/]

Q. DOES NARUC GUIDANCE SUPPORT RESERVE ADJUSTMENTS IN CONCERT WITH THE REMAINING LIFE TECHNIQUE?

A. Yes. NARUC notes that under the remaining life technique, reserve adjustments should be made upon commission approval:

> The desirability of using the remaining life technique is that any necessary adjustments of depreciation reserves, because of changes to the estimates of life on net salvage, are accrued automatically over the remaining life of

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30/ Public Utility Depreciation Practices, NARUC, August 1996, at 189.
31/ Id. ("Whereas the judgement of materiality is subjective, if further analysis confirms a material imbalance, one should make immediate depreciation accrual adjustments.")
32/ Public Utility Depreciation Practices, NARUC, August 1996, at 65.

> the property. Once commenced, adjustments to the depreciation reserve, outside of those inherent in the remaining life rate would require regulatory approval.[33/]

Q. ARE YOU PROPOSING PGE MOVE AWAY FROM THE REMAINING LIFE TECHNIQUE?

A. No, I recommend PGE continue to use the Remaining Life Technique as an appropriate technique to automatically reconcile minor reserve imbalances.

Q. IS YOUR RECOMMENDATION CONSISTENT WITH THE REMAINING LIFE TECHNIQUE?

A. Yes, my recommendation is to make a one-time reserve adjustment to amortize the existing reserve imbalance, and to continue with the Remaining Life Technique thereafter.

Q. HAVE OTHER JURISDICTIONS APPROVED TRANSFERRING RESERVES?

A. Yes. In Case No. PAC-E-13-02, the Idaho Public Utilities Commission approved a request to expedite amortization of excess reserves at the Gadsby Plant and Hunter Plant.[34/] PacifiCorp had booked $21 million of excess reserves associated with the Gadsby Plant and $29.6 million of excess reserves associated with the Hunter Plant. Expedited amortization of these excess reserves was approved as a means of offsetting the increased depreciation expense impacts associated with an accelerated depreciation date for the Carbon Plant.[35/]

Similarly, in Docket Nos. E-01933A-15-0239 and E-01933A-15-0322, the Arizona Corporation Commission approved a proposal to transfer $90 million in excess distribution reserves to Unit 1 of the San Juan Generating Station.[36/] This was accomplished to offset

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[33/] Public Utility Depreciation Practices, NARUC, August 1996, at 65.
[34/] Idaho Public Utilities Commission, Case No. PAC-E-13-02, Order No. 32926, ¶12 (Nov. 18, 2013).
[35/] Id.
[36/] Arizona Corporation Commission, Docket Nos. E-01933A-15-0239 and E-01933A-15-0322, Decision No. 75975, at 10:3-8 (Feb. 24, 2017).

increased depreciation expense for this coal unit. Tucson Electric Power ("TEP") Company explained that "[b]y modifying the depreciation reserves and rates for San Juan Unit 1, TEP's investment in the unit will be almost fully depreciated by 2022 when the current coal supply contract and participation agreement expire…and allows TEP to exit San Juan without large cost impacts on customers."[37/]

Further, in Docket Nos. 080677-EI and 090130-EI, the Florida Public Service Commission agreed with a recommendation from the Office of Public Counsel that unrecovered costs associated with the retirement of the Cape Canaveral and Riviera power plants (again, both coal-fired power plants) be offset by a portion of Florida Power & Light's reserve surplus for steam production investment.[38/]

Q. HAVE OTHER JURSIDICTIONS ALSO APPROVED ACCELERATED AMORTIZATION OF EXCESS RESERVES?

A. Yes. In the same Florida Power & Light case as discussed above, the Florida commission recognized FP&L's large reserve imbalance. While FP&L recommended that it be refunded over the life of the underlying plant, the Florida commission authorized amortization over a four-year period.[39/] This commission found that "the very presence of a reserve imbalance indicates the existence of intergenerational inequity."[40/] While the commission acknowledged that some reserve imbalance was to be expected, "that is not a reason to defer taking some action to correct reserve imbalances, where possible, either through reserve transfers or an

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37/ Id. at 11:5-10 (internal citations omitted).
38/ Florida Public Service Commission Docket Nos. 080677-IE/090130-EI, Order No. PSC-10-0153-FOF-EI at 21-22 (Mar. 17, 2010).
39/ Id. at 87.
40/ Id. at 83.

amortization."[41] In this case, the Florida commission did both. In Public Service Commission of Utah Docket No. 13-035-02, the Commission approved both reserve transfers and accelerated amortization over a 6.5-year period.[42] Similarly, the New York Public Service Commission approved a five-year amortization of excess reserves in order to mitigate rate increases for Orange & Rockland Utilities.[43]

Q. IS AWEC'S PROPOSAL SIMILAR TO THESE CASES?

A. Yes, just as excess depreciation reserves were used to offset an increase to depreciation expense associated with the Carbon Plant, the San Juan Generating Station, Cape Canaveral, and Riviera, all coal-fired power plants, AWEC's proposal accomplishes the same objective – offsetting increased depreciation expense associated with accelerating Colstrip's depreciable life to 2025 with excess depreciation reserves. AWEC's proposal also amortizes the remaining reserve imbalance over a ten-year period based on similar reasoning provided by the Florida commission.

Q. HOW DO PGE'S EXCESS RESERVES COMPARE TO THE COMPANIES IN THE CASES THAT YOU REFERENCE?

A. PGE's excess reserves are 19 percent of CAD. Florida Light and Power's excess reserves were 13 percent of CAD.[44] TEP's reported a reserve deficiency of 1.5 percent.[45] None of the utilities cited above had reserves as high as PGE's.

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[41] Id.
[42] Public Service Commission of Utah Docket No. 13-035-02, Order Confirming Bench Ruling Approving Stipulation on Depreciation Rate Changes.
[43] New York Public Service Comm'n Case No. 07-E-0949, Order Establishing Electric Rate Plan for Orange and Rockland Utilities, Inc. at 24-26 (July 23, 2008).
[44] Calculated from Florida Public Service Commission Docket Nos. 080677-IE/090130-EI, Exhibit JP2.
[45] Calculated from Arizona Corporation Commission Docket No. E-01933A-15-0322, Exhibit REW-1 at 36.

Q. IS YOUR RECOMMENDATION EQUITABLE?

A. Yes. Given that the reserve imbalance is due to historic depreciation expense and retirements, it is appropriate to consider the excess reserve as due to overcollection from existing and past customers. Account 373.07 clearly illustrates the inequitable cost outcomes associated with excess reserves. This outcome also exists, albeit to a lesser degree, for the accounts with substantial excess reserves.

The Remaining Life Technique will return the excess reserves to customers in 34 years. This may be reasonable for small imbalances. However, the abnormally large size of the excess reserves, the trend in excess reserves, and the fact that the Remaining Life Technique failed to perform properly for Account 373.07 means that extended amortization is not as equitable as a reserve adjustment.

Q. HOW DOES THE RESERVE TRANSFER COMPONENT OF YOUR PROPOSAL RESOLVE EQUITY CONCERNS?

A. The reserve transfer will reduce customer rates from 2022 to 2025 by eliminating Colstrip depreciation and return on rate base. This provides a benefit to the customers responsible for generating the reserve imbalance. It also benefits PGE because PGE recovers its capital related to Colstrip on a timely basis and it makes it easier for PGE to close Colstrip even earlier than 2025 if circumstances warrant.

Q. DOES YOUR RECOMMENDATION RESULT IN UNREASONABLE DEPRECIATION RATE CHANGES?

A. No. My recommendation is designed to align depreciation rates with the economically correct amount. This increases depreciation rates in the long term. While depreciation rates may appear to be lower initially, this is due to perspective. The appropriate perspective is to decompose depreciation rates into two parts, the economically appropriate rates, and a temporary offset to return excess collections to customers.

Q. DOES YOUR RECOMMENDATION HARM PGE?

A. No, PGE remains whole under my proposal. My proposal only affects the timing of PGE's capital recovery, not the amount, and PGE will have the opportunity to earn a reasonable return on its capital in the interim.

Q. HOW DOES YOUR PROPOSED RESERVE TRANSFER AFFECT COLSTRIP DEPRECIATION?

A. Under my proposal, Colstrip would be fully depreciated after the transfer is complete. This would eliminate return on rate base and depreciation expense for Colstrip from rates. This offers several advantages. It avoids a temporary rate increase associated with accelerating Colstrip's retirement. Absent my proposal, accelerating Colstrip depreciation expense shifts costs from future customers to present customers. However, those future customers will continue to receive electricity from Colstrip if it operates beyond 2025. This creates potential intergenerational equity issues that are avoided by transferring reserves.

Q. ARE THERE ANY CLASS ALLOCATION CONSIDERATIONS FOR THE RESERVE TRANSFER?

A. There is a minor class allocation consideration that the Commission should be aware of. The reserve imbalance in production accounts is not sufficient to fully offset Colstrip's future accruals. If depreciation reserves from distribution accounts are transferred to production accounts to fully buy down Colstrip's undepreciated value, transmission level customers will experience some benefit because they pay fewer distribution costs relative to residential and small commercial customers. However, Other Production Accounts combined with Transmission accounts have sufficient reserves to fully depreciate Colstrip. Accordingly, I recommend that the reserves transfer to Colstrip be limited to Other Production Accounts and Transmission reserve accounts. While not identical, transmission costs are allocated to rate classes similarly to production costs, thus avoiding class allocation equity issues.

Q. DO ANY OTHER FACTORS SUPPORT YOUR RECOMMENDATION?

A. PGE occasionally transfers assets at their net book value.[46/] If PGE maintains high excess reserves, there is some risk these reserves could pass on to other utilities through a property sale.

V. REMOVAL OF COLSTRIP FROM RATES

Q. PLEASE SUMMARIZE THIS ISSUE.

A. In the second Paragraph 5 of the Stipulation (likely misnumbered), the Stipulating Parties recommend that PGE accelerate capital recovery of Colstrip to 2025. This is supported by economic analysis performed by PGE demonstrating that Colstrip is not economical to operate after 2025.[47/] However, PGE has made no commitment to retire Colstrip[48/] or remove ongoing costs and benefits of Colstrip from rates after 2025, regardless of the Company's own study demonstrating such costs to be uneconomic. I recommend that as part of accelerating capital recovery of Colstrip, the Commission preclude PGE from passing any uneconomic operating costs on to customers for more than five years after PGE has received full capital recovery. This may necessitate PGE operating Colstrip as a merchant generator.

46/ AWEC/102 at 12 (PGE Response to AWEC DR 42).

47/ PGE Colstrip Enabling Study, available at: https://assets.ctfassets.net/416ywc1laqmd/2AK9jf4GCmd1tyaLA8EODE/fb40144334f40fab7cc2e001676f1977/2020-colstrip-enabling-study.pdf

48/ AWEC/102 at 11 (PGE Response to AWEC DR 38). PGE Response to AWEC DR 38 indicates PGE has not initiated an early closure vote in response to its enabling study.

Q. WHAT IS THE BASIS FOR YOUR RECOMMENDATION?

A. It is not fair for customers to bear both the burden of accelerated depreciation and uneconomic Colstrip generation. However, SB 1547 appears to provide PGE the opportunity to do just that. SB 1547 states that, for up to a five-year period following the date Colstrip is fully depreciated, "the commission shall authorize [PGE] … to include in the company's allocation of electricity the costs and benefits associated with [Colstrip] if: (a) [PGE] requests the commission to authorize the allocation of electricity."[49/] Consequently, the Commission appears to have no choice but to allow PGE to continue including the ongoing operating costs and power cost benefits of Colstrip in customer rates for five years after this plant is fully depreciated. Under the Stipulation, this means customers may continue to pay for Colstrip until 2030 even though PGE's own analysis shows that doing so will result in a net cost to customers.[50/]

An additional benefit of my recommendation in the previous section to transfer excess reserves to buy down Colstrip's undepreciated investment is that this will result in Colstrip becoming fully depreciated likely sometime in 2022.[51/] The five-year time limit provided in SB 1547 will then expire in 2027, removing this uneconomic resource from customer rates three years earlier than would occur under the Stipulation.

49/ ORS 757.518(4)(a).

50/ AWEC/102 at 4, 10 (PGE Response to AWEC DRs 18 and 37). PGE Response to AWEC DR 18 confirms PGE intends to pass any uneconomic costs to customers. PGE Response to AWEC DR 37 confirms that PGE intends to rely on SB 1547 provisions to remove the Commissions discretion regarding this.

51/ The specific date will depend on when the Commission issues a final order in this docket and when PGE transfers the excess reserves to the Colstrip accounts.

VI. ACCOUNT 344.01 GENERATORS - WIND

Q. DO YOU AGREE WITH THE STIPULATION'S RECOMMENDATION OF A 30-YEAR LIFE FOR THIS ACCOUNT?

A. No. This account contains generation components for PGE wind farms. PGE has 12 years of plant history with large plant balances in all years and minimal recorded retirements in the account.[52/] PGE proposed an R3 curve with a 35-year average life in the filed study.[53/] Staff recommended an R1 curve with a 25-year average life. Staff's recommendation is based on "the range of majority industry statistics" and a finding that "the curve fitting 22 Residual (SSR) for R1-25 showed a significantly better fit for a set of observations, and it has 22 percent less residual than does the curve of R3-35."[54/] The Stipulating Parties agreed to an R3 curve with a 30-year average life based in part on Staff's recommendation and in part on PGE's position that warrantees, minimal retirements, and statistical support for industry ranges.[55/]

I am concerned that Staff's recommendation, which forms the basis for deviating from the filed study, is based on incorrect assertions. PGE's industry data includes 13 companies with wind generation plant.[56/] Two companies rely on square curves with no average life given and presumably no interim retirements. No company supports a 25-year average life as claimed by Staff. Eight of eleven companies use average lives of 40 years or greater. Eight companies use a right modal curve. PacifiCorp's 2018 Depreciation Study filed in UM 1968 uses a 40-year average life.[57/] PacifiCorp's depreciation study was rigorously evaluated by

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52/ Depreciation Study Section VII-70.
53/ Depreciation Study Section VII-69.
54/ UM 2152 / Stipulating Parties/ 100 Peng – Gehrke – Spanos / 7.
55/ UM 2152 / Stipulating Parties/ 100 Peng – Gehrke – Spanos / 8.
56/ Confidential AWEC/106.
57/ Docket No. UM 1968, Exhibit PAC/202 Spanos/151. I located one additional Pacific Northwest utility with wind retirement experience. Puget Sound Energy produced a depreciation study in 2016. This study has retirement

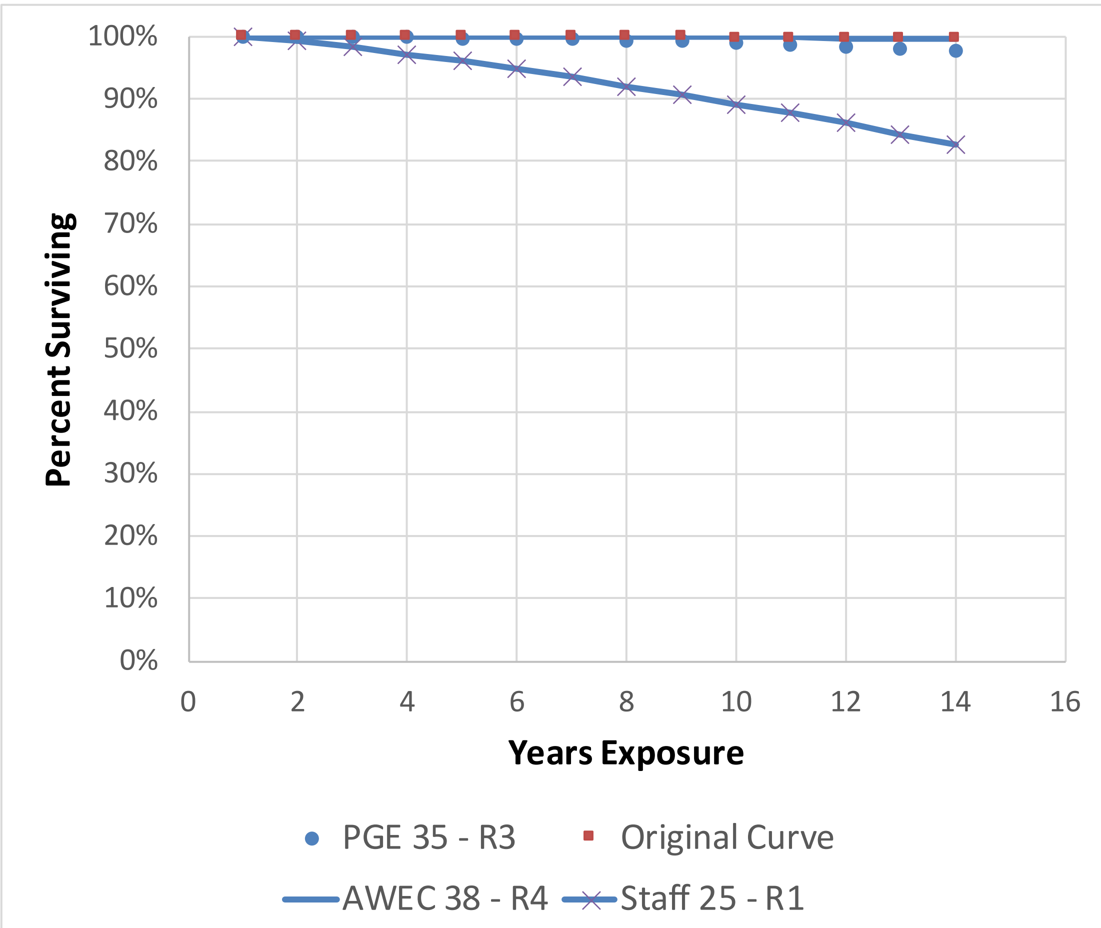
analysis in at least 5 jurisdictions, including myself, and this proposed life was accepted in all jurisdictions.

Staff's assertions regarding the statistical fit of the R1 curve with 25-year life are also incorrect.[58/] This curve fits PGE's retirement data poorly, as can be seen in the figure below. Note that Staff's proposal is substantially below the original survivor curve, which represents PGE's actual retirement experience. The sum of squared residual for an R1 curve is substantially higher than every other curve contemplated by participants in this case. While the shape of retirements after 12 years of age are uncertain, retirement patterns in the first 12 years are well established and the retirement curve selected should reflect few to no retirements in the first 12 years of life.

experience as PGE but models wind generator retirements using a 40-year average life. See Washington Utilities and Transportation Commission, Docket Nos. UE-170033 and UG-170034, Exh. JJS-3 at 131.

58/ Confidential AWEC/107.

Account		34401				
GENERATORS - WIND				**Iowa Curve**	**Avg. Life**	**SSR**
Band		1		R3	35	0.00119 PGE Proposed
EXPERIENCE		PLACEMENT		R3	30	0.00265 Stipulating Parties
BEGIN	END	BEGIN	END	R1	25	0.12110 Staff Proposed
2007	2019	2007	2019	R4	38	0.00000 AWEC Proposed
						-100% Change in SS



The Stipulating Parties' agreement was made based on incorrect findings. Accordingly, I recommend that Paragraph 7 of the Stipulation be rejected. I propose an R4 curve with a 38-year average life be used to calculate depreciation rates for this case. This produces a near perfect fit to PGE's data and has a lower average life than 72 percent of the companies in

PGE's industry data. The sum of squared residuals for this curve is 100 percent smaller than both PGE's proposed curve and the Stipulating Parties proposed curve.

Q. ARE THERE OTHER FACTORS THE COMMISSION SHOULD CONSIDER WHEN EVALUATING THE REASONABLENESS OF A 30-YEAR LIFE FOR WIND GENERATORS, AS RECOMMENDED BY THE STIPULATING PARTIES?

A. Yes, this recommendation could serve as precedent for other utilities. While PGE still has a relatively limited wind portfolio, PacifiCorp has added, and is likely to continue adding substantial wind resources. If the depreciable lives for these resources are accelerated to 30 years, this will result in a rate impact for PacifiCorp customers. Further, PGE is adding 300 MW of wind to rate base in UM 394 and is likely to add additional wind resources in the future. A 30-year assumed life not only harms existing customers (likely to the benefit of future customers given the data that these resources are likely to last well beyond 30 years), it also raises questions about the economic benefits of acquiring additional wind resources.

VII. ADDITIONAL ACCOUNT ADJUSTMENTS

a. Sullivan End of Life

Q. WHAT IS YOUR RECOMMENDATION FOR THE SULLIVAN HYDRO FACILITY?

A. Sullivan is a hydrogeneration facility owned by PGE. PGE's filing uses an end of life of June, 2035 for this plant.[59/] PGE Response to AWEC DR 29 indicates that PGE plans to renew Sullivan's FERC license and to continue operating the plant after 2035.[60/] Relicensing hydro facilities extends licenses from 30 to 50 years.[61/] PGE's policy is to only adjust accounting and

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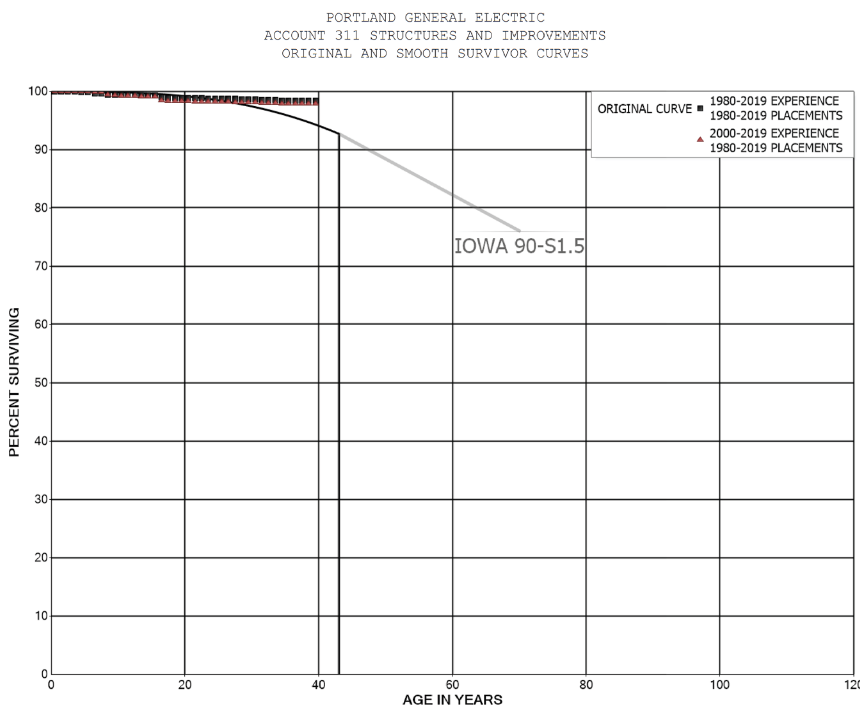
59/ Depreciation Study Section VI-5.
60/ AWEC/102 at 6 (PGE Response to AWEC DR 29).
61/ Federal Energy Regulatory Commission, Hydropower Licensing—Get Involved at 4 available at: https://ferc.gov/sites/default/files/2020-05/hydro-guide.pdf.

depreciation schedules when the license renewal is obtained.[62] However, this policy should not constrain the Commission from establishing depreciation rates consistent with the plant's expected operating life. I recommend extending the depreciable life for Sullivan accounts from 2035 to 2065, consistent with the lower range of FERC licenses.

b. <u>Account 311.00</u>

Q. WHAT IS YOUR RECOMMENDATION FOR THIS ACCOUNT?

A. Account 311.00 contains structures and improvements for Colstrip. The retirement curve and life selected by PGE diverges from PGE's actual retirement experience.

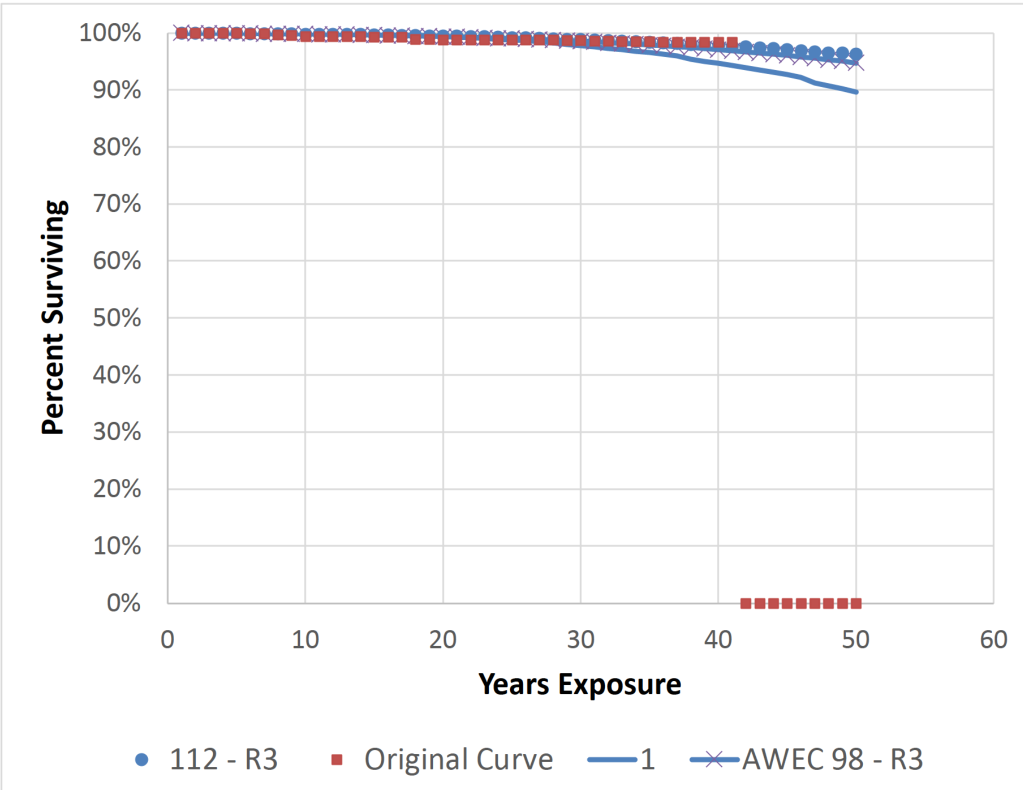


[62] AWEC/102 at 6 (PGE Response to AWEC DR 29).

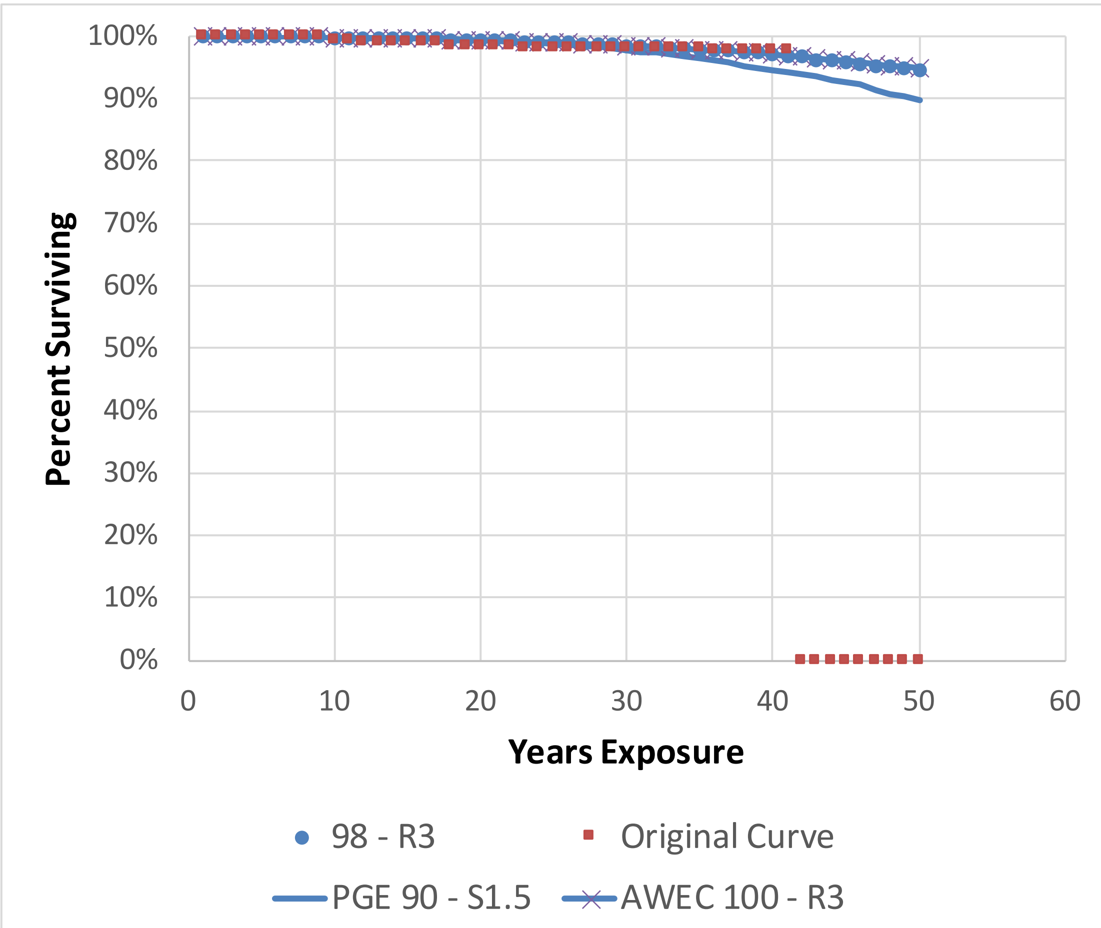
PGE maintains relatively large real plant balances over the entire retirement experience curve and there is no clear basis for discounting any portion of the experience curve. A longer lived right modal curve fits this data better than the curve proposed by PGE. Experience band 1 supports an R3 curve with 112-year average life. The sum of squared residuals for this curve is 87 percent smaller than for PGE's proposed curve. Experience band 2 supports an R3 curve with a 98-year average life. The sum of squared residuals for this curve is 76 percent smaller than for PGE's proposed curve. PGE's industry statistics show 20 of 49 companies use average lives of 100 or more years and 24 companies use right modal curves. Given that the statistical analysis agrees with PGE's industry data, I recommend the best fit curve from experience band 2, an R3 curve with a 98-year average life, be used for depreciation rate calculations.[63/]

[63/] AWEC/110 provides detailed results of my statistical analysis supporting this testimony.

Account		31100					
STRUCTURES AND IMI		1		**Iowa Curve**	**Avg. Life**	**SSR**	
Band		1		R3	112	0.00057	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	98	0.001064	AWEC Proposed
BEGIN	END	BEGIN	END	S1.5	90	0.007907	PGE Proposed
1980	2019	1980	2019			-0.86546	Change in SS



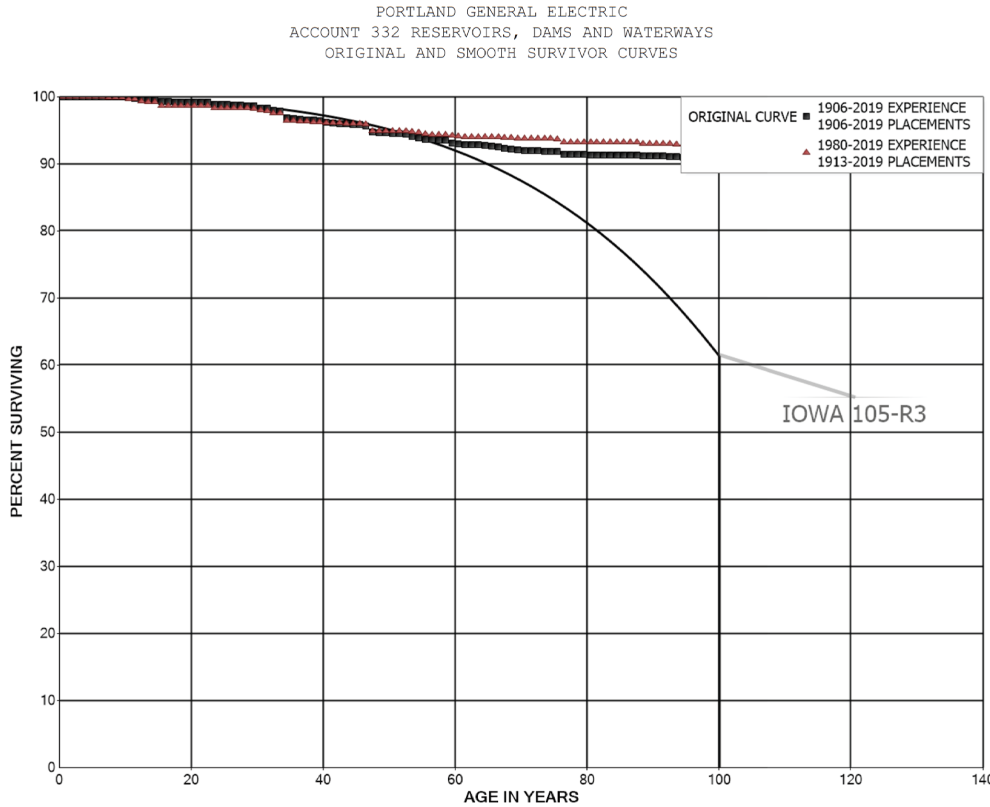
Account		31100					
STRUCTURES AND IMPROVEMENTS				**Iowa Curve**	**Avg. Life**	**SSR**	
Band		2		R3	98	0.001413	Band 2 Best Fit
EXPERIENCE		PLACEMENT		R3	100	0.001413	AWEC Proposed
BEGIN	END	BEGIN	END	S1.5	90	0.005798	PGE Proposed
2000	2019	1980	2019			-0.75632	Change in SS



c. **Account 332.00**

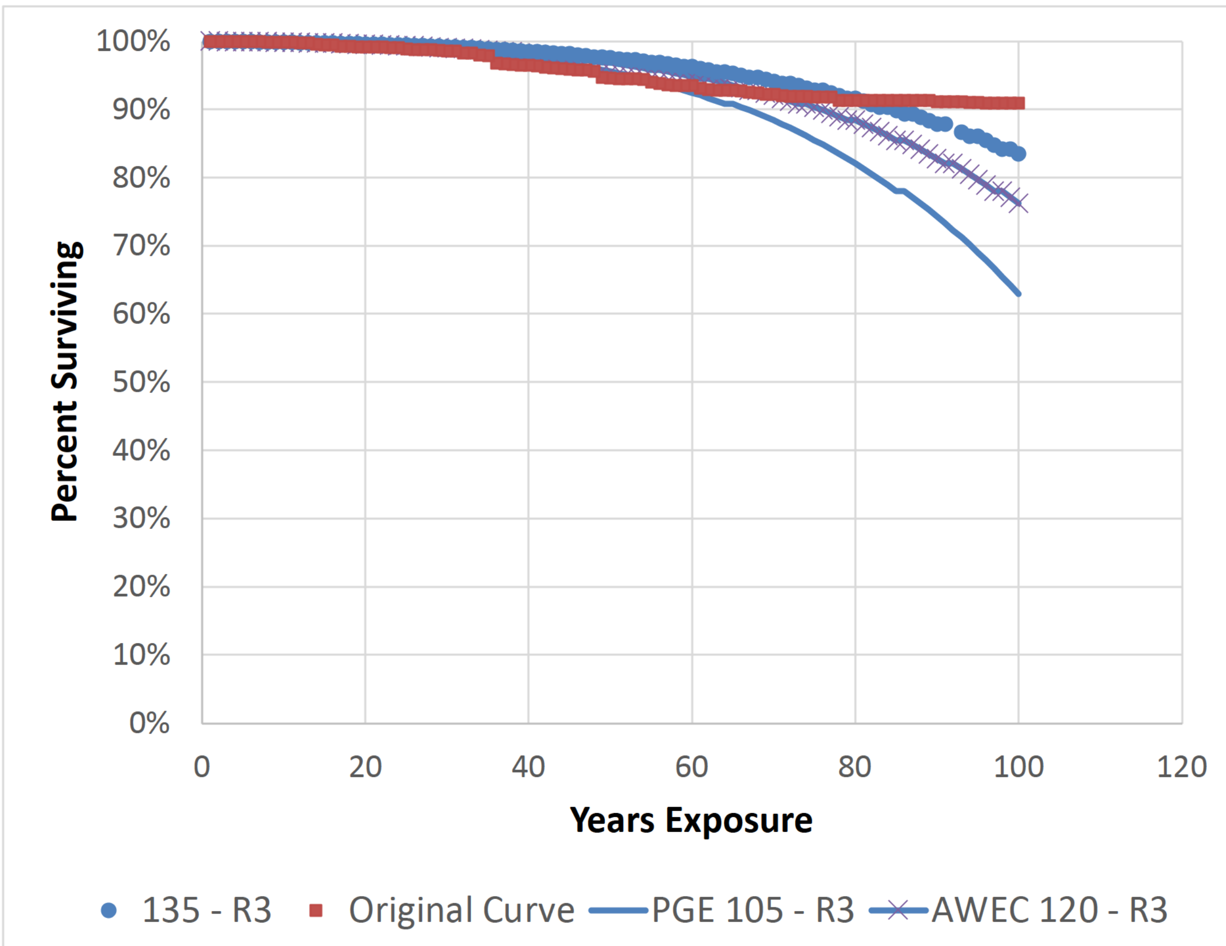
Q. WHAT IS YOUR RECOMMENDATION FOR THIS ACCOUNT?

A. Account 332.00 contains reservoirs, dams, and waterways. The retirement curve and life selected by PGE diverges from PGE's actual retirement experience.



PGE maintains relatively large real plant balances over the entire retirement experience curve and there is no clear basis for discounting any portion of the experience curve. A longer lived right modal curve fits this data better than the curve proposed by PGE. Experience band 1 supports an R3 curve with 135-year average life. Experience band 2 supports an R3 curve with a 135-year average life or an R4 curve with a 132-year average life. PGE's industry statistics show 7 of 29 companies use average lives of 120 or more years and 17 companies use right modal curves. The best fit curves for this account produce average lives that are higher than all but one company in PGE's industry statistics. A curve consistent with the upper range of industry lives is consistent with both PGE's data and industry statistics. I recommend an R3 curve with a 120-year average life be used for depreciation rate calculations. The sum of squared residuals for this curve is 75 percent smaller than for PGE's proposed curve for experience band 1 and 71 percent smaller for experience band 2.

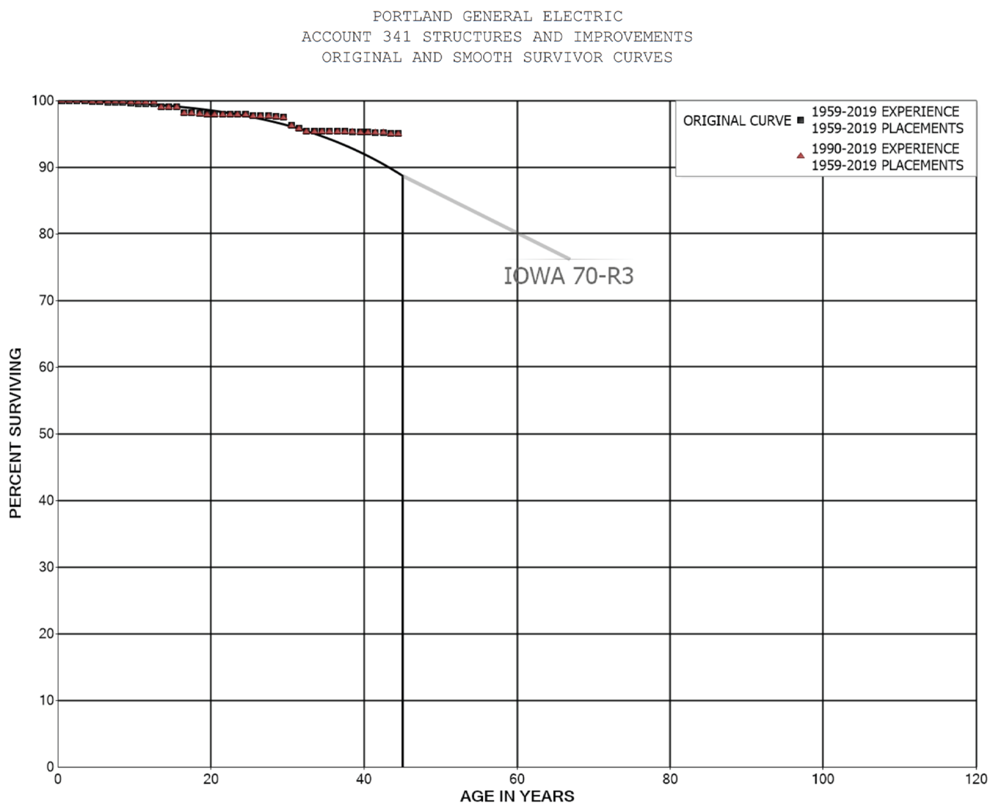
				Iowa Curve	Avg. Life	SSR	
Account		33200					
RESERVOIRS, DAMS AND WATERWAYS							
Band		1		R3	135	0.059	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	120	0.189	AWEC Proposed
BEGIN	END	BEGIN	END	R3	105	0.767	PGE Proposed
1906	2019	1906	2019			75%	Change in SS



d. Account 341.00 Structures and Improvements

Q. WHAT IS YOUR RECOMMENDATION FOR THIS ACCOUNT?

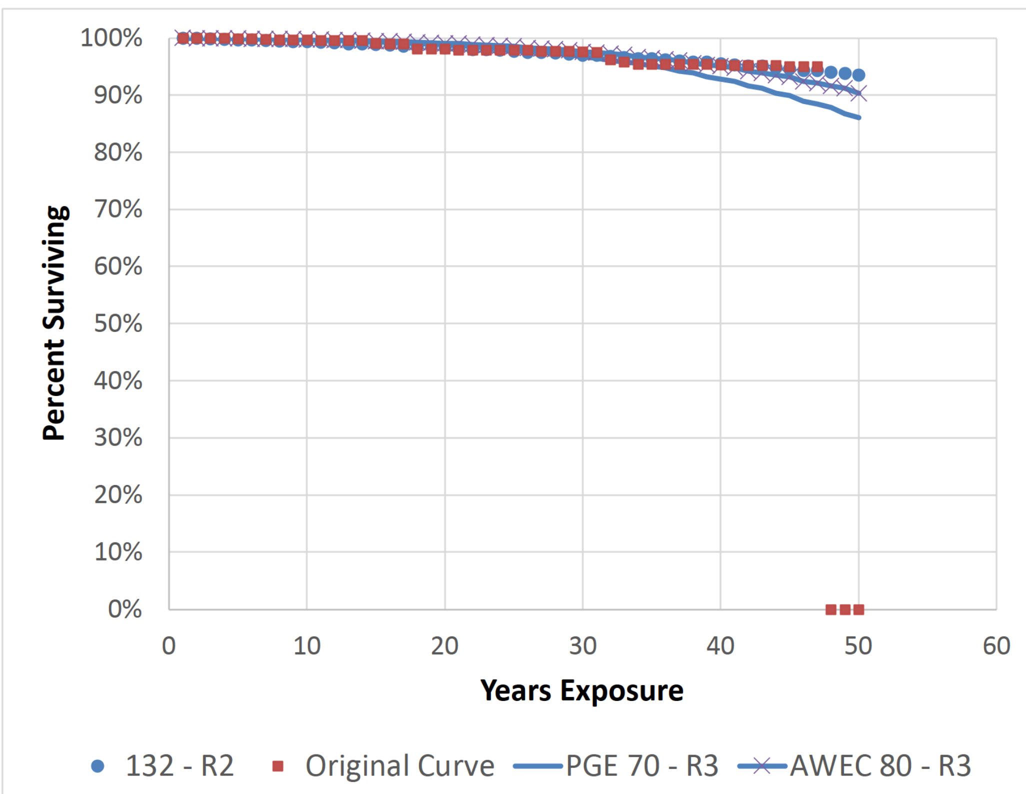
A. Account 341.00 contains structures and improvements related to Beaver, Coyote Springs, Port Westward Complex, Carty, and the KB Pipeline Plants. The retirement curve and life selected by PGE diverges from PGE's actual retirement experience.



PGE maintains relatively large real plant balances over the entire retirement experience curve and there is no clear basis for discounting any portion of the experience curve. A longer lived right modal curve fits this data better than the curve proposed by PGE. Experience band 1 supports an R2 curve with 132-year average life or an R3 curve with an 84-year average life. Experience band 2 supports an R2 curve with a 129-year average life or an R3 curve with an 84-year average life. PGE's industry statistics show 7 of 47 companies use average lives of

120 or more years and 33 companies use right modal curves. The R2 curve produces average lives that are higher than the companies in PGE's industry statistics. However, the R3 curve has similar fit and produces lives consistent with the upper range of industry lives. I recommend an R3 curve with an 80-year average life be used for depreciation rate calculations. The sum of squared residuals for this curve is 79 percent smaller than for PGE's proposed curve for experience band 1 and 78 percent smaller for experience band 2.

Account		34100					
STRUCTURES AND IMPROVEMENTS				**Iowa Curve**	**Avg. Life**	**SSR**	
Band			1	R2	132	0.001	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	80	0.004	AWEC Proposed
BEGIN	END	BEGIN	END	R3	70	0.019	PGE Proposed
1959	2019	1959	2019			-79%	Change in SS



e. **Account 341.01 Structures and Improvements - Wind**

Q. PLEASE SUMMARIZE YOUR CONCERNS REGARDING THIS ACCOUNT.

A. This account contains structures and improvements related to PGE wind farms. PGE has 11 years of plant history with no recorded retirements in the account.[64/] PGE proposes an R4 curve with a 40-year average life.[65/] PGE recommends relying on industry statistics due to the limited history of this account. Seven of nine companies in PGE's industry data have an average life of 50 years or more.[66/] Eight of nine companies have average lives greater than the life recommended by Gannett Fleming in this case. PGE believes industry data should play a key role.[67/] However, the fact that industry data provided by PGE shows all but one company with larger average lives suggests that the Depreciation Study recommendation is not based on industry data.

Gannett Fleming produced PacifiCorp's depreciation study filed in UM 1968. PacifiCorp has more extensive retirement history for this account. Gannett Fleming proposed an R-2 curve with a 65-year average life.[68/] I participated in PacifiCorp's 2018 depreciation study and reviewed Gannett Fleming's analysis of PacifiCorp's data for this account. I found its analysis of PacifiCorp to be consistent with the data. PacifiCorp provides an appropriate industry comparison to PGE given the overlap in service territory and location of wind facilities. However, PacifiCorp shows more retirements in the first 11 years than PGE's data show, which suggests that PacifiCorp's retirement curve shape may not be applicable. I

64/ Depreciation Study Section VII-58

65/ Depreciation Study Section VII-57.

66/ This excludes two companies with square curves that presumably do not model interim retirements for their wind plants, and one company with an average life of 5 years, which is appropriately excluded as non-comparable because PGE's wind structures have already exceeded the average life of 5 years with no retirement.

67/ AWEC/102 at 13 (PGE Response to AWEC DR 43).

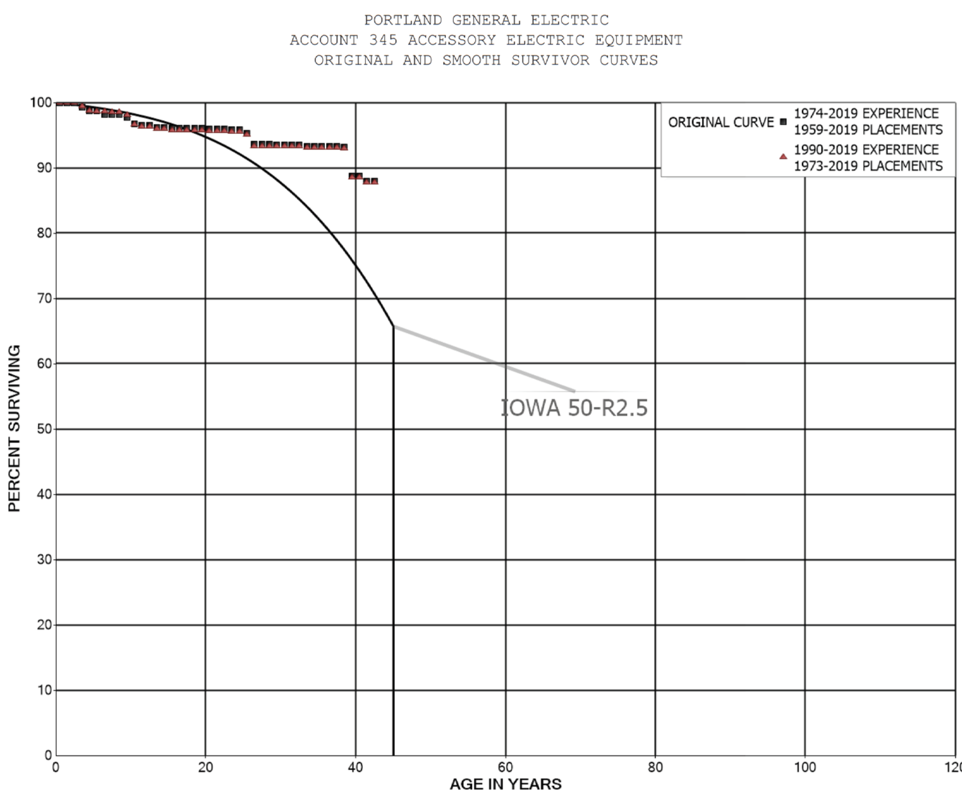
68/ Docket No. UM 1968, Exhibit PAC/202 Spanos/136.

recommend depreciation rates for this account be calculated using an S-3 curve with a 50-year average life. This recommendation reflects PGE's absence of retirements in the first 11 years of experience, PacifiCorp's longer life expectations supported by greater age of data and is consistent with more than three quarters of the companies provided as industry-comparable to PGE. The sum of squared residuals for this curve is 100 percent smaller than for PGE's proposed curve for experience band 1.

f. <u>Account 345.00 Accessory Electrical Equipment</u>

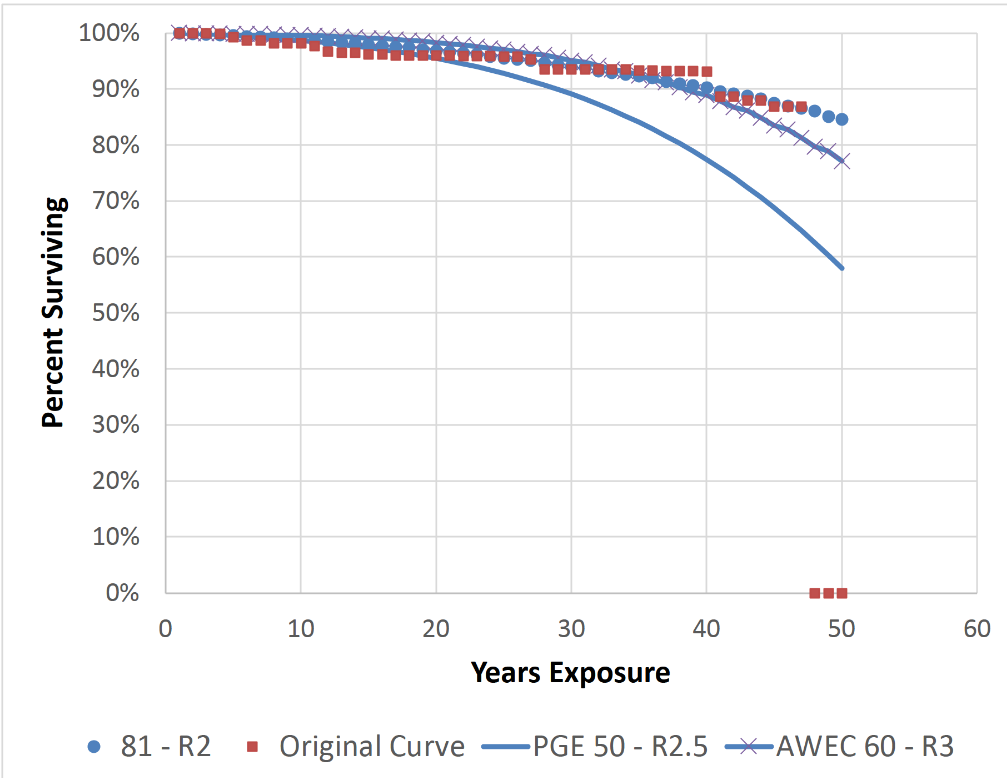
Q. WHAT IS YOUR RECOMMENDATION FOR THIS ACCOUNT?

A. This account relates to accessory electrical equipment for Beaver, Coyote Springs, Port Westward Complex, Carty, and the KB Pipeline Plants. The retirement curve and life selected by PGE diverges from PGE's actual retirement experience.



PGE maintains relatively large real plant balances over the entire retirement experience curve and there is no clear basis for discounting any portion of the experience curve. A longer lived right modal curve fits this data better than the curve proposed by PGE. Experience band 1 supports an R2 curve with 81-year average life or an R3 curve with a 64-year average life. Experience band 2 supports an R1 curve with a 129-year average life or an R2 curve with a 65-year average life. PGE's industry statistics show 6 of 47 companies use average lives of 60 or more years and 27 companies use right modal curves. The R1 and R2 curves produces average lives that are higher than the companies in PGE's industry statistics. However, the R3 curve has similar fit and produces lives consistent with the upper range of industry lives. I recommend an R3 curve with a 60-year average life be used for depreciation rate calculations. The sum of squared residuals for this curve is 93 percent smaller than for PGE's proposed curve for experience band 1 and 91 percent smaller for experience band 2.

Account		34500					
ACCESSORY ELECTRIC EQUIPMENT				**Iowa Curve**	**Avg. Life**	**SSR**	
Band		1		R2	81	0.006	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	60	0.024	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	50	0.339	PGE Proposed
1974	2019	1959	2019			-93%	Change in SS



g. **Account 345.01 Accessory Electrical Equipment - Wind**

Q. PLEASE SUMMARIZE YOUR CONCERNS REGARDING THIS ACCOUNT.

A. This account relates to accessory electrical equipment for PGE wind farms. PGE has 11 years of plant history with minimal recorded retirements and an 11-year survival rate of 99.56 percent.[69] PGE proposes an S2.5 curve with a 30-year average life.[70] PGE recommends

[69] Depreciation Study Section VII-79.
[70] Depreciation Study Section VII-78.

relying on industry statistics due to the limited history of this account. Eight of eleven companies in PGE's industry data have average lives greater than the life recommended by Gannett Fleming in this case.[71] Six of eleven companies in PGE's industry data have average lives of 45 years or greater.

As with Account 344.01, PacifiCorp has more extensive retirement history for this account. Gannett Fleming proposed an S-0.5 curve with a 60-year average life in PacifiCorp's 2018 depreciation study.[72] In that case, I found Gannett Fleming's analysis of PacifiCorp to be consistent with the data. However, as with Account 344.01, PacifiCorp shows more retirements in the first 11 years than PGE's data show, which suggests that PacifiCorp's retirement curve shape may not be applicable. I recommend depreciation rates for this account be calculated using an S-2 curve with a 45-year average life. This recommendation reflects PGE's absence of retirements in the first 11 years of experience, PacifiCorp's longer life expectations supported by greater age of data, and is consistent with nearly half of the companies provided as industry comparable by PGE. The sum of squared residuals for this curve is 60 percent smaller than for PGE's proposed curve for experience band 1.

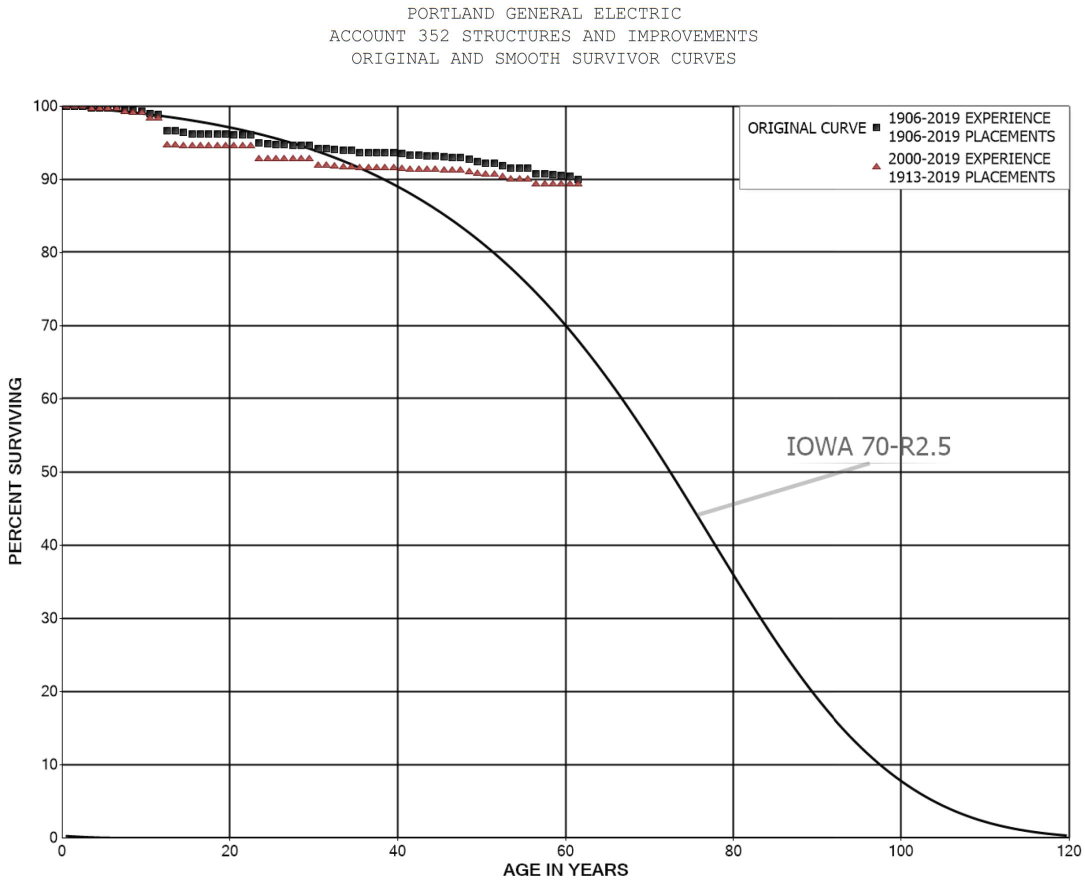
h. <u>Account 352.00 Transmission Structures and Improvements</u>

Q. WHAT IS YOUR RECOMMENDATION FOR THIS ACCOUNT?

A. This account contains transmission structures and improvements. The retirement curve and life selected by PGE diverges from PGE's actual retirement experience.

71/ This excludes one company with square curves that presumably does not model interim retirements for its wind plants, and one company with an average life of 12 years, which is appropriately excluded as non-comparable because PGE's wind structures have already reached the average life of 11.5 years with no retirement.

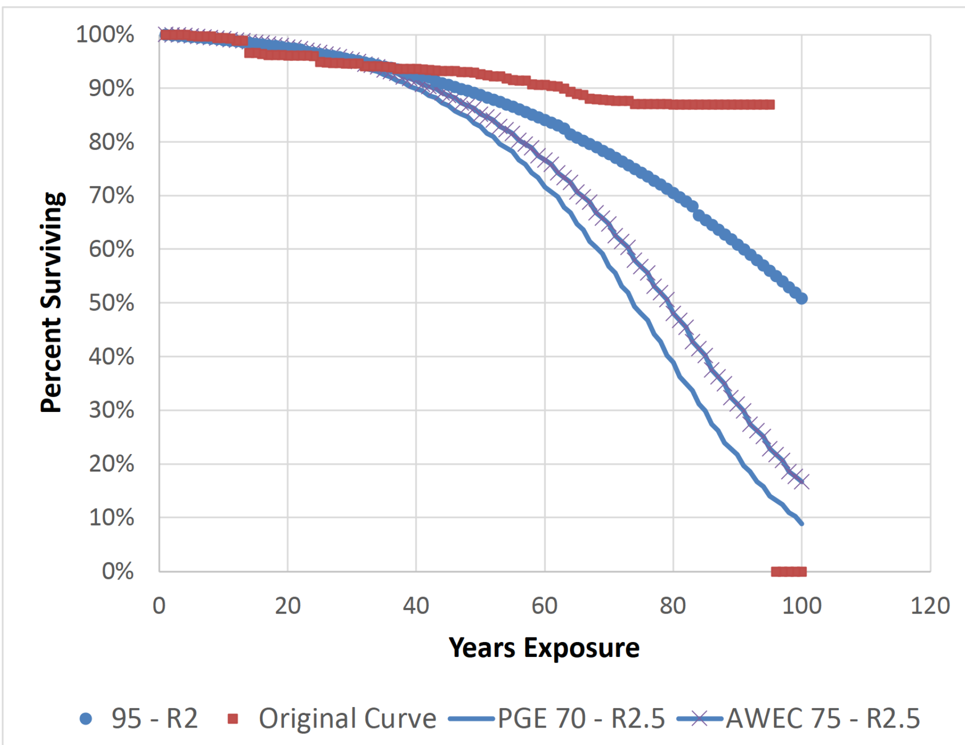
72/ Docket No. UM 1968, Exhibit PAC/202 Spanos/156.



This plant differs from the other accounts analyzed thus far in this section because PGE's plant balances for older age experience groups are minimal. PGE states that its selected curve, R2.5 with 70-year life, is consistent with statistical analysis when age is limited to 40 years or less. However, this is not correct.

When I limit the ages analyzed as PGE suggests, a longer lived right modal curve fits this data better than the curve proposed by PGE. Experience band 1 supports an R2 curve with a 95-year average life. Experience band 2 supports an R1 curve with a 118-year average life. PGE's proposed shape of R-2.5 has a better fit at a 75-year average life than the proposed 70-year average life. PGE's industry statistics show 3 of 65 companies with 75-year average lives. However, PGE's data support an average life at the top of the industry statistics when the data are limited as PGE suggests. I recommend an R2.5 curve with a 75-year average life be used for depreciation rate calculations. The sum of squared residuals for this curve is 32 percent smaller than for PGE's proposed curve for experience band 1 and 44 percent smaller for experience band 2. Even better fits are achieved with longer average lives.

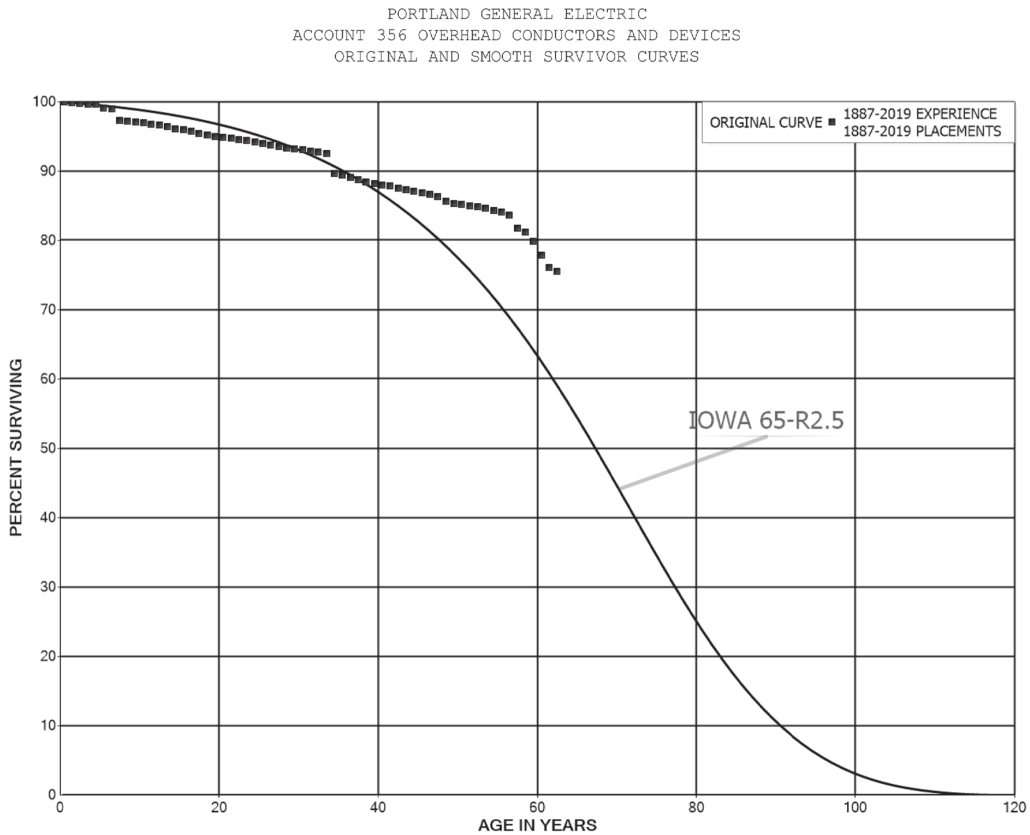
Account		35200					
STRUCTURES AND IMPROVEMENTS				Iowa Curve	Avg. Life	SSR	
Band			1	R2	95	0.004	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R2.5	75	5.697	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	70	8.409	PGE Proposed
1906	2019	1906	2019			-32%	Change in SS



i. <u>Account 356.00 Transmission Overhead Conductors And Devices</u>

Q. WHAT IS YOUR RECOMMENDATION FOR THIS ACCOUNT?

A. This account contains transmission structures and improvements. The retirement curve and life selected by PGE diverges from PGE's actual retirement experience.



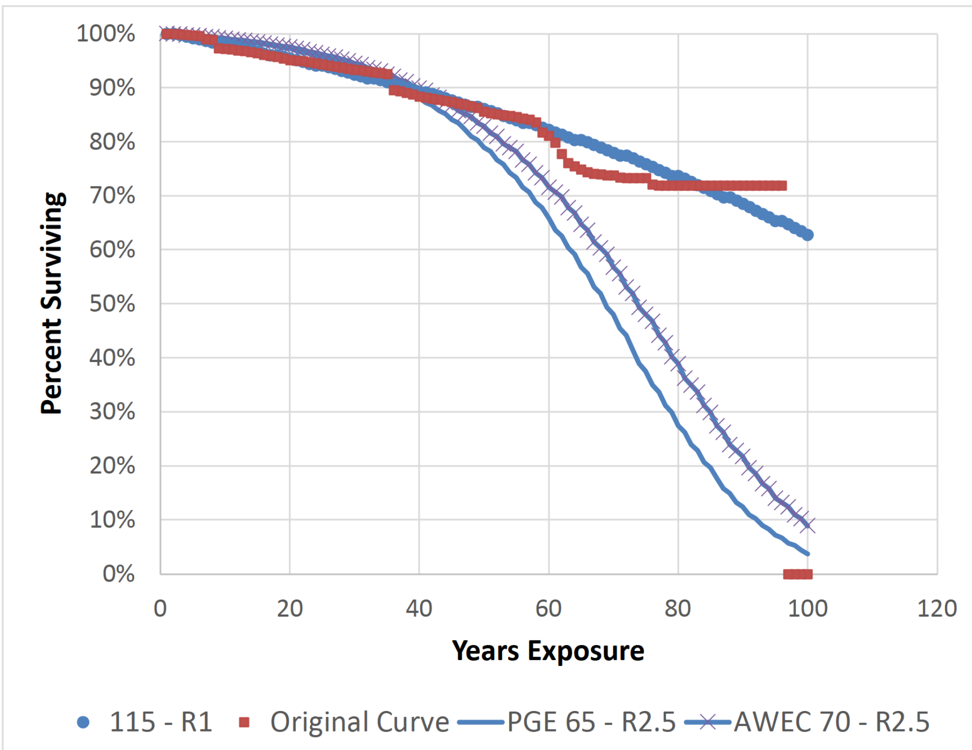
PGE's plant balances for older age experience groups are minimal. I limit the ages analyzed to assets under 50 years of age. Under this restriction, a longer lived right modal curve fits this data better than the curve proposed by PGE.[73/] Experience band 1 supports an R2 curve with a 95-year average life. Experience band 2 supports an R1 curve with a 115-year average life. PGE's proposed shape of R-2.5 has a better fit at a 70-year average life than the proposed 65-year average life. PGE's industry statistics show 4 of 73 companies with 70-year average lives. However, PGE's data support an average life at the top of the industry statistics. I recommend an R2.5 curve with a 70-year average life be used for depreciation rate

73/ Longer lived curves also fit unrestricted data better than PGE's proposed curves.

calculations. The sum of squared residuals for this curve is 35 percent smaller than for PGE's proposed curve for experience band 1. Even better fits are achieved with longer average lives.

Account		35600	
OVERHEAD CONDUCTORS AND DEVICES			
Band		1	
EXPERIENCE		PLACEMENT	
BEGIN	END	BEGIN	END
1887	2019	1887	2019

Iowa Curve	Avg. Life	SSR	
R1	115	0.002	Band 1 Best Fit
R2.5	70	4.610	AWEC Proposed
R2.5	65	7.134	PGE Proposed
		-35%	Change in SS



j. Account 373.07 Sentinel Lighting Equipment Rollforward

Q. PLEASE DESCRIBE THIS ISSUE.

A. Account 373.07 has not had material plant additions since 2011. The account is currently accumulating $25,010 per year in depreciation.[74/] Updated depreciation rates will not be in effect until May, 2022. This means between December 31, 2019 and the effective date of rate

[74/] Docket No. UM 1809, Stipulating Parties/102 Peng – Mullins – Spanos/4.

changes, the account will accrue approximately $58,333 in additional depreciation expense beyond the numbers presented in the 2019 Deprecation Study. Future accruals for this account as of December 31, 2019 are $51,725. Therefore, when revised rates take effect in May, 2022, future accruals will be zero. If depreciation is not rolled forward, PGE will continue to collect depreciation expense on an account that is fully accrued.

k. Helicopter Retirement Traits

Q. PLEASE SUMMARIZE YOUR CONCERNS WITH ACCOUNT 392.10 HELICOPTER TRANSPORTATION EQUIPMENT.

A. Account 392.10 contains helicopter transportation equipment. Helicopters are a unique class of vehicles because they retain value longer than most other vehicles.[75/] In addition, a helicopter's frame experiences little fatigue, and all other components can be replaced.[76/] Stipulating Parties propose a 20-S4 IOWA retirement curve and 15 percent net salvage rate for helicopters. These parameters do not reflect helicopter technical characteristics, industry expectations, or PGE's actual experience.

Helicopters can be maintained over extended periods and do not have a typical "useful life". In fact, some manufacturers claim indefinite operating lives: "Bell Helicopter designs and builds commercial aircraft airframes specifically with no need for a scheduled or finite retirement life, either in calendar time or in accumulated flight hours… by operating the aircraft in accordance with the Bell approved maintenance and overhaul recommendations, complying with the applicable bulletins recommended by Bell, and using only parts and

75/ AWEC/108 - https://www.helicoptersmagazine.com/depreciation-fact-or-fiction-85/
76/ AWEC/109 - http://www.experts.com/content/articles/sharon-desfor-helicopters-different-type-of-asset.pdf

processes acceptable to Bell."[77] The resale value of a well maintained helicopter can meet or exceed a helicopter's original purchase price.[78]

PGE owned and operated a 1980 Eurocopter MBB BO-105 between 1980 and 2010.[79] PGE's book value for the helicopter was $858, 311. In 2010, PGE sold the 30-year-old helicopter for $260,000. After brokerage fees and appraisal costs, the net salvage on the helicopter was $244,575, a net salvage rate of 28.5 percent. PGE experienced a higher salvage than proposed by the Stipulating Parties. PGE's industry data shows three companies with helicopter accounts. Two have net salvage of 40 percent and one has net salvage of 5 percent.[80]

I recommend that a 30 percent net salvage be used to calculate depreciation rates for this account. A net salvage rate of 30 percent is consistent with PGE's experience and industry expectations. I also recommend that accumulated depreciation for this account be rolled forward to December 31, 2022 given that plant additions and retirements are likely to be de minimis and absent this roll-forward the rates will be too high.

l. Transportation Net Salvage

Q. PLEASE SUMMARIZE YOUR CONCERNS WITH THE 392 ACCOUNTS.

A. PGE proposes a uniform 15 percent net salvage amount be applied across all transportation accounts. PGE asserts that there is not sufficient sub-account level experience to apply individual salvage estimates.[81] The 20-year average net salvage rate for this account is 18

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[77] Id.
[78] AWEC/108.
[79] AWEC/102 at 9 (PGE Response to AWEC DR 36).
[80] AWEC/106.
[81] AWEC/102 at 16 (PGE Response to AWEC DR 45).

percent. The 5-year average net salvage rate for this account is 29 percent. These values remain unchanged after removing helicopter retirements from the salvage data. I recommend using an 18 percent net salvage rate for all 392 subaccounts except the helicopter subaccount.

A. Q. DOES THIS CONCLUDE YOUR OPENING TESTIMONY?

A. Yes.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)

EXHIBIT AWEC/101

CURRICULUM VITAE OF LANCE D. KAUFMAN

CURRICULUM VITAE

LANCE KAUFMAN
Aegis Insight
4801 W. Yale Ave.
Denver, Colorado 80219
(541) 515-0380
lance@aegisinsight.com

EDUCATION:

University of Oregon	Ph.D.	Economics	2008 – 2013
University of Oregon	M.S.	Economics	2006 – 2008
University of Anchorage Alaska	B.B.A.	Economics	2001 – 2004

CERTIFICATIONS:

Certified Depreciation Professional	Society of Depreciation Professionals	2018

PROFESSIONAL EXPERIENCE:

Principal Economist	Aegis Insight	2014 – Present
Senior Economist	Oregon Public Utility Commission	2015 – 2018
Public Utility Advocate	Alaska Department of Law	2014 – 2015
Senior Economist	Oregon Public Utility Commission	2013 – 2014
Instructor	University of Oregon	2008 – 2012
Research Assistant	University of Alaska Anchorage	2003 – 2008

PROFESSIONAL MEMBERSHIPS:

Society of Depreciation Professionals	2015 – Present
American Economics Association	2017 – Present

RESEARCH, CONSULTING, AND ECONOMETRIC ANALYSIS:

- Cable Huston, LLP, Portland, OR 2020
  Retained as an expert witness for Alliance of Western Energy Consumers regarding revenue requirement, rate spread and rate design in Cascade Natural Gas Corporation Request for General Rate Revision, Public Utility Commission of Oregon, Docket No. UG 390.
- Davison Van Cleve, PC, Portland, OR 2020
  Retained as an expert witness for Alliance of Western Energy Consumers regarding net power costs in Portland General Electric Company 2021 Annual Power Cost Update Tariff, Public Utility Commission of Oregon, Docket No. UE 377.
- Davison Van Cleve, PC, Portland, OR 2020
  Retained as an expert witness for Alliance of Western Energy Consumers regarding net power costs in Portland General Electric Company 2021 Annual Update Tariff, Public Utility Commission of Oregon, Docket No. UE 381.
- Davison Van Cleve, PC, Portland, OR 2020

Retained as an expert witness for Alliance of Western Energy Consumers regarding revenue requirement, rate spread and rate design in Nevada Power Company 2021 General Rate Case, Public Utility Commission of Nevada, Docket No. 20-06003

- Frank & Salahuddin LLC, Denver, Colorado, 2020
  Retained as an expert witness for plaintiffs regarding calculation of lost earnings.
- Level Development Group, LLC, Denver, Colorado, 2020
  Develop real estate valuation model for establishing sale price of newly constructed residential housing.
- Hagens Berman Sobol Shapiro LLP, Phoenix, Arizona, 2020
  Deposed as an expert witness for plaintiffs re calculation of economic harm due to breach of contract in Jeff Olberg v. Allstate Insurance Company, Case No. C18-0573-JCC, United States District Court, Western District of Washington at Seattle.
- Hagens Berman Sobol Shapiro LLP, Phoenix, Arizona, 2020
  Deposed as an expert witness for plaintiffs re calculation of economic harm due to breach of contract in re Cameron Lundquist v. First National Insurance Company of America, Case No. 18-cv-05301-RJB, United States District Court, Western District of Washington at Tacoma.
- Killmer, Lane, and Newman, LLP, Denver, Colorado, 2020
  Deposed as expert witness for plaintiff re racial disparities in police use of force re Brandon Washington V. City Of Aurora, Colorado, Case No. 1:19-cv-01160-RM-MEH, United States District Court, District of Colorado.
- Davison Van Cleve, PC, Portland, OR 2020
  Retained as an expert witness for Alliance of Western Energy Consumers regarding coal plant pollution control investments, coal plant decommissioning costs, rate spread and rate design re PacifiCorp 2020 Request for a General Rate Revision, Public Utility Commission of Oregon Docket No. UE 374.
- Davison Van Cleve, PC, Portland, OR and Washington Attorney General, 2020
  Retained as an expert witness for Packaging Company of America and Washington Public Council regarding decommissioning costs and rate design re PacifiCorp 2020 Request for a General Rate Revision, Washington Utility and Transportation Commission.
- Sanger Law, PC, Portland, OR, 2019
  Retained as a consultant for Renewable Energy Coalition and for Northwest & Intermountain Power Producers Coalition to provide analysis of PacifiCorp avoided costs in a Utility PURPA Compliance Filing at the Washington Utility and Transportation Commission Docket, No. UE-190666.
- Sanger Law, PC, Portland, OR, 2019
  Retained as a consultant for Northwest & Intermountain Power Producers Coalition to provide analysis of Portland General Electric avoided costs in support of testimony to the Oregon Legislature.
- Powder River Basin Resource Council, Laramie, Wyoming, 2019.
  Testified as an expert witness for Powder River Basin Resource Council regarding coal plant closures re PacifiCorp 2019 Integrated Resource Plan, Wyoming Public Service Commission Docket No. 90000-147-XI-19.
- The Law Office of Ralph Lamar, Arvada, CO 2019

Deposed as an expert witness for plaintiffs regarding lost profits of a Farmers insurance agency

- Jester, Gibson & Moore, Denver, CO 2019
  Retained as an expert witness for plaintiffs regarding lost earnings in an ADEA wrongful termination matter.
- Albrechta & Coble, Ltd. Fremont, OH 2019
  Retained as an expert witness for plaintiff regarding lost earnings in a race related wrongful termination matter.
- Conrad Law, PC, Salt Lake City, UT 2019
  Retained as an expert witness for Ellis-Hall Consultants, LLC. regarding economic damages in Ellis-Hall Consultants, LLC. et. al. v. George B. Hofmann IV, United States District Court, District of Utah, Central Division.
- Davison Van Cleve, PC, Portland, OR 2019
  Retained as an expert witness for Alliance of Western Energy Consumers regarding net variable power cost calculations in PORTLAND GENERAL ELECTRIC COMPANY, 2020 Annual Power Cost Update Tariff Public Utility Commission of Oregon Docket No. UE 359.
- Sanger Law, PC, Portland, OR, 2019
  Testified as an expert witness for Renewable Energy Coalition and Rocky Mountain Coalition for Renewable Energy regarding Qualified Facility avoided costs in Application of Rocky Mountain Power for a Modification of Avoided Cost Methodology and Reduced Term of PURPA Power Purchase Agreements Public Service Commission of Wyoming Docket No. 20000-545-ET-18
- Sanger Law, PC, Portland, OR, 2019
  Retained as an expert witness for Cafeto Coffee Company regarding the necessity, design, and location of transmission lines in SPRINGFIELD UTILITY BOARD Petition for Certificate of Public Convenience and Necessity Public Utility Commission of Oregon Docket No. PCN 3.
- Baumgartner Law, LLC, Denver, CO, 2018
  Retained as an expert witness for plaintiffs re calculation of economic harm due to injury in re Eric Bowman, v. Top Tier Colorado, LLC,, Case No. 18CV31359, United States District Court, District of Colorado.
- Cohen Milstein Sellers & Toll PLLC, Washington DC, 2018
  Retained as an expert witness for plaintiffs re calculation of economic harm due to breach of contract in re Isaac Harris et al. v. Medical Transportation Management, Inc., Civil Action No. 17-1371, United States District Court, District of Columbia.
- Davison Van Cleve, PC, Portland, OR 2020
  Retained as an expert witness for Alliance of Western Energy Consumers regarding depreciation rates in re PacifiCorp Application for Authority to Implement Revised Depreciation Rates, Public Utility Commission of Oregon Docket No. UM 1968.
- Davison Van Cleve, PC, Salem, OR and Washington Attorney General, OR 2020
  Retained as an expert witness for Packaging Company of America and Washington Public Council regarding depreciation rates in re Pacific Power 2018 Depreciation Study, Washington Utility and Transportation Commission, Docket No. UE-180778.
- Hagens Berman Sobol Shapiro LLP, Phoenix, Arizona, 2018

Deposed as an expert witness for plaintiffs re calculation of economic harm due to breach of contract in re Vicky Maldonado and Carter v. Apple Inc., AppleCare Services Company, Inc., and Apple CSC, Inc., Case No. 3:16-cv-04067-WHO, United States District Court, District of California.

- Hagens Berman Sobol Shapiro, LLP, Phoenix, Arizona, 2018
  Deposed and testified as an expert witness for plaintiffs re calculation of unpaid mileage for truck drivers in re Swift Transportation Co., Inc., Civil Action No. CV2004-001777, Superior Court of the State of Arizona, County of Maricopa.
- Killmer, Lane, and Newman, LLP, Denver, Colorado, 2018
  Retained as expert witness for plaintiffs re reasonable attorney fees in re Jeanne Stroup and Ruben Lee, v. United Airlines, Inc., Case No. 15-cv-01389-WYD-STV, United States District Court, District of Colorado.
- Klein and Frank, PC, Denver, Colorado, 2018
  Retained as expert witness for plaintiffs re potential jury bias in re Gail Goehrig and Chris Goehrig v. Core Mountain Enterprises, LLC, Case No. 2016CV030004, San Juan County District Court.
- Robert Belluso, Pennsylvania, 2017
  Retained as expert witness for plaintiff re lost profit in re Robert Belluso D.O. v Trustees of Charleroi Community Park, PHRC Case No. 201505365, Pennsylvania Human Relations Commission.
- Lowery Parady, LLC, Denver, Colorado, 2017
  Analyzed payroll data and calculated unpaid overtime and unpaid hours for plaintiff class action in re Violeta Solis, et al. v. The Circle Group, LLC, et al., Case No. 1:16-cv-01329-RBJ, United States District Court, District of Colorado.
- Sawaya & Miller Law Firm, Denver, Colorado, 2017
  Provided data processing and analysis of employment records.
- Financial Scholars Group, Orinda, California, 2017
  Provided analysis of risk profile in bundled real estate and personal loans in re Old Republic Insurance Company v. Countrywide Bank et al., Circuit Court of Cook County, Illinois, Chancery Division.
- Financial Scholars Group, Orinda, California, 2017
  Provided consultation and analysis of financial market transactions in preparation of settlement claims filings in re Laydon v. Mizuho Bank, Ltd., et al. and Sonterra Capital Master Fund Ltd., et al v. UBS AG et al.
- Clean Energy Action, Boulder, Colorado, 2016 – 2017
  Provided consultation on the appropriate discounting methodology used in energy resource planning in the Public Service Company of Colorado application for approval of the 2016 Electric Resource Plan, Proceeding No. 16A-0396E, Public Utilities Commission of the State of Colorado.
- Confidential Client, 2016
  Provided analysis and report on the probability that distinct crimes are independent events based on geographical analysis of crime rates.
- Christine Lamb and Kevin James Burns, Denver, Colorado, 2016

Provided data analysis for defendant of the impact of ethnicity on termination decisions in re Aragon et al v. Home Depot USA, Inc., Case No. 1:15-cv- 00466-MCA-KK, United States District Court, District of New Mexico.

- Steptoe & Johnson LLP, Washington, DC, 2015 – 2016
  Programmed analysis of internet traffic data for plaintiffs applying a proprietary probability model developed to identify and verify accounts responsible for repeated infringements of asserted copyrights by defendants' internet subscribers in re BMG Rights Management (US) LLC, and Round Hill Music LP v. Cox Enterprises, Inc., et al., Case No. 1:14-cv-1611(LOG/JFA), United States District Court Eastern District of Virginia, Alexandria Division.
- Padilla & Padilla, PLLC, Denver, Colorado, 2014 – 2016
  Provided research and analysis for plaintiffs re the impact on minority applicants from use of the AccuPlacer Test by the City and County of Denver, and estimated damages in re Marian G. Kerner et al. v. City and County of Denver, Civil Action No. 11-cv-00256-MSK-KMT, United States District Court, District of Colorado.
- U.S. Equal Employment Opportunity Commission, 2013
  Provided statistical analysis of EEOC filings.

OTHER REGULATORY PROCEEDINGS:

- Portland General Electric 2016 Annual Power Cost Variance Docket No. UE 329.
- PacifiCorp 2016 Power Cost Adjustment Mechanism Docket No. UE 327.
- Public Utility Commission of Oregon Staff Investigation into the Treatment of New Facility Direct Access Charges Docket No. UM 1837
- PacifiCorp Oregon Specific Cost Allocation Investigation Docket No. UM 1824.
- PacifiCorp 2018 Transition Adjustment Mechanism Docket No. UE 323.
- Portland General Electric 2018 General Rate Case Docket No. UE 319.
- Avista Corp. 2017 General Rate Case Docket No. UG 325.
- Portland General Electric Affiliated Interest Agreement with Portland General Gas Supply Docket No. UI 376.
- Portland General Electric 2017 Automated Update Tariff Docket No. UE 308
- PacifiCorp 2017 Transition Adjustment Mechanism Docket No. UE 307
- Portland General Electric 2017 Reauthorization of Decoupling Adjustment Docket No. UE 306
- Northwest Natural Gas Investigation of WARM Program Docket No. UM 1750.
- PacifiCorp Investigation into Multi-Jurisdictional Allocation Issues Docket No. UM 1050.
- Idaho Power Company 2015 Power Supply Expense True Up Docket No. UE 305
- Homer Electric Association 2015 Depreciation Study U-15-094
- Submitted prefiled testimony regarding the depreciation study.
- Chugach Electric Association 2015 Rate Case U-15-081
- Developed staff position regarding margin calculations.
- ENSTAR 2014 Rate Case U-14-111
- Submitted prefiled testimony regarding sales forecast.
- Alaska Pacific Environmental Services 2014 Rate Case U-14-114/115/116/117/118
  Submitted prefiled testimony regarding cost allocations, cost of service, cost of capital, affiliated interests, and depreciation.

- Alaska Waste 2014 Rate Case U-14-104/105/106/107
  Submitted prefiled testimony regarding cost of service study, cost of capital, operating ratio, and affiliated interest real estate contracts.
- Fairbanks Natural Gas 2014 Rate Case U-14-102
  Submitted prefiled testimony regarding cost of service study and forecasting models.
- Avista 2015 Rate Case U-14-104
  Submitted analysis supporting OPUC Staff settlement positions regarding Avista's sales and load forecast, decoupling mechanisms and interstate cost allocation methodology. Represented Staff in settlement conferences on November 21, November 26, and December 4, 2013.
- Portland General Electric 2015 Rate Case
  Submitted pre-filed opening testimony addressing PGE's sales forecast, printing and mailing budget forecast, mailing budget, marginal cost study, line extension policy and reactive demand charge. Represented OPUC Staff in settlement conferences on May 20, May 27, and June 12, 2014.
- Portland General Electric 2014 General Rate Case
  Submitted analysis supporting OPUC Staff settlement positions regarding PGE's sales and load forecast, revenue decoupling mechanism, and cost of service study. Represented OPUC Staff in settlement conferences on May 29, June 3, June 6, July 2, and July 9 of 2013. Submitted testimony in support of partial stipulation, pre-filed opening testimony addressing PGE's decoupling mechanism, and testimony in support of a second partial stipulation.
- PacifiCorp 2014 General Electric Rate Case
  Submitted analysis supporting OPUC Staff settlement positions regarding PacifiCorp's sales and load forecast and cost of service study. Represented Staff in settlement conferences on June 12 through June 14, 2013.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)
	)

EXHIBIT AWEC/102

RESPONSES TO DATA REQUESTS

Date: August 27, 2021

TO: AWEC
Davison Van Cleve PC
Attorneys at Law
1750 SW Harbor Way Suite 450
Portland OR 97201

FROM: Ming Peng
Senior Economist
Energy Rates, Finance and Audit Division

OREGON PUBLIC UTILITY COMMISSION
Docket No. UM 2152 – AWEC's First Set of Data Request No 01.

Data Request No 01:

01. Please provide all workpapers and analysis performed by Staff regarding the appropriate lives and net salvage of each account included in Portland General Electric's depreciation study at issue in this proceeding.

Staff Response No 01:

01. See the attached 142 confidential files containing staff's workpapers and analysis.

April 22, 2021

TO: Jesse O. Gorsuch
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 015
Dated April 8, 2021

Request:

Please refer to the 2019 Depreciation Report page III-3 which states "Generally, the information external to the statistics led to no significant departure from the indicated survivor curves for the accounts listed below." For each account not listed, please provide the external information that led to a significant departure from the indicated survivor curve, and explain why and how this information led to such departure.

Response:

The accounts not listed in the referenced section of the Depreciation Report are those for which the statistical analysis did not factor as prominently in the development of the curve estimate as it did for the accounts that are listed.

Assets that do not have robust retirement data with which to perform a representative statistical analysis require further information to develop a meaningful curve estimate. These sources of information include company plans or policies related to retirement as well as life estimates used by other companies within the industry for similar assets. Knowledge of industry trends for the assets being studied and informed judgment are also important factors that are considered more heavily when statistical data are limited or the stub curve is inconclusive. This is particularly the case for long lived structures accounts such 311, 331 and 332. PGE has provided industry statistics in the response to AWEC Data Request No. 001, Attachment 001-B, file "(8) PGE2019-Electric Statistics."

April 22, 2021

TO: Jesse O. Gorsuch
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 016
Dated April 8, 2021

Request:

Please refer to the 2019 Depreciation Report page III-3 which states: "Statistical analyses of historical data for the period 1971 through 2019 contributed significantly toward the net salvage estimates for 44 plant accounts... as follows …." For each account not listed, please provide the basis for the net salvage estimates, including any supporting documentation.

Response:

The net salvage analysis is set forth in Part IV of the Depreciation Report, therefore, the response refers to page IV-2. The accounts not listed in the referenced section of the Depreciation Report are those for which the statistical analysis of the historical data did not factor as prominently in the development of the net salvage estimate as it did for the accounts that are listed.

Assets that have limited net salvage data with which to perform a representative statistical analysis require further information to develop a meaningful net salvage estimate. These sources of information include company plans or policies related to retirement and net salvage as well as net salvage estimates used by other companies within the industry for similar assets. Knowledge of industry trends for the assets being studied and informed judgment are also important factors that are relied upon more heavily when statistical data are limited. For example, Account 354, Towers and Fixtures, has very limited data in recent years so older data was considered as well as industry ranges and the practices in place for cost of removal when retirements occur. PGE has provided industry statistics in the response to AWEC Data Request No. 001, Attachment 001-B, file "(8) PGE2019-Electric Statistics".

June 4, 2021

TO: Corinne O. Milinovich
Alliance of Western Energy Consumers’

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 018
Dated May 21, 2021

Request:

Please refer to the initial filing at page 2 which states: “PGE is fully committed to helping Oregon reach its decarbonization goals and increasingly clean electricity will be key to decarbonizing other sectors of the economy. Therefore, in this depreciation study, PGE is proposing an adjustment to Colstrip end-of-life from December 31, 2030 to December 31, 2027.”

a. Is PGE proposing to end coal generation at Colstrip by December 31, 2027?
b. If no, why does PGE request accelerating Colstrip’s end-of-life to December 31, 2027?

Response:

a. PGE is proposing to accelerate the Colstrip depreciation to December 31, 2027. However, the circumstances around Colstrip do not provide PGE with the sole authority to end coal generation at Colstrip by December 31, 2027.
b. As provided in PGE’s response to CUB Data Request No. 002, PGE elected to set the Colstrip depreciable life at the end of 2027 within this depreciation study for multiple reasons:

   - In 2020, PGE performed an enabling study to analyze the impact of the early removal of Colstrip from PGE’s portfolio (provided in response to AWEC Data Request No 008, Attachment 008-A). This enabling study, when considered in light of prevailing circumstances and other reasons articulated below, supported PGE’s decision to set the depreciable life at 2027.
   - The OPUC recently approved a 2027 date for PacifiCorp in its 2021 general rate case Order 20-473. Maintaining alignment between PGE and PacifiCorp remains important as the co-owners navigate potential paths forward toward the exit from Colstrip.
   - Colstrip co-owners regulated in Washington state are subject to the 2019 Clean Energy Transformation Act which mandates the removal of coal from their portfolio serving load in Washington by 2025. Should similar legislation be passed in Oregon to require an earlier end to coal usage in Oregon, or should any other action make it necessary for

PGE to accelerate its date further, PGE will make the necessary adjustments at that time. In the meantime, all Colstrip co-owners must still meet their obligations under the Colstrip Owner and Operator Agreement.

- In setting the depreciable life at 2027 PGE also considered the customer price impact due to the Colstrip accelerated depreciation during the current economic contraction and uncertainty caused by the COVID-19 pandemic.

Ultimately, the circumstances around Colstrip are dynamic and it is important that PGE has flexibility to respond to evolving situations. In order to enable this flexibility PGE intends to remove Colstrip from its revenue requirement in a future rate proceeding and place it into a separate schedule in order to facilitate potential future legislative or Commission actions regarding the expected useful life of Colstrip

June 4, 2021

TO: Corinne O. Milinovich
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 029
Dated May 21, 2021

Request:

Please refer to the PGE 2019 Integrated Resource Plan page 277 which indicates that PGE's IRP assumes that the FERC license is renewed for the Willamette Falls Hydro Project, which includes the Sullivan Plant.

a. Please confirm that this assumption means that in the 2019 IRP the hydro project operates beyond 2035.
b. Please also refer to page VI-5 of the depreciation study which indicates the probable retirement date for the Sullivan Plant is 2035. Please explain why PGE's decommissioning study's end of life for the Sullivan Plant differs from the IRP end of life.

Response:

a. Yes, the hydro project is assumed to operate beyond 2035 in PGE's 2019 IRP.
b. The Sullivan plant end of life assumption differs in PGE's depreciation study compared to PGE's 2019 IRP because it is prepared based on accounting principles. Although PGE expects that the hydro project will renew its FERC license, PGE's policy is to only adjust accounting and depreciation schedules when the license renewal is obtained.

June 4, 2021

TO: Corinne O. Milinovich
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 033
Dated May 21, 2021

Request:

Please refer to the response to AWEC DR 0015. Please confirm that PGE has no additional documentation of its basis for departing from the indicated survivor curves other than that provided in response to AWEC DR 0015. If not confirmed, please provide such documentation.

Response:

As previously stated, life analysis is conducted for all accounts in the same manner which includes a combination of statistical analysis and informed judgment. The key factors are described in Part III of the Depreciation Study. This includes industry statistics and all the information obtained during the conduct of past depreciation studies over the last 10 years and were reflected in the past studies.

June 4, 2021

TO: Corinne O. Milinovich
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 034
Dated May 21, 2021

Request:

Please refer to the response to AWEC DR 0016. Please confirm that PGE has no additional documentation of its basis for the recommended net salvage values of accounts not listed in page IV-2 other than that provided in response to AWEC DR 0016. If not confirmed, please provide such documentation.

Response:

As previously stated, net salvage analysis is conducted for all accounts in the same manner which includes a combination of statistical analysis and informed judgment. The key factors are described in Part IV of the Depreciation Study. This includes industry statistics and all the information obtained during the conduct of past depreciation studies over the last 10 years and were reflected in the past studies.

August 20, 2021

TO: Jesse O. Gorsuch
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 036
Dated August 13, 2021

Request:

Please refer to the Depreciation Report, page VII-203. Please provide all documentation related to PGE's retirement of previously owned helicopters. Please include:

a. Documentation of condition of the helicopter at the time of retirement.
b. Basis for retiring the helicopter.
c. Maintenance logs of the helicopter for the year prior to retirement.
d. All invoices associated with retiring the helicopter, including removal and salvage.

Response:

a. Between 1980 and 2010, PGE owned a 1980 Eurocopter MBB BO-105. The helicopter was removed from service in January 2010 and sold to a third party, Tactical Helicopters, LLC. PGE applied for approval of the Sale of Property on March 29, 2010 in OPUC Docket No. UP-258. Order No. 10-179 approved the sale on May 13, 2010. Please refer to PGE's initial application in UP 258 for documentation relevant to parts (a), (b), and (d). This application is available on the Commission website.[1]
b. See response to part (a).
c. Given that PGE sold the 1980 Eurocopter MBB BO-105 in 2010, PGE has not retained maintenance records for this aircraft.
d. See response to part (a).

[1] https://www.oregon.gov/puc/edockets/Pages/default.aspx

August 20, 2021

TO: Jesse O. Gorsuch
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 037
Dated August 13, 2021

Request:

Please refer to PGE's response to AWEC DR 18, part a. Please confirm that PGE will continue to incur operating expenses and receive generation from Colstrip beyond 2027 if Colstrip owners vote to continue operation beyond 2027.

Response:

Should PGE remain a co-owner of Colstrip and should Colstrip continue to operate beyond 2027, then PGE would most likely continue to incur operating expenses and receive a share of generation.

However, if the UM 2152 Stipulation between PGE, OPUC Staff, and CUB (Stipulating Parties), filed with the Commission July 29, 2021 is approved by the Commission, then Colstrip will have a probable retirement date of December 31, 2025. At that point, Colstrip will be fully depreciated from customer prices. ORS 757.518(4) requires the Commission to authorize PGE to include in the company's allocation of electricity the costs and benefits associated with Colstrip for up to five years after it is fully depreciated.

August 20, 2021

TO: Jesse O. Gorsuch
Alliance of Western Energy Consumers'

FROM: Jaki Ferchland
Manager, Revenue Requirement

PORTLAND GENERAL ELECTRIC
UM 2152
PGE Response to AWEC Data Request No. 038
Dated August 13, 2021

Request:

Have the Colstrip owners voted on early closure of each Colstrip unit? If yes, describe the nature and outcome for each vote and for each unit from 2010 to present. Please identify how PGE voted in each vote. For each unit that has not had an early closure vote, why not?

Response:

No.

August 27, 2021

To: Jesse O. Gorsuch
Alliance of Western Energy Consumers

From: Jaki Ferchland
Manager, Revenue Requirement

Portland General Electric Company
UM 2152
PGE Response to AWEC Data Request 042
Dated August 20, 2021

Request:

Has PGE ever purchased or sold assets from or to other utilities or customers with a transfer price based on the net book value of the asset? If yes, please identify the five most recent transactions.

Response:

PGE objects to this request on the grounds that it is unduly burdensome. Without waiving and notwithstanding this objection PGE responds as follows:

Yes. PGE has in the past both sold and purchased assets based on the net book value of the asset. This has typically occurred infrequently and has generally involved purchases or sales between PGE and another utility. The most recent dockets PGE was able to identify that calculated a purchase price using this method are: Docket Nos. UP 343, UP 176, and UP 174. It is more common for PGE to purchase or sell an asset based on either a replacement value or based on the current market value. It is also worth noting that the net amounts resulting from sales of utility property are placed into a Commission established property sales balancing account and ultimately amortized back to customers.

August 27, 2021

To: Jesse O. Gorsuch
Alliance of Western Energy Consumers

From: Jaki Ferchland
Manager, Revenue Requirement

Portland General Electric Company
UM 2152
PGE Response to AWEC Data Request 043
Dated August 20, 2021

Request:

Please provide the basis for the recommended survival curve deviating from survival curve that minimizes the deviation between the life tables in Section VII of the depreciation study and the smoothed survivor curve for the following accounts:

a. 311.00
b. 332.00
c. 336.00
d. 341.00
e. 341.01. For this account, please also explain why this curve deviates from all other structures and improvement account recommendations.
f. 345.00
g. 352.00
h. 392.10

Response:

The process for determining survivor curves for each account is described in Part III of the Depreciation Study. As discussed, the process of life analysis and life estimation is not a statistical exercise of historical data but a determination of the forecasted life characteristics of the assets in the account. One aspect of life analyses is the statistical analysis of the past, as is presented in Part VII of the study. This is plotted along with the smooth survivor curve to illustrate a visual comparison. For the accounts listed above, the statistical indications of the past are not conclusive in determining a full life cycle of the assets in the account or subaccount. Therefore, the other factors discussed in Part III contribute to the determination of the most appropriate survivor curve. Changes in technology, changes in a company's policies and practices, industry trends, current estimates for the company, and estimates of others in the industry are considered when selecting a representative survivor curve for future expectations.

For Accounts, 311.00, 332.00, 336.00, 341.00 and 345.00, the survivor curve represents an interim survivor curve. These curves represent rates of retirement during the time the generating facility is in service and prior to final retirement. In each case, the interim survivor curve is a close approximation of the life characteristics for a majority of the historical data but deviates at later ages to incorporate some of the other factors discussed such as company plans, technology, and the nature of the assets in the account as they age. For Account 341.01, the historic data is inconclusive due to such a short period of time of assets being in service. Therefore, industry information and an understanding of the assets are the key factors for life estimation. For Account 352.00, Structure and Improvements, which relates to structures at transmission substations, the statistical data is consistent with the survivor curve for the first 40 ages which includes all types of structures in the account today. The assets that have exceeded age 50 are not a good indicator of the future as many of these assets will be retired when the older generation assets are retired in the short term. A 70-year average life is very long for these assets, particularly for the type of structures going into service today. For account 392.10, the statistical data is not a realistic indicator of all assets in this account. The 20-year average life and 30-year maximum life is a reasonable indicator for the assets in this account and comparable to others in the industry.

August 27, 2021

To: Jesse O. Gorsuch
Alliance of Western Energy Consumers

From: Jaki Ferchland
Manager, Revenue Requirement

Portland General Electric Company
UM 2152
PGE Response to AWEC Data Request 044
Dated August 20, 2021

Request:

Please provide the basis for PGE's recommended net salvage rate for account 392.10.

Response:

As discussed in Part IV of the Depreciation Study, the basis of the net salvage estimate for account 392.10 was analysis of the available historical net salvage data for PGE's transportation equipment accounts from transaction years 2000 to 2019 as well as PGE expectations for future net salvage activity and markets for retired equipment. All subaccounts of transportation equipment were analyzed together based on the available data. These factors were used along with judgement, informed by conducting studies of similar assets throughout the country, in order to determine the recommended net salvage percentage. In the case of account 392.10, the expectation is that, with the 20-year average life, the gross salvage will exceed the cost of removal by 15 percent throughout the entire life cycle.

August 27, 2021

To: Jesse O. Gorsuch
Alliance of Western Energy Consumers

From: Jaki Ferchland
Manager, Revenue Requirement

Portland General Electric Company
UM 2152
PGE Response to AWEC Data Request 045
Dated August 20, 2021

Request:

Does PGE believe that the salvage process and net salvage value is similar for helicopters and ground transportation equipment? If yes, why? If no, how does it differ?

Response:

PGE believes that the process for determining a net salvage percent for helicopters is similar to the process for determining a net salvage percent for other forms of transportation equipment, and as such, has performed and presented the net salvage analysis of these accounts together.

PGE does not believe that the typical net salvage value for helicopters is the same as the typical net salvage value for most ground transportation equipment. However, determining net salvage percentages may include larger groups of data until more specific group data is available. For all transportation equipment, the recommended net salvage percentage is positive 15 percent, which over the last 20 years reflects $36.2 million in retirements versus $6.6 million in gross salvage, or positive 18 percent. The statistical analysis of all transportation equipment, including the helicopter subaccount, can be supported by the positive 15 percent until further detailed information is available by subaccount to determine an alternative net salvage percentage for the helicopter as compared to the other ground transportation equipment.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)

EXHIBIT AWEC/103

DEPRECIATION BACKGROUND

Background

Q. WHAT IS DEPRECIATION IN THE CONTEXT OF THIS CASE?

A. The term depreciation can take on different meanings in different contexts. Depreciation, in the context of this case, is the allocation of the capital cost of plant, net of salvage, across the service life of the plant. In a depreciation case, all proposals and recommendations are simply different allocations of costs across time. In the long run, the total dollars recovered by the company are unchanged[1/] and in the interim, the Company has the opportunity to receive a fair return on the unrecovered dollars.

Q. WHAT PRINCIPLES GUIDE THE ALLOCATION OF DEPRECIATION COSTS?

A. The allocation of depreciation costs is sensitive to many factors, and Commission discretion plays a large role in how recovery of capital is spread across time. For example, PGE proposes the equal life group ("ELG") for most accounts, but average service life group for other accounts with specific locations placed in service after 2012.[2/] The use of ELG over Average Life Group ("ALG" or "Vintage Group") shifts recovery of capital closer to the present, increasing allocations for current ratepayers and decreasing allocations for future ratepayers. Commissions generally acknowledge both ELG and ALG as acceptable cost allocations despite the greatly different allocation results as illustrated in the table below.[3/]

1/ This assumes prudent investment. High depreciation rates can encourage utilities to over-invest in capital in order to support target earnings per share growth or other corporate goals.

2/ Depreciation Study at iii.

3/ This table is modified from page 173 of Public Utility Depreciation Practices, NARUC, August 1996.

	Share of Total Depreciation	
Age	*Equal Life Group*	*Average Life Group*
0.5	12%	8%
1.5	11%	8%
2.5	10%	8%
3.5	9%	8%
4.5	8%	8%
5.5	8%	7%
6.5	7%	7%
7.5	6%	7%
8.5	6%	6%
9.5	5%	6%
10.5	4%	5%
11.5	4%	5%
12.5	3%	4%
13.5	2%	3%
14.5	2%	3%
15.5	1%	2%
16.5	1%	2%
17.5	1%	1%
18.5	1%	1%
19.5	0%	1%

Judgments about cost allocations are ultimately judgments about rates. Oregon statute provides that rates must be just and reasonable.[4/] NARUC provides further guidance regarding depreciation by recommending that "regulators should strive to ensure that the unrecovered dollars are reasonable in relationship to the property's remaining life."[5/] In utility rate regulation, cost of service provides the basis for measuring reasonableness of rates.[6/] In Oregon, costs are allocated according to causation and benefit. Thus, the Commission must make a judgment about whether the

4/ ORS 757.210.
5/ Public Utility Depreciation Practices, NARUC, August 1996, at 187.
6/ Principles of Public Utility Rates, James C. Bonbright, at 66-67 (1960).

depreciation proposals in this case fairly allocate capital costs across time in accordance with causation and benefit.

Q. WHY IS ALLOCATION OF COSTS ACCORDING TO CAUSATION AND BENEFIT APPROPRIATE?

A. Allocating costs according to causation and benefit is economically efficient because it provides price signals to customers about the costs associated with their energy consumption choices.

Q. WHAT VARIABLES AFFECT ALLOCATION OF COSTS IN THIS CASE?

A. The rates developed in this case are the results of depreciation parameters and depreciation models. Depreciation parameters refer to the assumed retirement patters (such as average life and dispersion of IOWA curves) and net salvage rates. Retirement patterns define the expected service life of a group or subgroup of assets. Net Salvage Rates define the total capital recovered over the service life.

A depreciation model converts depreciation patterns and account balances into rates. A depreciation model consists of:

1. A Method for distributing capital costs across the service life of a group. Examples include unit cost (for example, tons of coal is a common unit cost for coal mines) and straight line, which is used for most utility accounts;
2. A Procedure for grouping assets and defining the time period that the group's capital recovery amount is spread over; and
3. A Technique for calculating depreciation rates, such as the Whole Life Technique or the Remaining Life Technique, the latter of which is proposed by the Stipulating Parties.

Depreciation parameters are fundamentally forecasts of retirements and salvage costs. They do not require direct judgments regarding appropriate fair and equitable allocations. However, they do affect allocations, and errors in forecasting can result in unfair allocations, even if allocation judgements were fair and equitable. When judgement is applied to selecting depreciation parameters, the judgement involves forecasting decisions rather than equity decisions.

The depreciation model contains the main application of judgement regarding equity. For example, selection of the straight-line method allocates capital recovery uniformly across the service life of a group. Most commissions approve straight-line methods. This treats customers equally across time, but not necessarily equally across value. For example, new vehicles may have better gas mileage and lower maintenance cost than older vehicles. Thus, customers receive more value in the first year of a vehicle's service life than in the second year of the vehicles service life.

The selection of a straight-line method reveals a preference for allocating costs equally across the service life over unequally across the service life. This selection plays an important consideration in the treatment of excess reserves.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)
	)

EXHIBIT AWEC/104

PGE 2012 TO 2019 RESERVE IMBALANCE SUMMARY

UM-2152 PGE 2019 Depreciation Study

Account	Original Cost	Calculated Accrued	Alloc. Book Reserve	Future Book Accruals	Annual Accrual	Remaining Life	Reserve Imbalance	Reserve Imbalance Pct
31100	117,227,390	97,832,964	102,160,808	19,755,678	2,525,322	8	4,327,844	4%
31200	256,228,933	186,809,877	191,047,771	75,430,319	9,552,728	8	4,237,894	2%
31400	72,869,038	57,435,901	50,194,898	25,588,901	3,363,349	8	-7,241,003	-13%
31500	23,503,446	19,950,084	20,506,294	3,937,289	515,725	8	556,210	3%
31600	6,495,791	5,193,984	5,411,803	1,343,820	176,123	8	217,819	4%
33100	84,069,522	36,264,845	27,887,176	102,348,992	3,729,970	27	-8,377,669	-23%
33200	358,769,141	186,527,381	170,500,839	436,974,444	13,877,724	31	-16,026,542	-9%
33300	76,994,706	42,084,396	40,407,390	84,101,715	2,936,786	29	-1,677,006	-4%
33400	31,601,534	12,256,857	9,883,168	41,879,027	1,594,252	26	-2,373,689	-19%
33500	2,953,736	1,934,720	1,471,470	3,563,360	165,803	21	-463,250	-24%
33600	15,391,900	8,530,753	7,331,417	17,803,496	641,985	28	-1,199,336	-14%
34100	176,384,884	52,333,591	58,687,335	124,843,767	3,993,499	31	6,353,744	12%
34101	53,718,221	12,445,614	13,979,337	42,773,387	1,426,585	30	1,533,723	12%
34200	147,256,858	82,039,059	99,279,378	57,176,671	3,023,174	19	17,240,319	21%
34400	1,079,609,902	258,754,787	289,788,000	829,528,291	30,806,408	27	31,033,213	12%
34401	1,320,494,668	370,278,834	420,757,622	974,511,750	39,846,896	24	50,478,788	14%
34402	4,427,436	837,999	-244,508	4,760,493	346,773	14	-1,082,507	-129%
34500	79,335,767	27,843,965	32,608,329	50,340,285	2,125,889	24	4,764,364	17%
34501	41,801,199	12,574,740	12,114,018	32,049,930	1,576,706	20	-460,722	-4%
34600	41,970,601	7,939,805	9,076,099	34,582,306	1,011,840	34	1,136,294	14%
34601	2,110,383	414,720	498,055	1,733,601	57,693	30	83,335	20%
35200	30,274,033	9,623,622	10,495,308	25,833,532	561,186	46	871,686	9%
35300	491,807,390	142,574,689	152,461,350	437,707,519	11,499,569	38	9,886,661	7%
35400	48,824,327	31,383,577	28,284,490	25,422,270	907,266	28	-3,099,087	-10%
35500	83,364,422	34,143,404	48,312,653	76,733,981	2,489,182	31	14,169,249	41%
35600	169,438,107	66,850,073	118,529,590	84,796,138	1,814,594	47	51,679,517	77%
35900	286,332	156,529	182,621	103,711	3,553	29	26,092	17%
36100	46,326,091	17,092,721	18,502,597	39,405,017	906,387	43	1,409,876	8%
36200	559,680,235	171,001,395	172,063,320	499,552,961	14,608,815	34	1,061,925	1%
36300	393,191	190,292	153,981	258,869	34,830	7	-36,311	-19%
36400	420,065,793	175,989,617	251,862,062	357,233,338	14,311,985	25	75,872,445	43%
36500	664,059,809	314,770,465	423,135,365	672,563,319	20,976,771	32	108,364,900	34%
36600	29,515,628	8,345,912	10,876,607	21,590,584	334,458	65	2,530,695	30%
36700	907,226,217	393,377,951	525,453,052	1,016,831,516	25,225,589	40	132,075,101	34%
36800	469,865,715	161,236,054	215,375,023	301,477,264	8,588,138	35	54,138,969	34%
36901	81,320,051	28,047,698	47,251,341	58,464,726	1,744,137	34	19,203,643	68%
36903	414,063,514	191,002,381	299,302,891	238,979,678	5,850,994	41	108,300,510	57%
37000	9,657,144	3,177,412	1,467,083	8,672,918	554,790	16	-1,710,329	-54%
37001	168,652,948	78,573,581	70,653,254	106,432,341	13,498,293	8	-7,920,327	-10%
37002	6,976,675	5,145,959	5,044,542	2,280,966	335,762	7	-101,417	-2%
37100	1,749,713	273,530	304,152	1,445,561	58,028	25	30,622	11%
37301	25,077,571	14,526,627	19,265,150	12,081,813	528,497	23	4,738,523	33%
37302	83,684,633	26,421,605	38,911,879	65,693,913	3,953,547	17	12,490,274	47%
37307	8,491,048	6,351,704	10,562,085	51,725	3,198	16	4,210,381	66%
39000	120,715,527	35,451,282	38,410,129	94,376,951	4,116,427	23	2,958,847	8%
39010	25,372,002	9,577,723	9,883,749	15,488,253	664,356	23	306,026	3%
39110	27,575,297	10,210,537	11,495,053	16,080,244	1,622,109	10	1,284,516	13%
39120	132,932,473	70,559,350	71,660,244	61,272,229	22,880,453	3	1,100,894	2%
39204	26,034,187	7,193,333	8,901,768	13,227,291	1,133,927	12	1,708,435	24%
39205	27,983,974	7,590,772	12,134,378	11,652,000	1,007,460	12	4,543,606	60%
39206	13,283,122	4,296,934	5,240,003	6,050,651	725,094	8	943,069	22%
39208	6,347,528	2,202,831	3,043,068	2,352,331	136,945	17	840,237	38%
39209	2,043,598	715,546	978,168	758,891	96,225	8	262,622	37%
39210	2,764,850	1,306,373	1,270,504	1,079,619	125,178	9	-35,869	-3%
39300	3,877,884	1,455,442	1,478,661	2,399,223	186,677	13	23,219	2%
39400	23,093,382	6,289,457	7,656,948	15,436,434	989,883	16	1,367,491	22%
39500	8,901,074	5,669,697	5,143,832	3,757,242	704,398	5	-525,865	-9%
39601	29,181,884	9,568,310	8,557,908	17,705,788	2,393,290	7	-1,010,402	-11%
39602	3,512,906	2,220,533	1,846,351	1,315,264	302,675	4	-374,182	-17%
39603	4,882,320	2,266,089	2,957,218	1,436,870	104,278	14	691,129	30%

39607	7,053,658	3,188,521	4,139,890	2,208,402	194,594	11	951,369	30%
39701	21,148,863	4,735,165	4,353,078	16,795,785	1,436,883	12	-382,087	-8%
39703	154,202,963	76,486,446	75,242,516	78,960,447	7,976,799	10	-1,243,930	-2%
39706	2,987,372	494,538	397,615	2,589,757	209,578	12	-96,923	-20%
39707	889,801	727,547	755,880	133,921	17,128	8	28,333	4%
39800	1,295,282	184,603	187,686	1,107,596	64,240	17	3,083	2%
Total	9,360,095,592	3,622,932,703	4,307,531,742	7,384,826,372	299,173,396	34	684,599,039	19%

UM 1809 PGE 2015 Depreciation Study

Account	Original Cost	Calculated Accrued	Alloc. Book Reserve	Future Book Accruals	Annual Accrual	Remaining Life	Reserve Imbalance	Reserve Imbalance
31100	222,031,509	170,738,249	184,961,536	42,739,698	5,645,307	8	14,223,287	8%
31200	488,111,982	331,073,023	354,164,188	145,712,145	20,442,426	7	23,091,165	7%
31201	10,039,472	5,668,814	8,451,505	1,587,967	103,622	15	2,782,691	49%
31400	160,183,824	116,502,901	110,521,031	53,459,522	6,471,580	8	-5,981,870	-5%
31500	47,493,367	36,517,876	38,966,078	9,707,329	1,293,130	8	2,448,202	7%
31600	12,704,585	9,046,246	9,810,639	3,210,458	452,789	7	764,393	8%
33100	53,251,268	28,264,484	16,415,282	77,697,421	2,382,667	33	-11,849,202	-42%
33200	333,125,125	147,175,916	117,705,681	476,910,062	13,329,918	36	-29,470,235	-20%
33300	60,671,875	35,923,251	32,513,525	73,728,045	2,328,380	32	-3,409,726	-9%
33400	18,667,254	10,165,414	7,291,756	25,798,619	948,518	27	-2,873,658	-28%
33500	2,098,574	1,744,478	1,038,709	2,719,706	116,341	23	-705,769	-40%
33600	11,060,462	8,200,079	5,580,858	15,434,611	512,902	30	-2,619,221	-32%
34100	116,893,055	38,048,260	44,456,099	80,040,860	2,678,029	30	6,407,839	17%
34101	50,662,253	6,858,867	8,768,323	45,769,214	1,393,194	33	1,909,456	28%
34200	124,564,873	73,244,991	92,446,636	40,203,890	2,050,733	20	19,201,645	26%
34400	664,999,139	178,855,493	176,007,859	532,000,080	24,278,841	22	-2,847,634	-2%
34401	1,307,118,896	252,079,795	242,815,982	1,164,408,636	52,745,072	22	-9,263,813	-4%
34402	1,467,562	44,907	41,740	1,455,173	89,801	16	-3,167	-7%
34500	66,179,843	20,756,632	24,587,049	45,511,705	2,168,384	21	3,830,417	18%
34501	41,297,767	7,094,110	6,478,226	37,965,350	1,767,505	21	-615,884	-9%
34600	13, 371,807.43	4,719,053	5,630,367	8,579,819	331,672	26	911,314	19%
34601	1,810,066	239,148	282,978	1,667,029	58,515	28	43,830	18%
35200	19,312,917	6,981,707	7,936,981	14,272,874	344,467	41	955,274	14%
35300	273,812,494	90,601,977	99,144,931	215,739,436	6,334,332	34	8,542,954	9%
35400	46,819,259	27,545,030	24,217,309	27,283,876	881,028	31	-3,327,721	-12%
35500	25,714,210	9,510,682	11,988,605	26,582,710	889,302	30	2,477,923	26%
35600	73,514,807	35,055,676	60,343,434	27,874,334	604,939	46	25,287,758	72%
35900	286,332	141,309	159,587	126,745	3,957	32	18,278	13%
36100	39,801,374	15,232,968	14,627,097	35,124,621	884,126	40	-605,871	-4%
36200	472,305,680	164,254,734	145,636,170	421,130,646	13,465,426	31	-18,618,564	-11%
36300	387,216	76,158	51,298	355,279	32,923	11	-24,860	-33%
36400	349,610,655	177,227,204	253,174,817	271,241,166	10,332,478	26	75,947,613	43%
36500	597,352,192	311,777,527	401,592,869	596,905,858	19,871,601	30	89,815,342	29%
36600	15,385,201	7,291,218	9,995,741	6,927,980	144,328	48	2,704,523	37%
36700	690,312,081	332,613,747	428,571,957	744,958,580	20,951,550	36	95,958,210	29%
36800	357,878,099	142,054,819	182,350,295	229,209,519	7,052,775	32	40,295,476	28%
36901	61,300,423	25,934,440	40,906,305	38,784,245	1,175,241	33	14,971,865	58%
36903	354,770,903	172,128,654	274,949,537	186,252,637	5,106,647	36	102,820,883	60%
37000	5,909,029	2,037,546	779,879	5,720,053	353,212	16	-1,257,667	-62%
37001	136,195,805	50,028,887	41,386,300	108,429,085	11,860,826	9	-8,642,587	-17%
37002	7,301,494	5,008,649	3,414,262	4,617,382	655,312	7	-1,594,387	-32%
37100	376,133	205,884	282,975	93,158	6,448	14	77,091	37%
37301	21,950,397	12,570,762	17,460,094	11,075,422	482,662	23	4,889,332	39%
37302	52,526,977	18,004,132	28,258,893	40,026,177	2,635,333	15	10,254,761	57%
37307	8,491,021	5,987,270	10,386,209	652,118	41,311	16	4,398,939	73%
39000	94,090,980	24,573,626	25,831,389	72,964,140	3,598,550	20	1,257,763	5%
39010	25,372,002	7,069,800	7,097,535	18,274,466	699,128	26	27,735	0%
39110	22,059,425	7,537,113	7,299,101	14,760,324	1,505,944	10	-238,012	-3%
39120	88,303,504	37,365,547	36,391,147	51,912,357	17,115,351	3	-974,400	-3%
39204	16,137,569	5,140,998	7,079,625	8,251,065	527,515	16	1,938,627	38%
39205	14,767,748	6,338,982	8,146,081	5,883,280	609,502	10	1,807,099	29%
39206	10,963,150	4,395,537	5,118,816	5,296,177	626,234	8	723,279	16%
39208	6,382,395	2,118,197	3,024,836	3,038,439	173,768	17	906,639	43%
39209	1,234,095	573,036	514,421	657,970	123,392	5	-58,615	-10%
39210	2,703,076	949,090	856,756	1,711,166	141,474	12	-92,334	-10%
39300	2,830,642	1,384,797	1,410,975	1,419,667	134,666	11	26,178	2%
39400	15,411,226	5,600,747	5,412,448	9,998,778	814,541	12	-188,299	-3%
39500	9,245,947	5,703,754	4,126,837	5,119,110	1,037,204	5	-1,576,917	-28%
39601	25,700,584	11,429,928	13,451,565	9,678,961	1,210,977	8	2,021,637	18%
39602	7,108,489	3,123,816	4,083,549	2,314,091	250,187	9	959,733	31%
39603	4,701,378	2,369,522	3,405,477	825,763	62,930	13	1,035,955	44%

39607	7,386,693	2,703,813	3,708,898	2,939,125	249,934	12	1,005,085	37%
39701	6,771,133	1,403,341	1,014,926	5,756,207	469,727	12	-388,415	-28%
39703	90,674,615	51,144,526	45,187,175	45,487,440	6,141,122	7	-5,957,351	-12%
39706	354,605	67,050	56,797	297,808	24,804	12	-10,253	-15%

UM-1697 PGE 2012 Depreciation Study

Account	Original Cost	Calculated Accrued	Alloc. Book Reserve	Future Book Accruals	Annual Accrual	Remaining Life	Reserve Imbalance	Reserve Imbalance Pct
31100	218,471,821	140,767,753	171,849,422	53,419,446	4,437,338	12	31,081,669	22%
31200	444,198,579	257,462,872	313,470,883	143,846,476	13,054,638	11	56,008,011	22%
31400	165,500,957	96,478,217	96,976,550	73,194,039	6,095,342	12	498,333	1%
31500	47,139,154	30,312,846	35,897,596	12,655,228	1,087,289	12	5,584,750	18%
31600	12,149,422	7,222,378	8,711,540	3,813,222	332,413	11	1,489,162	21%
33100	47,923,595	25,891,312	11,642,487	84,980,118	2,466,092	34	-14,248,825	-55%
33200	255,948,831	134,357,943	94,611,715	406,165,006	10,859,319	37	-39,746,228	-30%
33300	51,942,365	36,565,760	27,527,125	74,038,104	2,242,510	33	-9,038,635	-25%
33400	16,563,254	8,576,550	5,207,500	25,973,274	907,918	29	-3,369,050	-39%
33500	1,853,414	1,859,391	802,894	3,209,548	132,412	24	-1,056,497	-57%
33600	9,762,959	8,029,871	4,469,327	16,796,894	523,666	32	-3,560,544	-44%
34100	83,128,929	31,195,365	39,156,071	51,442,204	1,699,216	30	7,960,706	26%
34101	32,813,735	3,289,481	4,812,435	30,954,537	910,651	34	1,522,954	46%
34200	115,850,099	68,026,825	89,013,522	36,293,833	1,854,436	20	20,986,697	31%
34400	407,727,720	135,834,324	139,273,063	304,834,334	15,187,169	20	3,438,739	3%
34401	860,382,974	126,608,604	127,377,520	810,439,922	35,197,604	23	768,916	1%
34500	40,602,297	18,063,562	21,742,697	22,070,975	977,756	23	3,679,135	20%
34501	24,958,049	3,138,815	2,866,156	24,338,117	1,097,230	22	-272,659	-9%
34600	9,319,279	3,930,904	5,098,509	5,023,849	214,459	23	1,167,605	30%
34601	847,554	114,591	132,834	790,999	31,455	25	18,243	16%
35200	17,407,070	6,435,281	6,797,117	13,221,013	353,866	37	361,836	6%
35300	241,319,092	78,753,814	82,698,466	194,818,490	6,029,329	32	3,944,652	5%
35400	46,808,292	28,445,112	21,550,183	36,960,181	1,079,228	34	-6,894,929	-24%
35500	20,460,356	8,687,892	9,396,543	27,432,097	988,913	28	708,651	8%
35600	74,129,949	37,722,495	57,901,127	42,174,304	1,021,678	41	20,178,632	53%
35900	339,371	170,855	146,519	192,853	6,680	29	-24,336	-14%
36100	36,822,187	13,254,908	12,249,928	33,777,806	842,106	40	-1,004,980	-8%
36200	384,524,570	140,769,572	120,825,481	340,604,004	11,185,779	30	-19,944,091	-14%
36400	325,204,225	180,730,041	233,516,446	303,070,525	12,242,850	25	52,786,405	29%
36500	533,059,151	282,652,769	324,305,182	608,548,333	22,148,466	27	41,652,413	15%
36600	15,523,586	7,582,953	9,517,421	8,334,703	184,283	45	1,934,468	26%
36700	624,820,669	293,532,001	351,739,956	710,455,181	21,951,949	32	58,207,955	20%
36800	306,548,578	140,293,299	158,484,717	209,373,577	7,431,903	28	18,191,418	13%
36901	40,361,950	24,976,530	37,798,996	20,725,831	708,110	29	12,822,466	51%
36903	337,639,570	176,505,768	263,527,773	226,049,604	6,287,797	36	87,022,005	49%
37000	5,613,935	1,443,335	594,883	5,580,446	318,852	18	-848,452	-59%
37001	112,581,575	22,133,945	20,648,101	103,191,632	9,239,495	11	-1,485,844	-7%
37002	7,523,317	4,481,589	1,781,367	6,494,281	888,856	7	-2,700,222	-60%
37100	376,133	170,832	253,970	122,163	7,254	17	83,138	49%
37301	21,175,640	11,795,771	15,125,414	18,755,610	698,971	27	3,329,643	28%
37302	28,661,422	21,021,083	27,473,507	18,384,767	1,216,886	15	6,452,424	31%
37307	8,483,866	6,550,110	9,442,510	4,131,676	267,170	15	2,892,400	44%
39000	50,907,102	20,398,678	22,999,361	30,453,096	1,475,457	21	2,600,683	13%
39010	20,016,090	5,367,994	5,973,138	14,042,950	514,358	27	605,144	11%
39110	16,154,320	7,115,241	5,067,207	11,087,113	1,777,770	6	-2,048,034	-29%
39120	50,495,109	23,320,434	21,120,607	29,374,501	10,624,019	3	-2,199,827	-9%
39204	10,310,359	4,844,702	7,478,261	1,801,062	127,752	14	2,633,559	54%
39205	13,096,541	5,583,072	7,837,401	3,949,487	460,131	9	2,254,329	40%
39206	8,585,405	4,774,373	5,761,784	1,965,081	327,645	6	987,411	21%
39208	5,035,199	1,886,095	2,414,441	2,117,238	149,698	14	528,346	28%
39209	1,174,747	439,714	422,708	634,565	106,935	6	-17,006	-4%
39210	2,703,076	527,708	564,801	1,867,967	122,655	15	37,093	7%
39300	2,851,686	1,145,844	1,067,992	1,783,694	154,588	12	-77,852	-7%
39400	11,124,759	5,312,497	4,201,984	6,922,774	840,771	8	-1,110,513	-21%
39500	9,949,816	4,889,513	2,780,784	7,169,032	1,422,464	5	-2,108,729	-43%
39601	25,760,291	11,931,900	13,170,098	11,302,179	1,477,363	8	1,238,198	10%
39602	8,491,374	3,686,718	4,659,141	3,407,665	328,124	10	972,423	26%
39603	4,868,443	2,241,589	3,235,875	1,389,147	102,937	13	994,286	44%
39607	5,680,187	2,598,316	3,479,017	1,917,161	174,793	11	880,701	34%

39701	1,833,385	737,613	544,039	1,289,346	116,397	11	-193,574	-26%
39703	69,486,641	41,123,579	31,953,470	37,533,171	5,863,891	6	-9,170,109	-22%
39706	598,856	148,992	303,999	294,857	25,475	12	155,007	104%
39707	688,064	454,326	439,897	248,167	49,235	5	-14,429	-3%
39800	129,175	37,374	93,653	35,522	2,261	16	56,279	151%
Total	6,356,410,118	2,774,403,591	3,111,985,111	5,287,264,977	230,654,053	25	337,581,520	12%

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

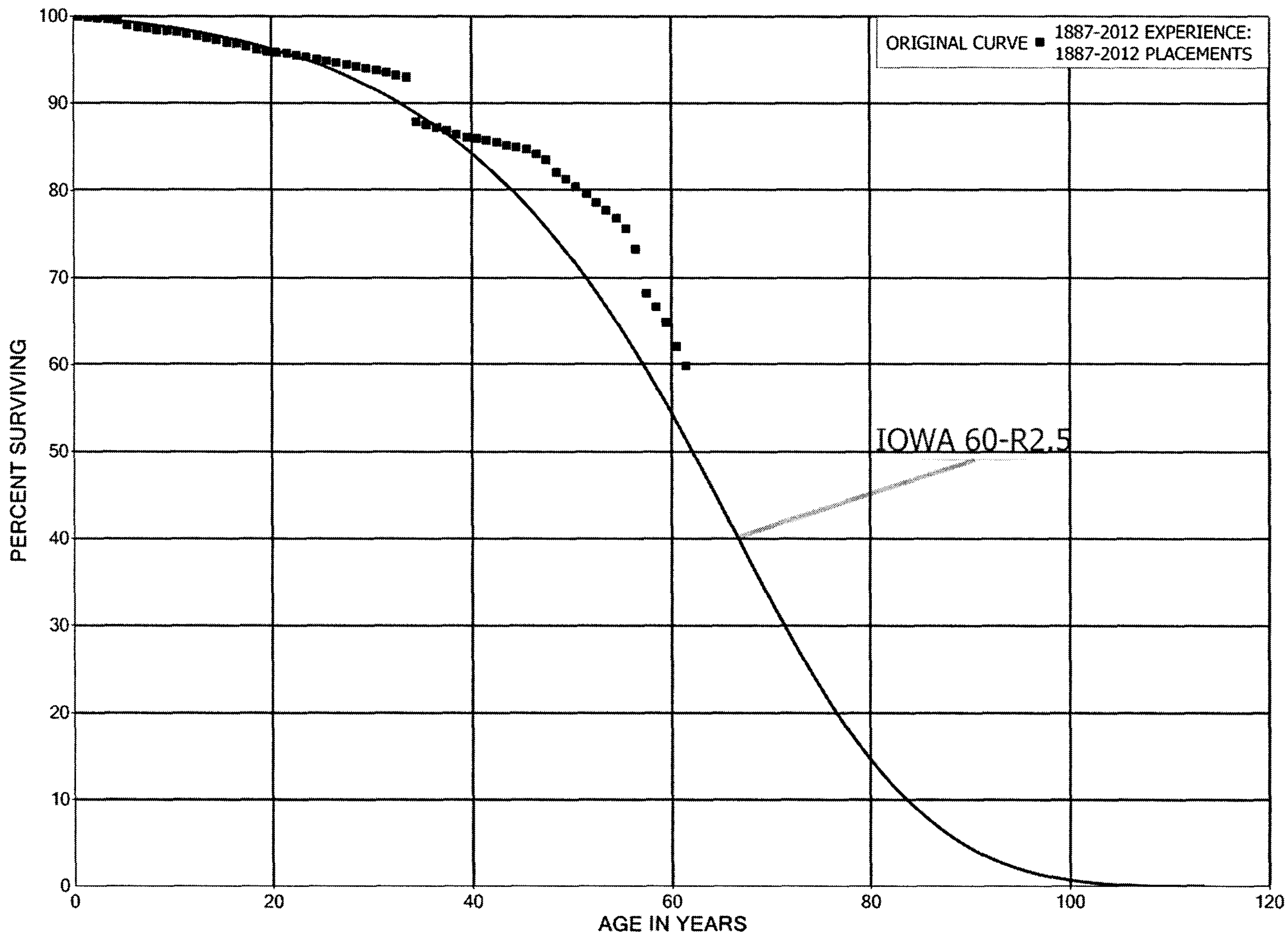
UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)
	)

EXHIBIT AWEC/105

PGE 2012 AND 2019 DEPRECIATION STUDY COMPARISON

PORTLAND GENERAL ELECTRIC
ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1887-2012 EXPERIENCE BAND 1887-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	131,460,633	69,317	0.0005	0.9995	100.00
0.5	129,435,212	150,252	0.0012	0.9988	99.95
1.5	124,633,284	157,553	0.0013	0.9987	99.83
2.5	118,817,914	101,316	0.0009	0.9991	99.71
3.5	104,419,250	107,157	0.0010	0.9990	99.62
4.5	98,539,130	619,183	0.0063	0.9937	99.52
5.5	88,297,203	136,651	0.0015	0.9985	98.89
6.5	85,207,969	129,093	0.0015	0.9985	98.74
7.5	78,026,579	121,017	0.0016	0.9984	98.59
8.5	75,018,125	113,247	0.0015	0.9985	98.44
9.5	74,083,199	122,571	0.0017	0.9983	98.29
10.5	73,183,322	143,813	0.0020	0.9980	98.13
11.5	71,800,756	142,726	0.0020	0.9980	97.93
12.5	70,494,624	167,338	0.0024	0.9976	97.74
13.5	69,344,019	196,016	0.0028	0.9972	97.51
14.5	62,701,784	142,691	0.0023	0.9977	97.23
15.5	61,869,958	139,686	0.0023	0.9977	97.01
16.5	61,167,108	183,281	0.0030	0.9970	96.79
17.5	58,692,269	207,038	0.0035	0.9965	96.50
18.5	58,066,308	95,542	0.0016	0.9984	96.16
19.5	57,544,092	81,979	0.0014	0.9986	96.00
20.5	56,523,543	96,896	0.0017	0.9983	95.86
21.5	56,120,983	112,942	0.0020	0.9980	95.70
22.5	55,581,088	132,039	0.0024	0.9976	95.51
23.5	54,942,827	131,342	0.0024	0.9976	95.28
24.5	54,158,853	128,156	0.0024	0.9976	95.05
25.5	53,795,595	108,821	0.0020	0.9980	94.83
26.5	50,691,301	119,547	0.0024	0.9976	94.64
27.5	50,270,043	98,107	0.0020	0.9980	94.41
28.5	33,036,116	76,833	0.0023	0.9977	94.23
29.5	32,069,772	92,915	0.0029	0.9971	94.01
30.5	30,696,559	82,307	0.0027	0.9973	93.74
31.5	30,410,769	95,913	0.0032	0.9968	93.49
32.5	27,701,044	89,089	0.0032	0.9968	93.19
33.5	27,276,691	1,488,939	0.0546	0.9454	92.89
34.5	25,524,308	104,263	0.0041	0.9959	87.82
35.5	21,738,170	80,004	0.0037	0.9963	87.46
36.5	21,015,858	86,446	0.0041	0.9959	87.14
37.5	20,856,553	85,674	0.0041	0.9959	86.78
38.5	19,044,761	68,165	0.0036	0.9964	86.43

PORTLAND GENERAL ELECTRIC

ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2012 EXPERIENCE BAND 1887-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	18,843,158	42,224	0.0022	0.9978	86.12
40.5	18,432,200	43,100	0.0023	0.9977	85.92
41.5	18,281,858	56,263	0.0031	0.9969	85.72
42.5	17,829,869	48,811	0.0027	0.9973	85.46
43.5	17,621,774	52,850	0.0030	0.9970	85.22
44.5	17,378,141	50,844	0.0029	0.9971	84.97
45.5	7,806,117	54,982	0.0070	0.9930	84.72
46.5	7,648,910	54,679	0.0071	0.9929	84.12
47.5	7,481,301	133,299	0.0178	0.9822	83.52
48.5	6,648,988	59,527	0.0090	0.9910	82.03
49.5	3,525,853	38,463	0.0109	0.9891	81.30
50.5	3,480,875	36,080	0.0104	0.9896	80.41
51.5	1,921,300	23,131	0.0120	0.9880	79.58
52.5	1,859,092	21,628	0.0116	0.9884	78.62
53.5	1,728,967	20,131	0.0116	0.9884	77.71
54.5	1,372,452	21,334	0.0155	0.9845	76.80
55.5	1,188,058	36,638	0.0308	0.9692	75.61
56.5	1,040,101	72,173	0.0694	0.9306	73.28
57.5	963,455	21,500	0.0223	0.9777	68.19
58.5	940,441	25,309	0.0269	0.9731	66.67
59.5	909,858	39,800	0.0437	0.9563	64.88
60.5	866,064	30,588	0.0353	0.9647	62.04
61.5	833,748	9,079	0.0109	0.9891	59.85
62.5	820,439	6,896	0.0084	0.9916	59.20
63.5	802,390	6,002	0.0075	0.9925	58.70
64.5	787,520	2,643	0.0034	0.9966	58.26
65.5	780,397	1,446	0.0019	0.9981	58.06
66.5	778,694	1,344	0.0017	0.9983	57.96
67.5	777,047	923	0.0012	0.9988	57.86
68.5	775,611	4,034	0.0052	0.9948	57.79
69.5	771,507	291	0.0004	0.9996	57.49
70.5	771,195	326	0.0004	0.9996	57.46
71.5	770,869	176	0.0002	0.9998	57.44
72.5	770,694	155	0.0002	0.9998	57.43
73.5	767,769	11,924	0.0155	0.9845	57.42
74.5	754,957	2,656	0.0035	0.9965	56.52
75.5	748,356		0.0000	1.0000	56.32
76.5	741,882		0.0000	1.0000	56.32
77.5	736,817		0.0000	1.0000	56.32
78.5	729,330		0.0000	1.0000	56.32

PORTLAND GENERAL ELECTRIC

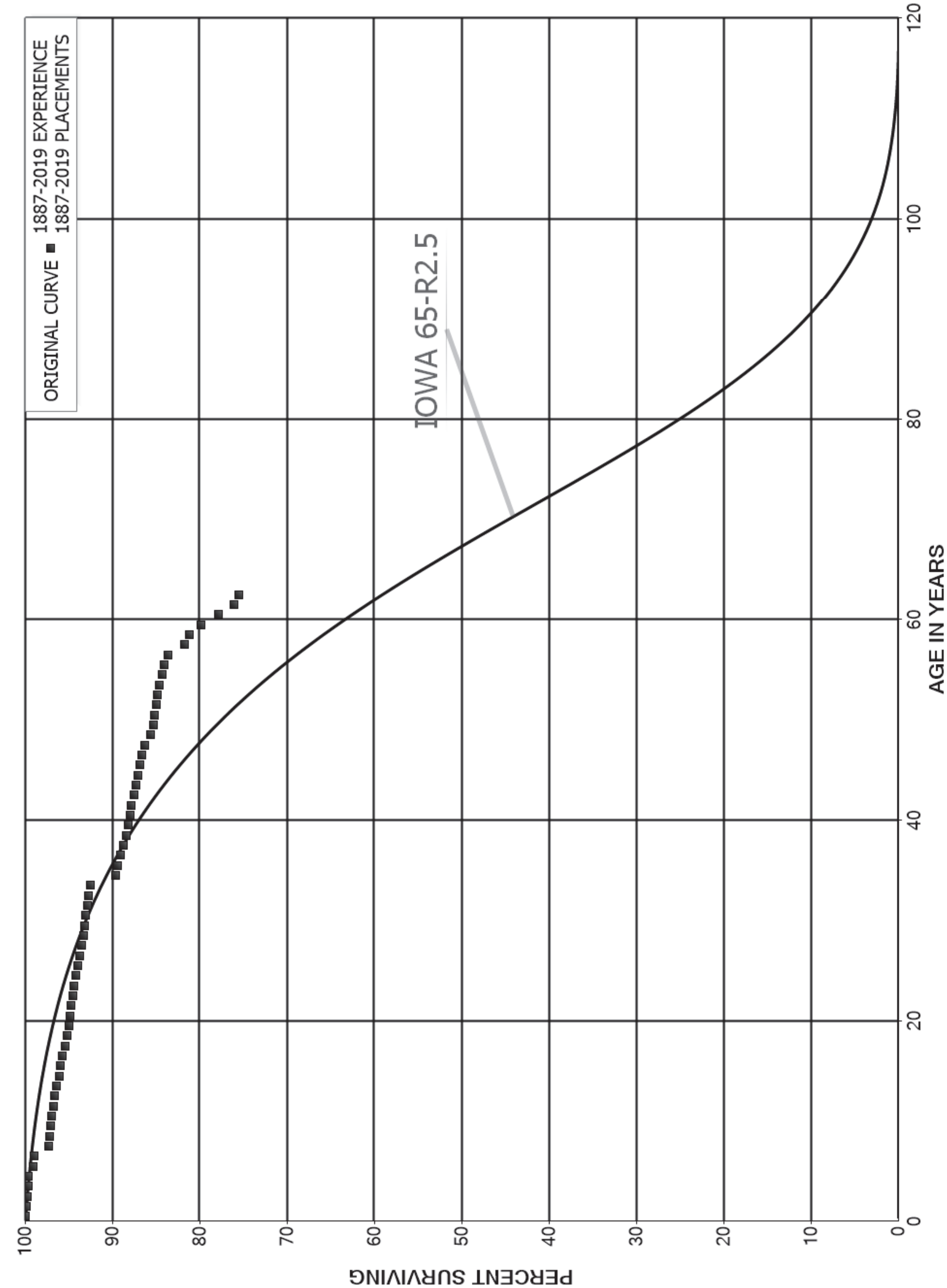
ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2012 EXPERIENCE BAND 1887-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	726,201		0.0000	1.0000	56.32
80.5	723,386		0.0000	1.0000	56.32
81.5	719,418		0.0000	1.0000	56.32
82.5	718,288		0.0000	1.0000	56.32
83.5	717,328		0.0000	1.0000	56.32
84.5	717,064		0.0000	1.0000	56.32
85.5	716,644		0.0000	1.0000	56.32
86.5	716,163		0.0000	1.0000	56.32
87.5	6,123		0.0000	1.0000	56.32
88.5	5,594		0.0000	1.0000	56.32
89.5	5,001		0.0000	1.0000	56.32
90.5	4,491		0.0000	1.0000	56.32
91.5	3,363		0.0000	1.0000	56.32
92.5	2,515		0.0000	1.0000	56.32
93.5					56.32

PORTLAND GENERAL ELECTRIC
ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1887-2019 EXPERIENCE BAND 1887-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	166,208,958	69,317	0.0004	0.9996	100.00
0.5	152,164,317	150,252	0.0010	0.9990	99.96
1.5	132,922,843	157,553	0.0012	0.9988	99.86
2.5	126,735,473	101,316	0.0008	0.9992	99.74
3.5	117,782,308	107,157	0.0009	0.9991	99.66
4.5	116,547,489	619,183	0.0053	0.9947	99.57
5.5	113,752,170	136,651	0.0012	0.9988	99.04
6.5	110,662,937	1,831,470	0.0165	0.9835	98.92
7.5	101,192,784	121,017	0.0012	0.9988	97.29
8.5	97,886,547	113,247	0.0012	0.9988	97.17
9.5	96,951,621	122,571	0.0013	0.9987	97.06
10.5	85,376,512	143,813	0.0017	0.9983	96.93
11.5	79,347,097	142,726	0.0018	0.9982	96.77
12.5	71,346,587	167,338	0.0023	0.9977	96.60
13.5	70,195,983	196,016	0.0028	0.9972	96.37
14.5	68,499,735	142,691	0.0021	0.9979	96.10
15.5	67,667,909	139,686	0.0021	0.9979	95.90
16.5	66,965,059	183,281	0.0027	0.9973	95.70
17.5	66,302,687	207,038	0.0031	0.9969	95.44
18.5	65,678,242	95,542	0.0015	0.9985	95.14
19.5	65,144,842	81,979	0.0013	0.9987	95.00
20.5	64,494,221	96,896	0.0015	0.9985	94.89
21.5	58,323,866	112,942	0.0019	0.9981	94.74
22.5	57,783,971	132,039	0.0023	0.9977	94.56
23.5	57,145,710	131,342	0.0023	0.9977	94.34
24.5	54,549,269	128,156	0.0023	0.9977	94.13
25.5	54,184,622	108,821	0.0020	0.9980	93.91
26.5	53,955,250	119,547	0.0022	0.9978	93.72
27.5	53,175,391	98,107	0.0018	0.9982	93.51
28.5	52,862,967	76,833	0.0015	0.9985	93.34
29.5	51,903,911	92,915	0.0018	0.9982	93.20
30.5	50,530,698	82,307	0.0016	0.9984	93.03
31.5	50,244,907	95,913	0.0019	0.9981	92.88
32.5	49,912,286	89,089	0.0018	0.9982	92.70
33.5	46,595,862	1,488,939	0.0320	0.9680	92.54
34.5	44,857,134	104,263	0.0023	0.9977	89.58
35.5	24,165,876	80,004	0.0033	0.9967	89.37
36.5	23,436,277	86,446	0.0037	0.9963	89.08
37.5	23,276,972	85,674	0.0037	0.9963	88.75
38.5	24,371,903	68,165	0.0028	0.9972	88.42

PORTLAND GENERAL ELECTRIC

ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2019 EXPERIENCE BAND 1887-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	20,550,598	42,224	0.0021	0.9979	88.18
40.5	20,139,640	43,100	0.0021	0.9979	87.99
41.5	19,964,314	56,263	0.0028	0.9972	87.81
42.5	19,498,440	48,811	0.0025	0.9975	87.56
43.5	19,293,178	52,850	0.0027	0.9973	87.34
44.5	19,049,545	50,844	0.0027	0.9973	87.10
45.5	17,172,706	54,982	0.0032	0.9968	86.87
46.5	17,015,499	54,679	0.0032	0.9968	86.59
47.5	16,858,326	133,299	0.0079	0.9921	86.31
48.5	16,683,921	59,527	0.0036	0.9964	85.63
49.5	16,609,919	38,463	0.0023	0.9977	85.32
50.5	16,562,108	36,080	0.0022	0.9978	85.13
51.5	16,516,753	23,131	0.0014	0.9986	84.94
52.5	7,095,107	21,628	0.0030	0.9970	84.82
53.5	7,054,322	20,131	0.0029	0.9971	84.56
54.5	7,003,174	21,334	0.0030	0.9970	84.32
55.5	6,298,324	36,638	0.0058	0.9942	84.06
56.5	3,198,474	72,173	0.0226	0.9774	83.58
57.5	3,121,828	21,500	0.0069	0.9931	81.69
58.5	1,584,594	25,309	0.0160	0.9840	81.13
59.5	1,554,328	39,800	0.0256	0.9744	79.83
60.5	1,421,454	30,588	0.0215	0.9785	77.79
61.5	1,073,334	9,079	0.0085	0.9915	76.11
62.5	922,573	6,896	0.0075	0.9925	75.47
63.5	802,965	6,002	0.0075	0.9925	74.91
64.5	788,095	2,643	0.0034	0.9966	74.35
65.5	780,973	1,446	0.0019	0.9981	74.10
66.5	778,953	1,344	0.0017	0.9983	73.96
67.5	777,047	923	0.0012	0.9988	73.83
68.5	775,611	4,034	0.0052	0.9948	73.74
69.5	771,576	291	0.0004	0.9996	73.36
70.5	771,264	326	0.0004	0.9996	73.33
71.5	770,938	176	0.0002	0.9998	73.30
72.5	770,763	155	0.0002	0.9998	73.29
73.5	767,838	11,924	0.0155	0.9845	73.27
74.5	755,026	2,656	0.0035	0.9965	72.13
75.5	748,425		0.0000	1.0000	71.88
76.5	741,882		0.0000	1.0000	71.88
77.5	737,110		0.0000	1.0000	71.88
78.5	729,623		0.0000	1.0000	71.88

PORTLAND GENERAL ELECTRIC

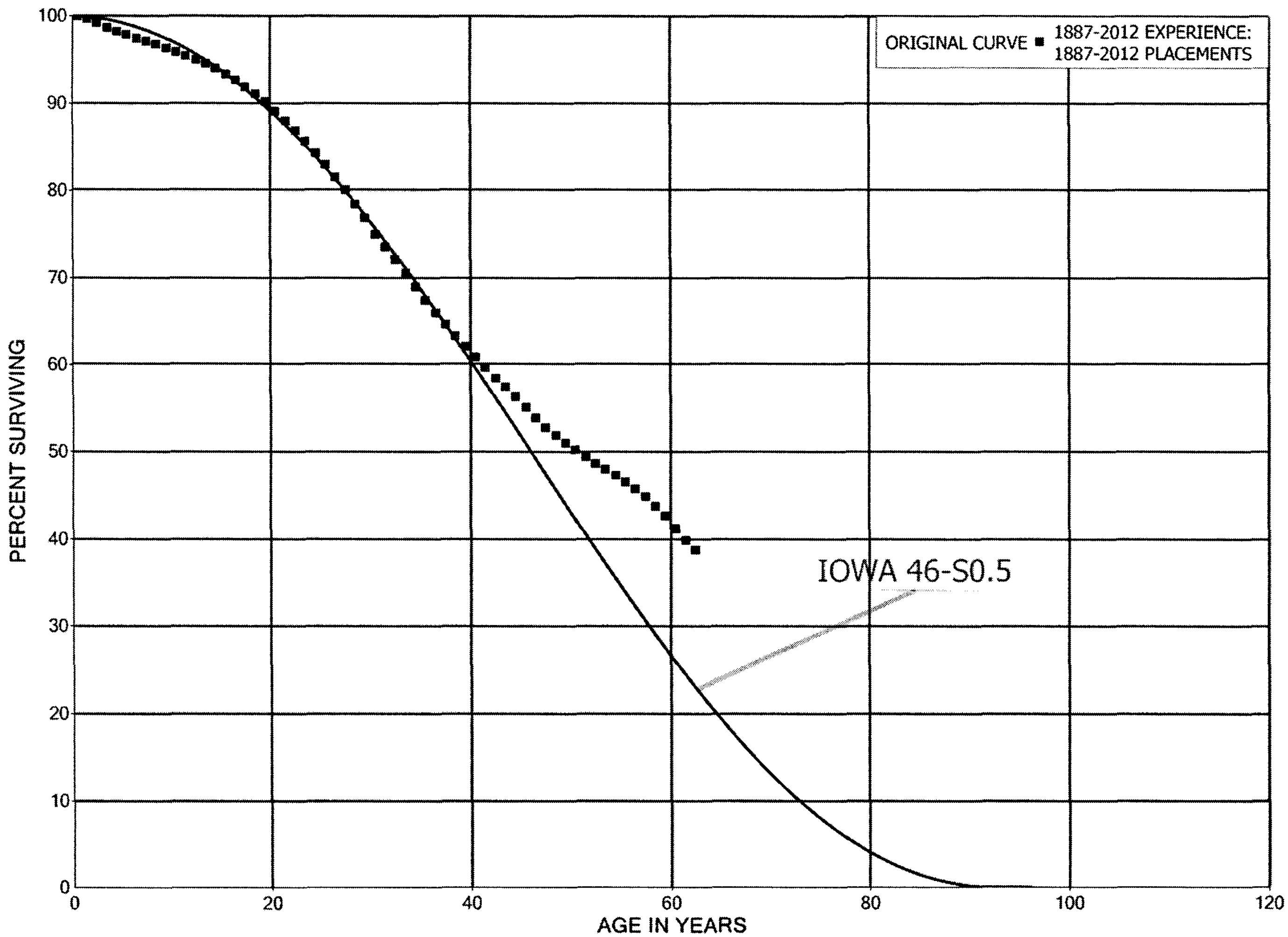
ACCOUNT 356 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2019 EXPERIENCE BAND 1887-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	726,494		0.0000	1.0000	71.88
80.5	723,678		0.0000	1.0000	71.88
81.5	719,711		0.0000	1.0000	71.88
82.5	718,581		0.0000	1.0000	71.88
83.5	717,621		0.0000	1.0000	71.88
84.5	717,064		0.0000	1.0000	71.88
85.5	716,644		0.0000	1.0000	71.88
86.5	716,163		0.0000	1.0000	71.88
87.5	716,043		0.0000	1.0000	71.88
88.5	715,515		0.0000	1.0000	71.88
89.5	714,921		0.0000	1.0000	71.88
90.5	714,411		0.0000	1.0000	71.88
91.5	713,284		0.0000	1.0000	71.88
92.5	712,436		0.0000	1.0000	71.88
93.5	709,921		0.0000	1.0000	71.88
94.5					71.88

PORTLAND GENERAL ELECTRIC
ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1887-2012 EXPERIENCE BAND 1887-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	540,473,483	319,234	0.0006	0.9994	100.00
0.5	520,629,307	1,902,069	0.0037	0.9963	99.94
1.5	488,030,964	2,137,230	0.0044	0.9956	99.58
2.5	450,125,351	2,236,026	0.0050	0.9950	99.14
3.5	423,892,235	1,861,686	0.0044	0.9956	98.65
4.5	408,171,269	1,631,119	0.0040	0.9960	98.21
5.5	383,860,067	1,687,685	0.0044	0.9956	97.82
6.5	361,716,410	1,355,178	0.0037	0.9963	97.39
7.5	346,728,374	1,231,550	0.0036	0.9964	97.03
8.5	320,512,355	1,209,850	0.0038	0.9962	96.68
9.5	307,973,563	1,541,948	0.0050	0.9950	96.32
10.5	292,335,974	1,213,051	0.0041	0.9959	95.83
11.5	270,122,488	1,279,038	0.0047	0.9953	95.44
12.5	235,934,062	1,262,364	0.0054	0.9946	94.99
13.5	218,550,571	1,309,161	0.0060	0.9940	94.48
14.5	201,818,771	1,404,679	0.0070	0.9930	93.91
15.5	182,143,042	1,294,244	0.0071	0.9929	93.26
16.5	159,482,016	1,264,581	0.0079	0.9921	92.59
17.5	141,668,807	1,229,418	0.0087	0.9913	91.86
18.5	126,906,626	1,214,743	0.0096	0.9904	91.06
19.5	114,738,401	1,476,913	0.0129	0.9871	90.19
20.5	101,776,337	1,193,323	0.0117	0.9883	89.03
21.5	92,311,065	1,186,411	0.0129	0.9871	87.99
22.5	82,833,686	1,162,891	0.0140	0.9860	86.86
23.5	76,117,246	1,158,635	0.0152	0.9848	85.64
24.5	71,666,253	1,193,160	0.0166	0.9834	84.33
25.5	67,427,366	1,165,394	0.0173	0.9827	82.93
26.5	63,567,699	1,130,487	0.0178	0.9822	81.50
27.5	59,972,583	1,270,958	0.0212	0.9788	80.05
28.5	56,503,840	1,077,422	0.0191	0.9809	78.35
29.5	53,643,740	1,327,450	0.0247	0.9753	76.86
30.5	50,326,901	962,909	0.0191	0.9809	74.95
31.5	46,358,406	918,648	0.0198	0.9802	73.52
32.5	42,725,882	900,421	0.0211	0.9789	72.06
33.5	38,874,930	866,137	0.0223	0.9777	70.54
34.5	35,674,776	808,661	0.0227	0.9773	68.97
35.5	36,295,350	761,955	0.0210	0.9790	67.41
36.5	34,124,304	714,573	0.0209	0.9791	65.99
37.5	31,164,608	615,135	0.0197	0.9803	64.61
38.5	27,419,172	549,947	0.0201	0.9799	63.34

PORTLAND GENERAL ELECTRIC

ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2012 EXPERIENCE BAND 1887-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	23,851,070	492,776	0.0207	0.9793	62.07
40.5	22,154,481	438,028	0.0198	0.9802	60.78
41.5	19,889,423	388,009	0.0195	0.9805	59.58
42.5	18,323,284	337,114	0.0184	0.9816	58.42
43.5	16,767,602	318,433	0.0190	0.9810	57.35
44.5	12,097,148	264,584	0.0219	0.9781	56.26
45.5	10,590,641	225,701	0.0213	0.9787	55.03
46.5	9,652,945	199,215	0.0206	0.9794	53.85
47.5	8,814,255	157,596	0.0179	0.9821	52.74
48.5	7,883,400	131,926	0.0167	0.9833	51.80
49.5	6,711,045	104,635	0.0156	0.9844	50.93
50.5	5,892,716	82,278	0.0140	0.9860	50.14
51.5	4,832,462	75,649	0.0157	0.9843	49.44
52.5	4,059,436	58,984	0.0145	0.9855	48.66
53.5	3,259,439	48,481	0.0149	0.9851	47.96
54.5	2,628,214	40,178	0.0153	0.9847	47.24
55.5	2,089,563	36,571	0.0175	0.9825	46.52
56.5	1,503,228	29,502	0.0196	0.9804	45.71
57.5	1,154,694	28,414	0.0246	0.9754	44.81
58.5	906,088	22,767	0.0251	0.9749	43.71
59.5	725,573	24,776	0.0341	0.9659	42.61
60.5	563,139	18,186	0.0323	0.9677	41.15
61.5	386,109	10,560	0.0273	0.9727	39.83
62.5	277,286	4,039	0.0146	0.9854	38.74
63.5	1,169,056	969,045	0.8289	0.1711	38.17
64.5	126,386	1,259	0.0100	0.9900	6.53
65.5	75,068	710	0.0095	0.9905	6.47
66.5	52,149	492	0.0094	0.9906	6.40
67.5	46,222	633	0.0137	0.9863	6.34
68.5	38,161	506	0.0133	0.9867	6.26
69.5	32,561	1,629	0.0500	0.9500	6.17
70.5	28,667	236	0.0082	0.9918	5.87
71.5	23,410	143	0.0061	0.9939	5.82
72.5	13,648	73	0.0053	0.9947	5.78
73.5	7,557	52	0.0069	0.9931	5.75
74.5	4,198	79	0.0189	0.9811	5.71
75.5	7,817	94	0.0120	0.9880	5.60
76.5	14,197	177	0.0125	0.9875	5.54
77.5	18,434	261	0.0142	0.9858	5.47
78.5	25,660	295	0.0115	0.9885	5.39

PORTLAND GENERAL ELECTRIC

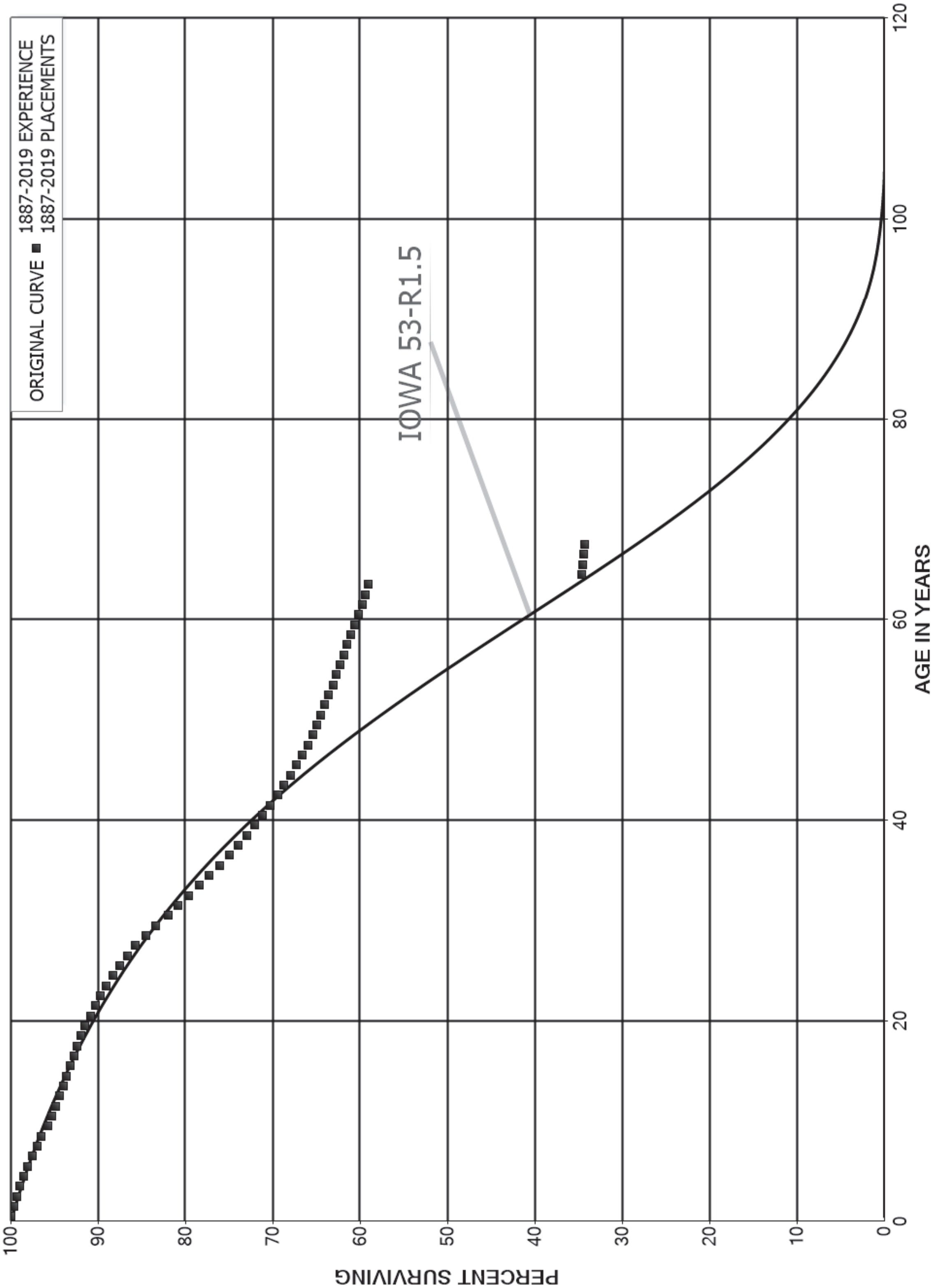
ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2012 EXPERIENCE BAND 1887-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	28,475	438	0.0154	0.9846	5.33
80.5	30,852	496	0.0161	0.9839	5.25
81.5	34,324	447	0.0130	0.9870	5.16
82.5	32,791	488	0.0149	0.9851	5.09
83.5	32,463	347	0.0107	0.9893	5.02
84.5	28,830	324	0.0112	0.9888	4.96
85.5	23,102	257	0.0111	0.9889	4.91
86.5	19,036	166	0.0087	0.9913	4.85
87.5	12,260	122	0.0100	0.9900	4.81
88.5	9,855	71	0.0072	0.9928	4.76
89.5	7,850	75	0.0095	0.9905	4.73
90.5	4,724	51	0.0107	0.9893	4.68
91.5	4,788	44	0.0093	0.9907	4.63
92.5	4,731	58	0.0123	0.9877	4.59
93.5	6,951	66	0.0095	0.9905	4.53
94.5	6,509	93	0.0143	0.9857	4.49
95.5	5,986	105	0.0176	0.9824	4.43
96.5	5,774	86	0.0150	0.9850	4.35
97.5	5,216	107	0.0206	0.9794	4.28
98.5	4,581	34	0.0074	0.9926	4.20
99.5	4,095	57	0.0140	0.9860	4.16
100.5	3,047	49	0.0160	0.9840	4.11
101.5	2,259	76	0.0339	0.9661	4.04
102.5					3.90

PORTLAND GENERAL ELECTRIC
ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1887-2019 EXPERIENCE BAND 1887-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	743,745,084	319,234	0.0004	0.9996	100.00
0.5	708,644,183	2,347,883	0.0033	0.9967	99.96
1.5	619,290,965	2,137,845	0.0035	0.9965	99.63
2.5	581,702,152	2,238,571	0.0038	0.9962	99.28
3.5	573,701,637	2,347,005	0.0041	0.9959	98.90
4.5	568,459,976	2,380,055	0.0042	0.9958	98.50
5.5	551,330,730	2,948,379	0.0053	0.9947	98.08
6.5	527,164,662	3,202,158	0.0061	0.9939	97.56
7.5	516,752,443	2,575,693	0.0050	0.9950	96.97
8.5	491,377,627	3,629,372	0.0074	0.9926	96.48
9.5	466,809,371	2,545,094	0.0055	0.9945	95.77
10.5	439,389,624	2,077,925	0.0047	0.9953	95.25
11.5	413,006,514	1,853,503	0.0045	0.9955	94.80
12.5	389,262,710	1,670,252	0.0043	0.9957	94.37
13.5	365,746,915	1,464,713	0.0040	0.9960	93.97
14.5	345,554,763	1,538,291	0.0045	0.9955	93.59
15.5	317,393,771	1,364,608	0.0043	0.9957	93.17
16.5	304,466,763	1,349,901	0.0044	0.9956	92.77
17.5	288,733,890	1,343,448	0.0047	0.9953	92.36
18.5	265,704,827	1,319,197	0.0050	0.9950	91.93
19.5	230,836,313	1,581,870	0.0069	0.9931	91.48
20.5	212,780,973	1,298,810	0.0061	0.9939	90.85
21.5	195,772,445	1,280,071	0.0065	0.9935	90.29
22.5	176,038,910	1,352,223	0.0077	0.9923	89.70
23.5	153,376,694	1,238,512	0.0081	0.9919	89.02
24.5	136,021,351	1,251,867	0.0092	0.9908	88.30
25.5	121,162,504	1,212,576	0.0100	0.9900	87.48
26.5	108,778,870	1,171,389	0.0108	0.9892	86.61
27.5	95,944,797	1,303,660	0.0136	0.9864	85.68
28.5	86,367,339	1,108,269	0.0128	0.9872	84.51
29.5	77,507,755	1,357,167	0.0175	0.9825	83.43
30.5	71,477,153	997,760	0.0140	0.9860	81.97
31.5	66,629,012	966,980	0.0145	0.9855	80.82
32.5	62,649,670	943,277	0.0151	0.9849	79.65
33.5	59,275,622	905,257	0.0153	0.9847	78.45
34.5	55,884,089	851,869	0.0152	0.9848	77.25
35.5	56,314,940	802,387	0.0142	0.9858	76.07
36.5	53,517,063	748,605	0.0140	0.9860	74.99
37.5	49,578,043	647,999	0.0131	0.9869	73.94
38.5	45,830,250	591,658	0.0129	0.9871	72.97

PORTLAND GENERAL ELECTRIC

ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2019 EXPERIENCE BAND 1887-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	42,461,392	533,249	0.0126	0.9874	72.03
40.5	39,052,038	477,673	0.0122	0.9878	71.13
41.5	36,149,716	419,137	0.0116	0.9884	70.26
42.5	33,926,337	370,988	0.0109	0.9891	69.44
43.5	31,688,089	342,901	0.0108	0.9892	68.68
44.5	29,256,683	286,558	0.0098	0.9902	67.94
45.5	26,074,780	251,420	0.0096	0.9904	67.28
46.5	22,773,407	221,578	0.0097	0.9903	66.63
47.5	21,110,492	171,855	0.0081	0.9919	65.98
48.5	19,080,939	145,886	0.0076	0.9924	65.44
49.5	17,399,409	119,427	0.0069	0.9931	64.94
50.5	15,933,669	99,357	0.0062	0.9938	64.50
51.5	11,235,538	90,362	0.0080	0.9920	64.09
52.5	9,802,320	71,758	0.0073	0.9927	63.58
53.5	8,997,040	62,569	0.0070	0.9930	63.11
54.5	8,226,675	52,474	0.0064	0.9936	62.67
55.5	7,399,913	49,064	0.0066	0.9934	62.27
56.5	6,327,157	40,868	0.0065	0.9935	61.86
57.5	5,584,857	38,989	0.0070	0.9930	61.46
58.5	4,573,956	29,717	0.0065	0.9935	61.03
59.5	3,826,340	30,774	0.0080	0.9920	60.64
60.5	3,052,284	22,685	0.0074	0.9926	60.15
61.5	2,438,919	14,281	0.0059	0.9941	59.70
62.5	1,916,609	7,593	0.0040	0.9960	59.35
63.5	2,339,770	971,471	0.4152	0.5848	59.12
64.5	1,060,844	3,229	0.0030	0.9970	34.57
65.5	845,577	2,677	0.0032	0.9968	34.47
66.5	685,075	1,684	0.0025	0.9975	34.36
67.5	545,745	1,275	0.0023	0.9977	34.27
68.5	387,950	769	0.0020	0.9980	34.19
69.5	287,022	1,798	0.0063	0.9937	34.12
70.5	204,804	346	0.0017	0.9983	33.91
71.5	123,956	226	0.0018	0.9982	33.85
72.5	70,727	131	0.0018	0.9982	33.79
73.5	51,172	87	0.0017	0.9983	33.73
74.5	46,694	99	0.0021	0.9979	33.67
75.5	42,992	102	0.0024	0.9976	33.60
76.5	45,642	178	0.0039	0.9961	33.52
77.5	48,512	262	0.0054	0.9946	33.39
78.5	51,541	296	0.0057	0.9943	33.21

PORTLAND GENERAL ELECTRIC

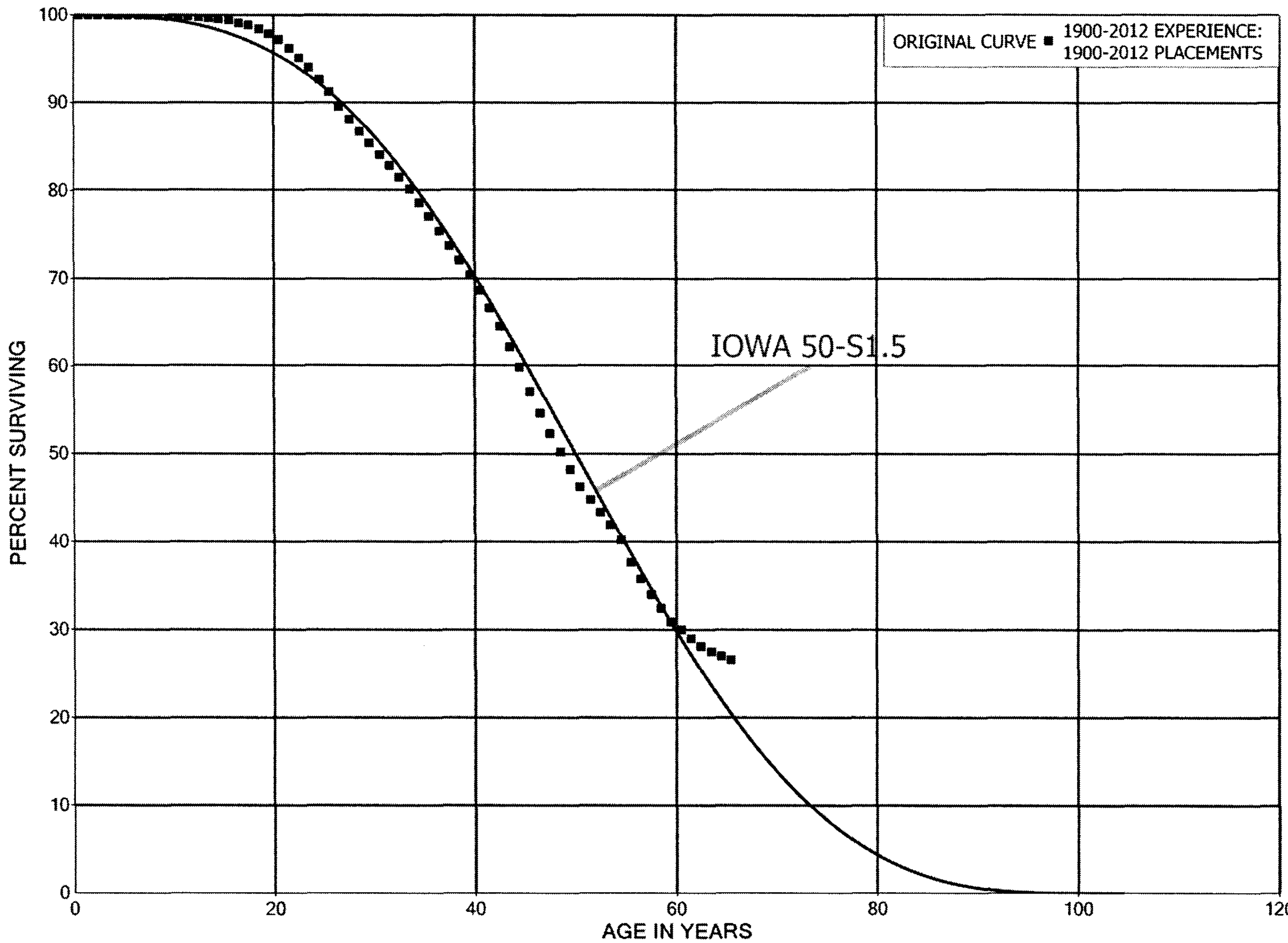
ACCOUNT 365 OVERHEAD CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1887-2019 EXPERIENCE BAND 1887-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	44,688	438	0.0098	0.9902	33.02
80.5	38,432	496	0.0129	0.9871	32.70
81.5	37,602	447	0.0119	0.9881	32.27
82.5	38,038	494	0.0130	0.9870	31.89
83.5	38,213	353	0.0092	0.9908	31.48
84.5	37,566	329	0.0088	0.9912	31.19
85.5	37,657	270	0.0072	0.9928	30.91
86.5	37,849	181	0.0048	0.9952	30.69
87.5	37,787	140	0.0037	0.9963	30.54
88.5	36,300	87	0.0024	0.9976	30.43
89.5	34,319	84	0.0025	0.9975	30.36
90.5	33,946	62	0.0018	0.9982	30.28
91.5	31,471	54	0.0017	0.9983	30.23
92.5	26,457	62	0.0024	0.9976	30.18
93.5	24,632	69	0.0028	0.9972	30.10
94.5	17,855	94	0.0053	0.9947	30.02
95.5	14,959	107	0.0071	0.9929	29.86
96.5	12,334	87	0.0071	0.9929	29.65
97.5	8,700	109	0.0125	0.9875	29.44
98.5	7,583	38	0.0050	0.9950	29.07
99.5	6,688	62	0.0093	0.9907	28.93
100.5	6,390	58	0.0091	0.9909	28.66
101.5	5,957	88	0.0148	0.9852	28.40
102.5	5,440	20	0.0036	0.9964	27.98
103.5	5,314	15	0.0028	0.9972	27.88
104.5	4,832		0.0000	1.0000	27.80
105.5	4,308		0.0000	1.0000	27.80
106.5	3,861		0.0000	1.0000	27.80
107.5	2,884		0.0000	1.0000	27.80
108.5	2,154		0.0000	1.0000	27.80
109.5					27.80

PORTLAND GENERAL ELECTRIC
ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1900-2012 EXPERIENCE BAND 1900-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	642,155,983	0	0.0000	1.0000	100.00
0.5	621,917,005	254	0.0000	1.0000	100.00
1.5	600,633,813	2,134	0.0000	1.0000	100.00
2.5	575,010,265	7,852	0.0000	1.0000	100.00
3.5	546,398,573	18,281	0.0000	1.0000	100.00
4.5	513,932,584	33,229	0.0001	0.9999	99.99
5.5	478,344,641	54,186	0.0001	0.9999	99.99
6.5	447,334,912	72,835	0.0002	0.9998	99.98
7.5	417,766,267	99,715	0.0002	0.9998	99.96
8.5	377,813,878	112,763	0.0003	0.9997	99.94
9.5	363,806,447	139,245	0.0004	0.9996	99.91
10.5	337,001,676	174,344	0.0005	0.9995	99.87
11.5	311,663,222	214,963	0.0007	0.9993	99.82
12.5	290,244,422	284,287	0.0010	0.9990	99.75
13.5	269,775,256	355,857	0.0013	0.9987	99.65
14.5	245,996,138	428,300	0.0017	0.9983	99.52
15.5	217,814,997	514,918	0.0024	0.9976	99.35
16.5	190,144,822	582,512	0.0031	0.9969	99.11
17.5	165,622,634	671,156	0.0041	0.9959	98.81
18.5	143,515,336	805,452	0.0056	0.9944	98.41
19.5	126,119,574	940,693	0.0075	0.9925	97.85
20.5	109,070,600	1,082,321	0.0099	0.9901	97.12
21.5	93,679,268	1,058,575	0.0113	0.9887	96.16
22.5	76,674,961	869,665	0.0113	0.9887	95.07
23.5	61,349,440	916,598	0.0149	0.9851	94.00
24.5	56,163,341	842,228	0.0150	0.9850	92.59
25.5	51,950,421	979,196	0.0188	0.9812	91.20
26.5	48,089,479	767,550	0.0160	0.9840	89.48
27.5	44,198,698	670,580	0.0152	0.9848	88.06
28.5	40,535,234	631,759	0.0156	0.9844	86.72
29.5	37,756,521	558,260	0.0148	0.9852	85.37
30.5	34,917,914	527,868	0.0151	0.9849	84.11
31.5	31,383,736	502,572	0.0160	0.9840	82.83
32.5	27,176,561	447,911	0.0165	0.9835	81.51
33.5	22,545,827	438,006	0.0194	0.9806	80.16
34.5	18,810,038	368,562	0.0196	0.9804	78.61
35.5	16,691,435	358,894	0.0215	0.9785	77.07
36.5	14,546,002	329,469	0.0227	0.9773	75.41
37.5	13,063,007	282,169	0.0216	0.9784	73.70
38.5	11,453,789	280,149	0.0245	0.9755	72.11

PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1900-2012 EXPERIENCE BAND 1900-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	9,115,121	230,468	0.0253	0.9747	70.35
40.5	7,319,925	205,547	0.0281	0.9719	68.57
41.5	5,763,348	183,651	0.0319	0.9681	66.64
42.5	4,557,669	168,021	0.0369	0.9631	64.52
43.5	3,630,683	135,682	0.0374	0.9626	62.14
44.5	2,858,781	133,790	0.0468	0.9532	59.82
45.5	2,354,977	98,765	0.0419	0.9581	57.02
46.5	1,921,078	81,447	0.0424	0.9576	54.63
47.5	1,603,719	66,394	0.0414	0.9586	52.31
48.5	1,340,787	54,032	0.0403	0.9597	50.15
49.5	1,058,811	41,974	0.0396	0.9604	48.12
50.5	946,906	30,337	0.0320	0.9680	46.22
51.5	780,852	25,606	0.0328	0.9672	44.74
52.5	690,147	23,167	0.0336	0.9664	43.27
53.5	613,195	23,687	0.0386	0.9614	41.82
54.5	562,004	36,117	0.0643	0.9357	40.20
55.5	462,777	22,807	0.0493	0.9507	37.62
56.5	401,033	19,959	0.0498	0.9502	35.76
57.5	350,707	16,690	0.0476	0.9524	33.98
58.5	319,141	15,627	0.0490	0.9510	32.37
59.5	290,294	7,790	0.0268	0.9732	30.78
60.5	275,123	9,570	0.0348	0.9652	29.96
61.5	253,632	7,653	0.0302	0.9698	28.91
62.5	227,818	5,638	0.0247	0.9753	28.04
63.5	218,930	3,281	0.0150	0.9850	27.35
64.5	212,627	3,496	0.0164	0.9836	26.94
65.5	208,070	3,564	0.0171	0.9829	26.49
66.5	204,507	3,507	0.0171	0.9829	26.04
67.5	150,824	2,331	0.0155	0.9845	25.59
68.5	147,182	3,824	0.0260	0.9740	25.20
69.5	143,358	3,616	0.0252	0.9748	24.54
70.5	139,316	5,740	0.0412	0.9588	23.93
71.5	133,577	3,172	0.0237	0.9763	22.94
72.5	129,954	6,406	0.0493	0.9507	22.39
73.5	111,724	8,826	0.0790	0.9210	21.29
74.5	102,899	12,270	0.1192	0.8808	19.61
75.5	90,364	10,758	0.1191	0.8809	17.27
76.5	78,828	9,320	0.1182	0.8818	15.21
77.5	68,933	9,199	0.1335	0.8665	13.42
78.5	58,690	7,834	0.1335	0.8665	11.63

PORTLAND GENERAL ELECTRIC

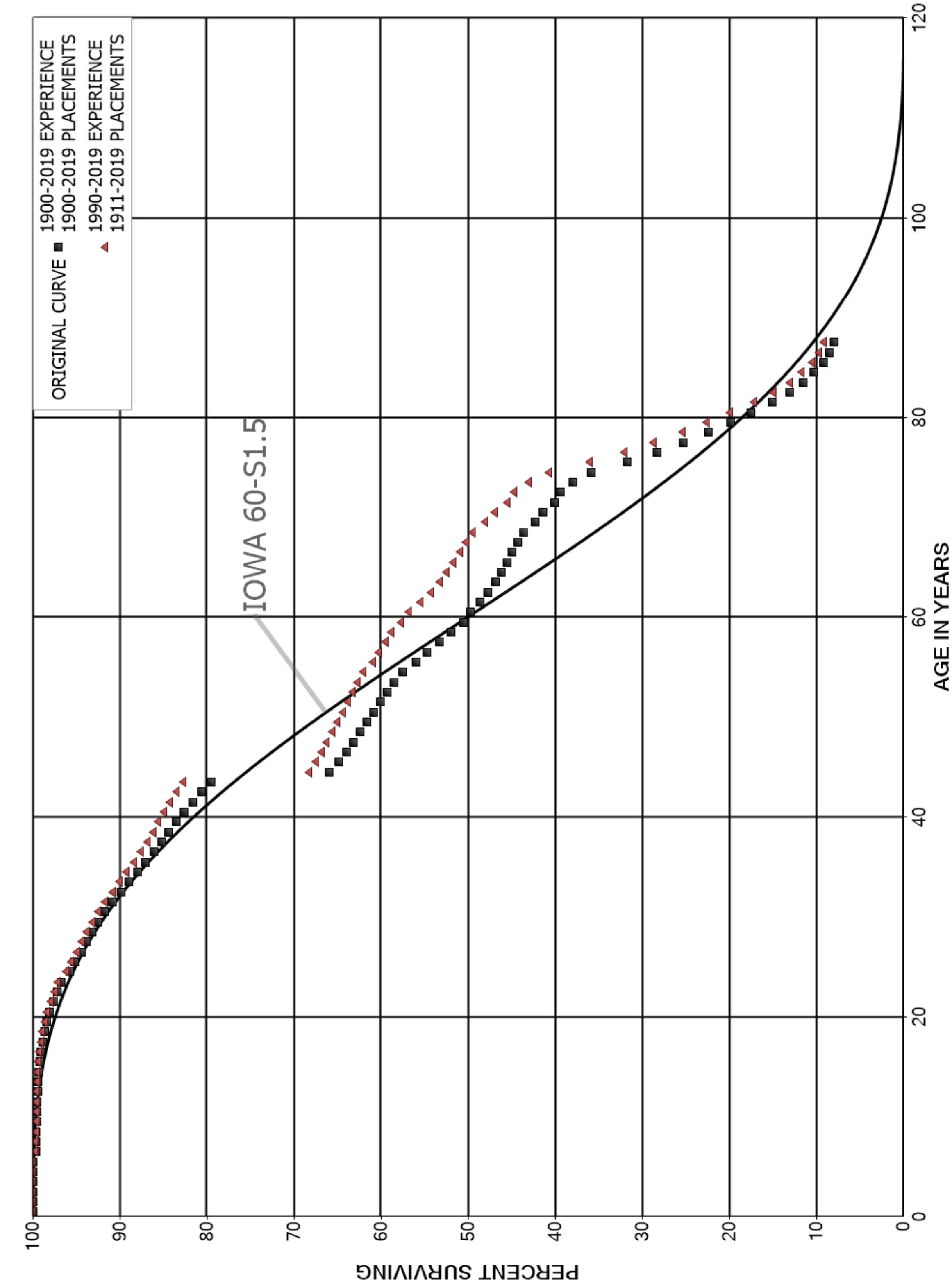
ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1900-2012 EXPERIENCE BAND 1900-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	50,332	7,100	0.1411	0.8589	10.07
80.5	42,523	6,127	0.1441	0.8559	8.65
81.5	31,917	4,676	0.1465	0.8535	7.41
82.5	23,910	3,305	0.1382	0.8618	6.32
83.5	15,515	2,008	0.1294	0.8706	5.45
84.5	11,759	1,457	0.1239	0.8761	4.74
85.5	8,242	998	0.1211	0.8789	4.15
86.5	5,420	649	0.1197	0.8803	3.65
87.5	2,923	395	0.1352	0.8648	3.21
88.5	1,390	175	0.1258	0.8742	2.78
89.5	470	53	0.1130	0.8870	2.43
90.5	304	29	0.0951	0.9049	2.16
91.5	275	36	0.1298	0.8702	1.95
92.5	239	39	0.1633	0.8367	1.70
93.5	100	16	0.1576	0.8424	1.42
94.5	85	14	0.1664	0.8336	1.20
95.5	70	11	0.1591	0.8409	1.00
96.5	47	5	0.1112	0.8888	0.84
97.5	42	5	0.1249	0.8751	0.75
98.5	30	3	0.1055	0.8945	0.65
99.5	23	3	0.1389	0.8611	0.58
100.5	9	1	0.1249	0.8751	0.50
101.5					0.44

PORTLAND GENERAL ELECTRIC
ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1900-2019 EXPERIENCE BAND 1900-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	934,608,541	0	0.0000	1.0000	100.00
0.5	844,395,128	254	0.0000	1.0000	100.00
1.5	755,325,610	2,146	0.0000	1.0000	100.00
2.5	737,085,296	7,949	0.0000	1.0000	100.00
3.5	683,250,418	18,738	0.0000	1.0000	100.00
4.5	662,549,980	110,671	0.0002	0.9998	100.00
5.5	649,925,055	2,461,474	0.0038	0.9962	99.98
6.5	632,900,145	76,851	0.0001	0.9999	99.60
7.5	616,618,856	105,867	0.0002	0.9998	99.59
8.5	600,002,001	122,302	0.0002	0.9998	99.57
9.5	574,285,359	151,754	0.0003	0.9997	99.55
10.5	545,475,169	186,941	0.0003	0.9997	99.52
11.5	514,198,773	232,848	0.0005	0.9995	99.49
12.5	478,416,972	307,862	0.0006	0.9994	99.45
13.5	447,436,432	381,866	0.0009	0.9991	99.38
14.5	417,567,644	459,869	0.0011	0.9989	99.30
15.5	377,621,864	557,187	0.0015	0.9985	99.19
16.5	363,151,352	638,312	0.0018	0.9982	99.04
17.5	335,943,749	736,005	0.0022	0.9978	98.87
18.5	308,711,479	873,991	0.0028	0.9972	98.65
19.5	286,657,988	1,009,194	0.0035	0.9965	98.37
20.5	265,217,493	1,148,392	0.0043	0.9957	98.02
21.5	240,739,421	1,126,459	0.0047	0.9953	97.60
22.5	211,900,313	940,865	0.0044	0.9956	97.14
23.5	183,871,933	1,901,408	0.0103	0.9897	96.71
24.5	158,078,975	912,439	0.0058	0.9942	95.71
25.5	135,801,581	1,020,063	0.0075	0.9925	95.16
26.5	119,174,732	794,856	0.0067	0.9933	94.44
27.5	102,340,563	695,909	0.0068	0.9932	93.82
28.5	87,352,530	658,172	0.0075	0.9925	93.18
29.5	70,827,088	584,427	0.0083	0.9917	92.48
30.5	55,872,617	551,505	0.0099	0.9901	91.71
31.5	51,079,552	529,111	0.0104	0.9896	90.81
32.5	47,203,569	482,832	0.0102	0.9898	89.87
33.5	43,888,396	483,058	0.0110	0.9890	88.95
34.5	40,308,743	419,112	0.0104	0.9896	87.97
35.5	36,928,043	402,087	0.0109	0.9891	87.05
36.5	34,400,447	361,345	0.0105	0.9895	86.11
37.5	31,815,766	309,039	0.0097	0.9903	85.20
38.5	28,538,232	303,147	0.0106	0.9894	84.37

PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1900-2019 EXPERIENCE BAND 1900-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	24,576,152	257,574	0.0105	0.9895	83.48
40.5	20,150,425	239,351	0.0119	0.9881	82.60
41.5	16,664,275	215,530	0.0129	0.9871	81.62
42.5	14,722,129	195,926	0.0133	0.9867	80.57
43.5	12,787,775	2,178,284	0.1703	0.8297	79.49
44.5	9,442,908	155,889	0.0165	0.9835	65.95
45.5	7,986,884	113,909	0.0143	0.9857	64.86
46.5	7,872,975	92,836	0.0118	0.9882	63.94
47.5	6,250,037	75,612	0.0121	0.9879	63.18
48.5	4,868,211	61,669	0.0127	0.9873	62.42
49.5	3,806,727	49,163	0.0129	0.9871	61.63
50.5	3,010,584	36,553	0.0121	0.9879	60.83
51.5	2,353,643	29,898	0.0127	0.9873	60.09
52.5	1,962,295	27,139	0.0138	0.9862	59.33
53.5	1,609,311	26,604	0.0165	0.9835	58.51
54.5	1,355,265	38,199	0.0282	0.9718	57.54
55.5	1,100,042	24,409	0.0222	0.9778	55.92
56.5	854,627	21,535	0.0252	0.9748	54.68
57.5	759,331	18,803	0.0248	0.9752	53.30
58.5	609,702	16,992	0.0279	0.9721	51.98
59.5	525,293	8,680	0.0165	0.9835	50.53
60.5	464,983	10,144	0.0218	0.9782	49.70
61.5	428,933	8,235	0.0192	0.9808	48.62
62.5	359,182	6,503	0.0181	0.9819	47.68
63.5	315,895	4,165	0.0132	0.9868	46.82
64.5	282,878	3,937	0.0139	0.9861	46.20
65.5	265,575	3,817	0.0144	0.9856	45.56
66.5	249,012	3,652	0.0147	0.9853	44.90
67.5	238,416	3,556	0.0149	0.9851	44.24
68.5	221,885	6,351	0.0286	0.9714	43.58
69.5	198,597	4,546	0.0229	0.9771	42.34
70.5	191,035	5,887	0.0308	0.9692	41.37
71.5	182,359	3,271	0.0179	0.9821	40.09
72.5	177,448	6,433	0.0363	0.9637	39.37
73.5	171,016	9,385	0.0549	0.9451	37.95
74.5	116,294	13,338	0.1147	0.8853	35.86
75.5	101,661	11,171	0.1099	0.8901	31.75
76.5	90,490	9,458	0.1045	0.8955	28.26
77.5	80,659	9,398	0.1165	0.8835	25.31
78.5	71,261	8,043	0.1129	0.8871	22.36

PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1900-2019 EXPERIENCE BAND 1900-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	62,837	7,342	0.1168	0.8832	19.84
80.5	45,716	6,317	0.1382	0.8618	17.52
81.5	39,399	5,172	0.1313	0.8687	15.10
82.5	34,024	4,280	0.1258	0.8742	13.12
83.5	29,170	3,124	0.1071	0.8929	11.47
84.5	25,634	2,541	0.0991	0.9009	10.24
85.5	22,347	1,693	0.0758	0.9242	9.22
86.5	20,279	1,228	0.0606	0.9394	8.52
87.5	18,545	941	0.0507	0.9493	8.01
88.5	14,405	647	0.0449	0.9551	7.60
89.5	11,379	392	0.0344	0.9656	7.26
90.5	7,352	219	0.0299	0.9701	7.01
91.5	5,884	103	0.0175	0.9825	6.80
92.5	4,310	54	0.0125	0.9875	6.68
93.5	2,953	28	0.0096	0.9904	6.60
94.5	1,604	29	0.0182	0.9818	6.54
95.5	762	16	0.0213	0.9787	6.42
96.5	213	7	0.0330	0.9670	6.28
97.5	125	8	0.0635	0.9365	6.07
98.5	117	4	0.0361	0.9639	5.69
99.5	113	5	0.0433	0.9567	5.48
100.5	36	3	0.0859	0.9141	5.24
101.5	33	2	0.0692	0.9308	4.79
102.5	31	2	0.0760	0.9240	4.46
103.5	20	1	0.0284	0.9716	4.12
104.5	20		0.0000	1.0000	4.00
105.5	15		0.0000	1.0000	4.00
106.5	12		0.0000	1.0000	4.00
107.5	5		0.0000	1.0000	4.00
108.5					4.00

PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1911-2019 EXPERIENCE BAND 1990-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	851,005,629		0.0000	1.0000	100.00
0.5	775,449,744	188	0.0000	1.0000	100.00
1.5	690,734,665	1,574	0.0000	1.0000	100.00
2.5	675,907,638	5,901	0.0000	1.0000	100.00
3.5	625,087,123	13,425	0.0000	1.0000	100.00
4.5	607,685,694	99,518	0.0002	0.9998	100.00
5.5	598,280,879	2,443,378	0.0041	0.9959	99.98
6.5	583,631,852	51,441	0.0001	0.9999	99.57
7.5	569,954,559	69,464	0.0001	0.9999	99.56
8.5	556,880,349	79,800	0.0001	0.9999	99.55
9.5	535,669,301	98,084	0.0002	0.9998	99.54
10.5	512,213,546	120,927	0.0002	0.9998	99.52
11.5	485,331,637	158,175	0.0003	0.9997	99.50
12.5	452,112,950	217,994	0.0005	0.9995	99.46
13.5	423,926,344	289,442	0.0007	0.9993	99.41
14.5	396,043,384	361,824	0.0009	0.9991	99.35
15.5	358,474,421	449,062	0.0013	0.9987	99.26
16.5	347,158,358	521,204	0.0015	0.9985	99.13
17.5	322,461,358	593,647	0.0018	0.9982	98.98
18.5	297,487,711	734,729	0.0025	0.9975	98.80
19.5	277,194,689	865,303	0.0031	0.9969	98.56
20.5	257,193,515	1,014,060	0.0039	0.9961	98.25
21.5	233,942,017	1,005,421	0.0043	0.9957	97.86
22.5	205,897,993	832,470	0.0040	0.9960	97.44
23.5	178,596,936	1,808,789	0.0101	0.9899	97.05
24.5	153,352,481	815,011	0.0053	0.9947	96.06
25.5	131,623,286	932,913	0.0071	0.9929	95.55
26.5	115,544,789	707,768	0.0061	0.9939	94.88
27.5	98,966,102	612,082	0.0062	0.9938	94.30
28.5	84,366,317	575,017	0.0068	0.9932	93.71
29.5	68,075,562	498,304	0.0073	0.9927	93.07
30.5	53,340,617	464,371	0.0087	0.9913	92.39
31.5	48,711,656	441,340	0.0091	0.9909	91.59
32.5	45,015,775	392,139	0.0087	0.9913	90.76
33.5	41,894,943	391,713	0.0093	0.9907	89.97
34.5	38,503,594	350,054	0.0091	0.9909	89.13
35.5	35,243,845	328,486	0.0093	0.9907	88.32
36.5	32,822,836	280,057	0.0085	0.9915	87.49
37.5	30,352,682	225,686	0.0074	0.9926	86.75
38.5	27,230,463	204,097	0.0075	0.9925	86.10

PORTLAND GENERAL ELECTRIC

ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1911-2019 EXPERIENCE BAND 1990-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	23,480,872	170,900	0.0073	0.9927	85.46
40.5	19,169,676	157,681	0.0082	0.9918	84.83
41.5	15,807,527	140,466	0.0089	0.9911	84.14
42.5	13,996,807	125,133	0.0089	0.9911	83.39
43.5	12,148,360	2,123,310	0.1748	0.8252	82.64
44.5	8,951,797	111,006	0.0124	0.9876	68.20
45.5	7,543,190	75,204	0.0100	0.9900	67.35
46.5	7,475,063	60,471	0.0081	0.9919	66.68
47.5	5,891,606	51,922	0.0088	0.9912	66.14
48.5	4,535,680	41,461	0.0091	0.9909	65.56
49.5	3,500,127	34,632	0.0099	0.9901	64.96
50.5	2,743,439	25,242	0.0092	0.9908	64.32
51.5	2,104,873	19,437	0.0092	0.9908	63.73
52.5	1,730,253	15,379	0.0089	0.9911	63.14
53.5	1,392,423	13,997	0.0101	0.9899	62.58
54.5	1,153,153	21,201	0.0184	0.9816	61.95
55.5	919,131	10,385	0.0113	0.9887	60.81
56.5	690,239	8,390	0.0122	0.9878	60.12
57.5	612,036	7,166	0.0117	0.9883	59.39
58.5	498,095	9,247	0.0186	0.9814	58.69
59.5	441,119	6,872	0.0156	0.9844	57.60
60.5	411,837	9,490	0.0230	0.9770	56.71
61.5	386,334	8,183	0.0212	0.9788	55.40
62.5	327,808	6,503	0.0198	0.9802	54.23
63.5	294,521	4,165	0.0141	0.9859	53.15
64.5	272,023	3,937	0.0145	0.9855	52.40
65.5	260,781	3,817	0.0146	0.9854	51.64
66.5	247,793	3,652	0.0147	0.9853	50.89
67.5	237,738	3,556	0.0150	0.9850	50.14
68.5	221,208	6,351	0.0287	0.9713	49.39
69.5	197,920	4,546	0.0230	0.9770	47.97
70.5	190,836	5,887	0.0308	0.9692	46.87
71.5	182,160	3,271	0.0180	0.9820	45.42
72.5	177,249	6,433	0.0363	0.9637	44.60
73.5	170,875	9,385	0.0549	0.9451	42.99
74.5	116,154	13,338	0.1148	0.8852	40.63
75.5	101,554	11,171	0.1100	0.8900	35.96
76.5	90,402	9,458	0.1046	0.8954	32.00
77.5	80,620	9,398	0.1166	0.8834	28.66
78.5	71,261	8,043	0.1129	0.8871	25.32

PORTLAND GENERAL ELECTRIC

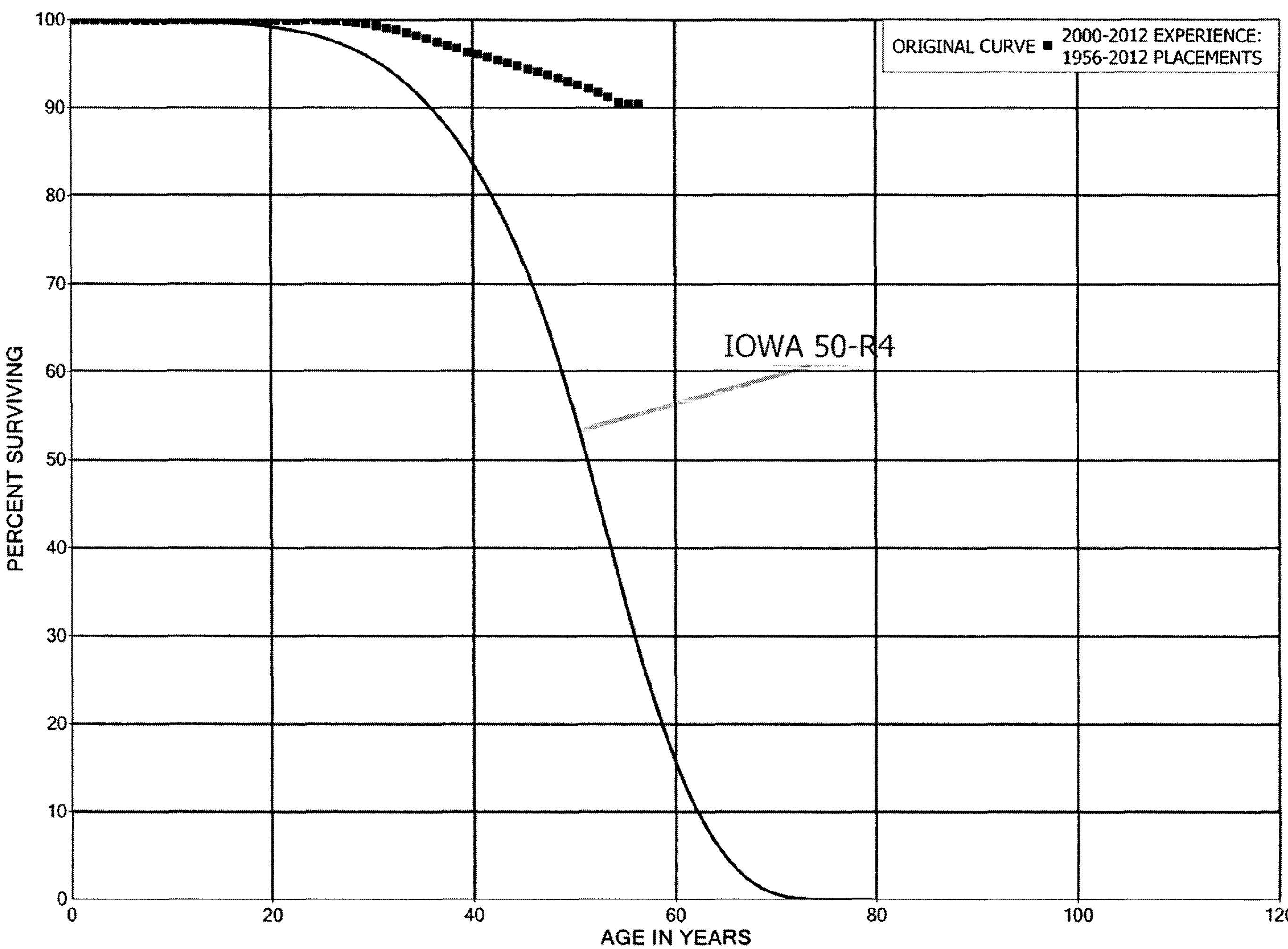
ACCOUNT 367 UNDERGROUND CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1911-2019 EXPERIENCE BAND 1990-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
79.5	62,837	7,342	0.1168	0.8832	22.46
80.5	45,716	6,317	0.1382	0.8618	19.83
81.5	39,399	5,172	0.1313	0.8687	17.09
82.5	34,024	4,280	0.1258	0.8742	14.85
83.5	29,170	3,124	0.1071	0.8929	12.98
84.5	25,634	2,541	0.0991	0.9009	11.59
85.5	22,347	1,693	0.0758	0.9242	10.44
86.5	20,279	1,228	0.0606	0.9394	9.65
87.5	18,545	941	0.0507	0.9493	9.07
88.5	14,405	647	0.0449	0.9551	8.61
89.5	11,379	392	0.0344	0.9656	8.22
90.5	7,352	219	0.0299	0.9701	7.94
91.5	5,884	103	0.0175	0.9825	7.70
92.5	4,310	54	0.0125	0.9875	7.57
93.5	2,953	28	0.0096	0.9904	7.47
94.5	1,604	29	0.0182	0.9818	7.40
95.5	762	16	0.0213	0.9787	7.26
96.5	213	7	0.0330	0.9670	7.11
97.5	125	8	0.0635	0.9365	6.88
98.5	117	4	0.0361	0.9639	6.44
99.5	113	5	0.0433	0.9567	6.21
100.5	36	3	0.0859	0.9141	5.94
101.5	33	2	0.0692	0.9308	5.43
102.5	31	2	0.0760	0.9240	5.05
103.5	20	1	0.0284	0.9716	4.67
104.5	20		0.0000	1.0000	4.53
105.5	15		0.0000	1.0000	4.53
106.5	12		0.0000	1.0000	4.53
107.5	5		0.0000	1.0000	4.53
108.5					4.53

PORTLAND GENERAL ELECTRIC
ACCOUNT 369.03 SERVICES - UNDERGROUND
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 369.03 SERVICES - UNDERGROUND

ORIGINAL LIFE TABLE

PLACEMENT BAND 1956-2012 EXPERIENCE BAND 2000-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	138,243,991		0.0000	1.0000	100.00
0.5	144,035,404	55	0.0000	1.0000	100.00
1.5	151,851,355		0.0000	1.0000	100.00
2.5	159,405,428		0.0000	1.0000	100.00
3.5	165,654,372		0.0000	1.0000	100.00
4.5	165,873,536		0.0000	1.0000	100.00
5.5	159,891,634	2,325	0.0000	1.0000	100.00
6.5	152,316,962	4,809	0.0000	1.0000	100.00
7.5	145,248,222	848	0.0000	1.0000	100.00
8.5	135,454,160		0.0000	1.0000	99.99
9.5	137,825,854	2,317	0.0000	1.0000	99.99
10.5	136,769,258	4,230	0.0000	1.0000	99.99
11.5	130,021,542	1,913	0.0000	1.0000	99.99
12.5	123,792,533	2,830	0.0000	1.0000	99.99
13.5	118,055,114	5,644	0.0000	1.0000	99.99
14.5	110,524,067	5,945	0.0001	0.9999	99.98
15.5	99,105,772	4,426	0.0000	1.0000	99.98
16.5	87,483,218	4,682	0.0001	0.9999	99.97
17.5	77,565,333	5,956	0.0001	0.9999	99.97
18.5	70,879,573	2,440	0.0000	1.0000	99.96
19.5	68,966,350	4,623	0.0001	0.9999	99.96
20.5	68,101,414	5,303	0.0001	0.9999	99.95
21.5	65,897,595	6,446	0.0001	0.9999	99.94
22.5	62,359,138	7,655	0.0001	0.9999	99.93
23.5	56,046,729	5,749	0.0001	0.9999	99.92
24.5	53,804,674	11,228	0.0002	0.9998	99.91
25.5	52,562,599	21,144	0.0004	0.9996	99.89
26.5	51,657,216	35,969	0.0007	0.9993	99.85
27.5	50,659,666	58,286	0.0012	0.9988	99.78
28.5	49,869,572	79,214	0.0016	0.9984	99.66
29.5	49,120,584	90,024	0.0018	0.9982	99.50
30.5	48,221,547	118,962	0.0025	0.9975	99.32
31.5	45,898,297	129,458	0.0028	0.9972	99.08
32.5	41,863,837	112,694	0.0027	0.9973	98.80
33.5	37,731,041	141,195	0.0037	0.9963	98.53
34.5	33,592,228	127,509	0.0038	0.9962	98.16
35.5	30,533,924	123,600	0.0040	0.9960	97.79
36.5	27,646,848	98,474	0.0036	0.9964	97.39
37.5	25,203,336	92,088	0.0037	0.9963	97.05
38.5	22,572,489	83,942	0.0037	0.9963	96.69

PORTLAND GENERAL ELECTRIC

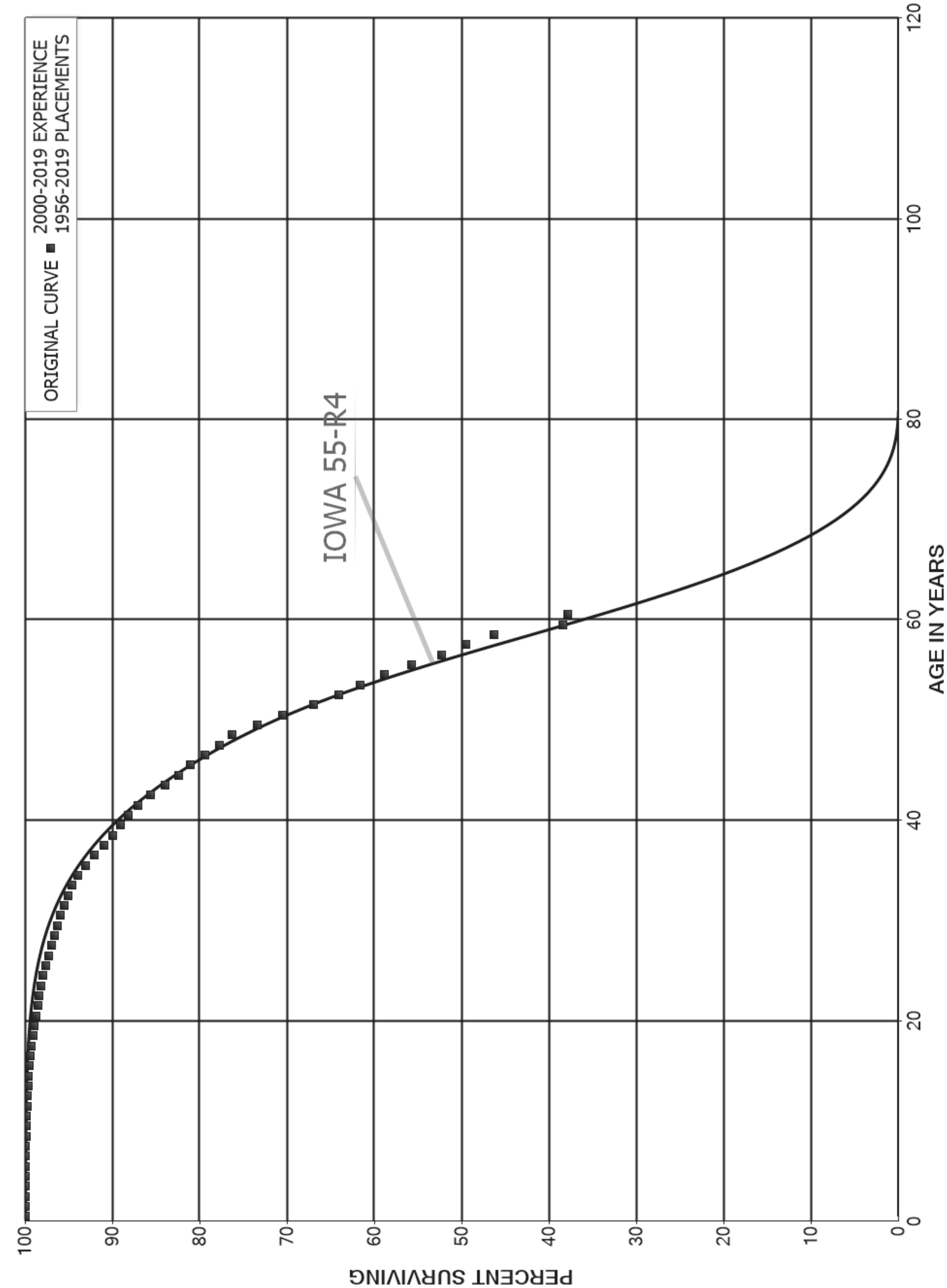
ACCOUNT 369.03 SERVICES - UNDERGROUND

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1956-2012 EXPERIENCE BAND 2000-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	19,582,935	61,911	0.0032	0.9968	96.33
40.5	16,530,084	54,792	0.0033	0.9967	96.03
41.5	14,005,626	45,739	0.0033	0.9967	95.71
42.5	12,268,530	41,811	0.0034	0.9966	95.40
43.5	10,688,253	36,140	0.0034	0.9966	95.07
44.5	9,119,177	30,996	0.0034	0.9966	94.75
45.5	8,148,041	28,526	0.0035	0.9965	94.43
46.5	6,372,726	24,190	0.0038	0.9962	94.10
47.5	4,917,044	20,659	0.0042	0.9958	93.74
48.5	3,473,181	12,992	0.0037	0.9963	93.35
49.5	2,552,436	10,096	0.0040	0.9960	93.00
50.5	1,931,599	8,631	0.0045	0.9955	92.63
51.5	1,419,002	7,195	0.0051	0.9949	92.22
52.5	979,626	5,648	0.0058	0.9942	91.75
53.5	650,243	4,237	0.0065	0.9935	91.22
54.5	455,794	957	0.0021	0.9979	90.63
55.5	303,579		0.0000	1.0000	90.44
56.5					90.44

PORTLAND GENERAL ELECTRIC
ACCOUNT 369.03 SERVICES - UNDERGROUND
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 369.03 SERVICES - UNDERGROUND

ORIGINAL LIFE TABLE

PLACEMENT BAND 1956-2019 EXPERIENCE BAND 2000-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	240,945,759		0.0000	1.0000	100.00
0.5	223,881,868	3,147	0.0000	1.0000	100.00
1.5	190,002,603	14,878	0.0001	0.9999	100.00
2.5	201,903,284	6,350	0.0000	1.0000	99.99
3.5	211,265,423	5,891	0.0000	1.0000	99.99
4.5	216,361,056	25,776	0.0001	0.9999	99.98
5.5	218,582,487	38,730	0.0002	0.9998	99.97
6.5	217,224,153	68,916	0.0003	0.9997	99.96
7.5	221,132,764	96,528	0.0004	0.9996	99.92
8.5	225,533,425	97,906	0.0004	0.9996	99.88
9.5	226,119,613	104,234	0.0005	0.9995	99.84
10.5	228,159,103	144,947	0.0006	0.9994	99.79
11.5	220,891,513	14,527	0.0001	0.9999	99.73
12.5	208,844,930	132,585	0.0006	0.9994	99.72
13.5	198,718,792	157,627	0.0008	0.9992	99.66
14.5	189,220,953	162,177	0.0009	0.9991	99.58
15.5	175,153,328	159,045	0.0009	0.9991	99.49
16.5	171,948,051	216,864	0.0013	0.9987	99.40
17.5	163,474,226	291,428	0.0018	0.9982	99.28
18.5	155,146,391	306,265	0.0020	0.9980	99.10
19.5	149,336,945	305,856	0.0020	0.9980	98.90
20.5	145,050,504	283,020	0.0020	0.9980	98.70
21.5	138,632,890	217,965	0.0016	0.9984	98.51
22.5	128,285,959	236,222	0.0018	0.9982	98.35
23.5	117,921,689	284,174	0.0024	0.9976	98.17
24.5	108,306,925	320,413	0.0030	0.9970	97.94
25.5	100,887,018	425,834	0.0042	0.9958	97.65
26.5	97,255,353	279,087	0.0029	0.9971	97.23
27.5	93,845,198	283,202	0.0030	0.9970	96.96
28.5	88,834,181	319,522	0.0036	0.9964	96.66
29.5	82,736,043	358,918	0.0043	0.9957	96.32
30.5	74,660,191	343,496	0.0046	0.9954	95.90
31.5	70,897,999	316,806	0.0045	0.9955	95.46
32.5	67,441,592	330,050	0.0049	0.9951	95.03
33.5	64,873,123	454,045	0.0070	0.9930	94.56
34.5	61,804,547	556,994	0.0090	0.9910	93.90
35.5	59,472,706	668,112	0.0112	0.9888	93.06
36.5	57,342,453	652,661	0.0114	0.9886	92.01
37.5	54,776,464	584,758	0.0107	0.9893	90.96
38.5	51,204,650	542,736	0.0106	0.9894	89.99

PORTLAND GENERAL ELECTRIC

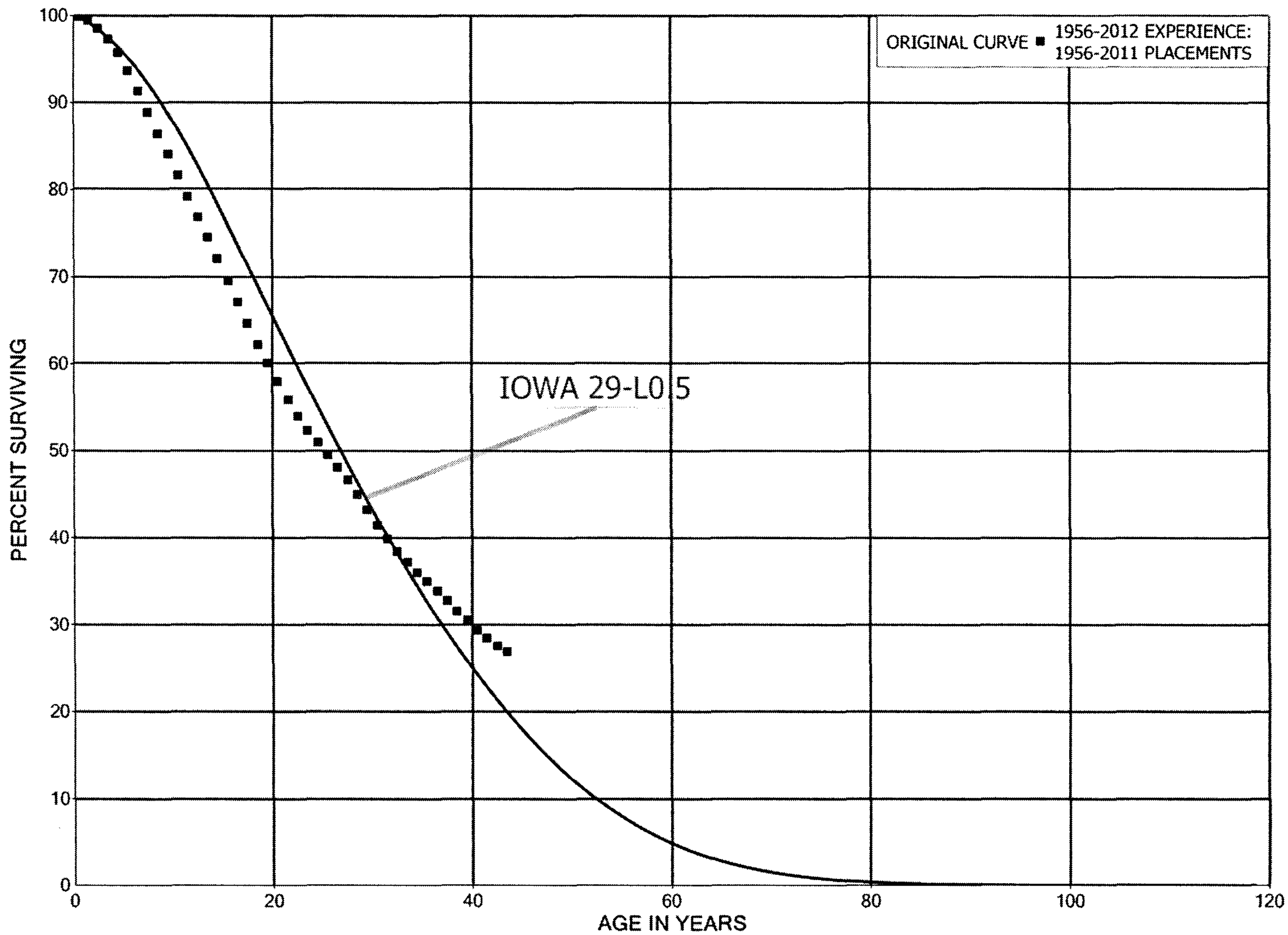
ACCOUNT 369.03 SERVICES - UNDERGROUND

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1956-2019 EXPERIENCE BAND 2000-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	46,624,063	476,377	0.0102	0.9898	89.04
40.5	41,160,345	512,560	0.0125	0.9875	88.13
41.5	35,895,431	573,874	0.0160	0.9840	87.03
42.5	31,532,813	601,313	0.0191	0.9809	85.64
43.5	27,963,381	524,512	0.0188	0.9812	84.01
44.5	24,840,280	412,539	0.0166	0.9834	82.43
45.5	21,798,359	436,289	0.0200	0.9800	81.06
46.5	18,532,175	395,020	0.0213	0.9787	79.44
47.5	15,376,708	290,530	0.0189	0.9811	77.75
48.5	12,907,756	485,586	0.0376	0.9624	76.28
49.5	10,945,409	439,418	0.0401	0.9599	73.41
50.5	9,059,721	457,737	0.0505	0.9495	70.46
51.5	7,431,752	317,160	0.0427	0.9573	66.90
52.5	6,414,945	246,017	0.0384	0.9616	64.05
53.5	4,905,926	215,565	0.0439	0.9561	61.59
54.5	3,687,075	196,670	0.0533	0.9467	58.88
55.5	2,525,355	155,494	0.0616	0.9384	55.74
56.5	1,776,583	94,424	0.0531	0.9469	52.31
57.5	1,299,339	84,904	0.0653	0.9347	49.53
58.5	909,748	156,209	0.1717	0.8283	46.29
59.5	506,131	7,392	0.0146	0.9854	38.34
60.5	322,285		0.0000	1.0000	37.78
61.5	220,620	1,915	0.0087	0.9913	37.78
62.5	144,034		0.0000	1.0000	37.46
63.5					37.46

PORTLAND GENERAL ELECTRIC
ACCOUNT 373.07 SENTINEL LIGHTING EQUIPMENT
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 373.07 SENTINEL LIGHTING EQUIPMENT

ORIGINAL LIFE TABLE

PLACEMENT BAND 1956-2011 EXPERIENCE BAND 1956-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	13,614,575	18,381	0.0014	0.9986	100.00
0.5	13,596,194	64,328	0.0047	0.9953	99.86
1.5	13,337,842	112,819	0.0085	0.9915	99.39
2.5	13,035,377	161,746	0.0124	0.9876	98.55
3.5	12,673,006	204,130	0.0161	0.9839	97.33
4.5	12,136,404	269,652	0.0222	0.9778	95.76
5.5	11,412,770	286,141	0.0251	0.9749	93.63
6.5	10,734,419	286,802	0.0267	0.9733	91.29
7.5	10,072,772	272,186	0.0270	0.9730	88.85
8.5	9,332,044	260,850	0.0280	0.9720	86.45
9.5	8,920,974	257,325	0.0288	0.9712	84.03
10.5	8,353,049	245,608	0.0294	0.9706	81.61
11.5	7,773,676	233,317	0.0300	0.9700	79.21
12.5	7,242,830	223,688	0.0309	0.9691	76.83
13.5	6,734,686	219,335	0.0326	0.9674	74.46
14.5	6,193,285	212,680	0.0343	0.9657	72.03
15.5	5,601,230	198,596	0.0355	0.9645	69.56
16.5	5,022,797	186,186	0.0371	0.9629	67.09
17.5	4,513,667	166,667	0.0369	0.9631	64.60
18.5	4,082,011	143,601	0.0352	0.9648	62.22
19.5	3,770,602	134,431	0.0357	0.9643	60.03
20.5	3,475,012	126,295	0.0363	0.9637	57.89
21.5	3,164,166	104,994	0.0332	0.9668	55.79
22.5	2,877,552	90,838	0.0316	0.9684	53.94
23.5	2,589,180	62,622	0.0242	0.9758	52.23
24.5	2,306,916	67,136	0.0291	0.9709	50.97
25.5	2,074,448	60,359	0.0291	0.9709	49.49
26.5	1,921,972	57,018	0.0297	0.9703	48.05
27.5	1,746,899	63,615	0.0364	0.9636	46.62
28.5	1,570,745	61,896	0.0394	0.9606	44.92
29.5	1,438,385	57,255	0.0398	0.9602	43.15
30.5	1,190,338	46,726	0.0393	0.9607	41.44
31.5	964,291	35,194	0.0365	0.9635	39.81
32.5	803,621	25,498	0.0317	0.9683	38.36
33.5	666,406	20,348	0.0305	0.9695	37.14
34.5	551,472	16,679	0.0302	0.9698	36.00
35.5	466,939	14,613	0.0313	0.9687	34.92
36.5	394,697	13,148	0.0333	0.9667	33.82
37.5	325,958	11,832	0.0363	0.9637	32.70
38.5	271,734	8,650	0.0318	0.9682	31.51

PORTLAND GENERAL ELECTRIC

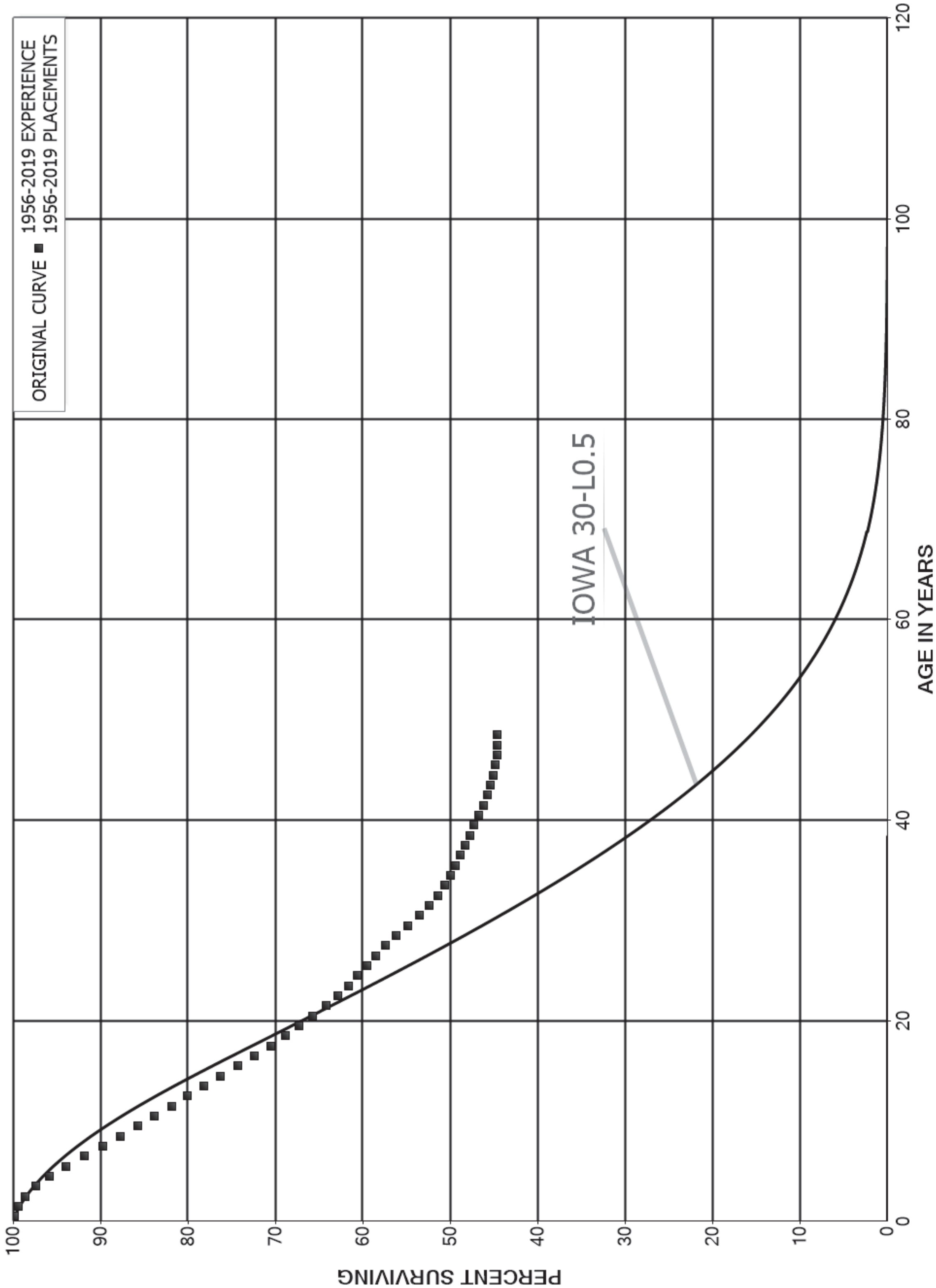
ACCOUNT 373.07 SENTINEL LIGHTING EQUIPMENT

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1956-2011 EXPERIENCE BAND 1956-2012

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	225,881	8,663	0.0384	0.9616	30.51
40.5	190,992	5,912	0.0310	0.9690	29.34
41.5	154,078	4,926	0.0320	0.9680	28.43
42.5	119,120	3,145	0.0264	0.9736	27.52
43.5	90,030	2,053	0.0228	0.9772	26.79
44.5	68,652	1,351	0.0197	0.9803	26.18
45.5	51,905	1,248	0.0241	0.9759	25.67
46.5	34,445	147	0.0043	0.9957	25.05
47.5	21,255	79	0.0037	0.9963	24.94
48.5	9,962		0.0000	1.0000	24.85
49.5					24.85

PORTLAND GENERAL ELECTRIC
ACCOUNT 373.07 SENTINEL LIGHTING EQUIPMENT
ORIGINAL AND SMOOTH SURVIVOR CURVES



PORTLAND GENERAL ELECTRIC

ACCOUNT 373.07 SENTINEL LIGHTING EQUIPMENT

ORIGINAL LIFE TABLE

PLACEMENT BAND 1956-2019 EXPERIENCE BAND 1956-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	13,621,757	18,381	0.0013	0.9987	100.00
0.5	13,603,376	64,328	0.0047	0.9953	99.87
1.5	13,539,048	112,819	0.0083	0.9917	99.39
2.5	13,426,206	161,746	0.0120	0.9880	98.56
3.5	13,264,456	204,130	0.0154	0.9846	97.38
4.5	13,056,631	269,652	0.0207	0.9793	95.88
5.5	12,782,579	286,141	0.0224	0.9776	93.90
6.5	12,496,438	286,802	0.0230	0.9770	91.80
7.5	12,209,636	272,186	0.0223	0.9777	89.69
8.5	11,744,365	260,850	0.0222	0.9778	87.69
9.5	11,293,869	257,325	0.0228	0.9772	85.74
10.5	10,835,919	245,608	0.0227	0.9773	83.79
11.5	10,257,839	233,317	0.0227	0.9773	81.89
12.5	9,570,540	223,688	0.0234	0.9766	80.03
13.5	8,954,642	219,335	0.0245	0.9755	78.16
14.5	8,360,462	212,680	0.0254	0.9746	76.24
15.5	7,679,241	198,596	0.0259	0.9741	74.30
16.5	7,330,426	186,186	0.0254	0.9746	72.38
17.5	6,833,640	166,667	0.0244	0.9756	70.54
18.5	6,333,208	143,601	0.0227	0.9773	68.82
19.5	5,892,078	134,431	0.0228	0.9772	67.26
20.5	5,473,191	126,295	0.0231	0.9769	65.73
21.5	5,024,828	104,994	0.0209	0.9791	64.21
22.5	4,540,460	90,838	0.0200	0.9800	62.87
23.5	4,069,783	62,622	0.0154	0.9846	61.61
24.5	3,684,217	67,136	0.0182	0.9818	60.66
25.5	3,352,092	60,359	0.0180	0.9820	59.56
26.5	3,123,925	57,018	0.0183	0.9817	58.49
27.5	2,905,748	63,615	0.0219	0.9781	57.42
28.5	2,657,583	61,896	0.0233	0.9767	56.16
29.5	2,414,068	57,255	0.0237	0.9763	54.85
30.5	2,159,279	46,726	0.0216	0.9784	53.55
31.5	1,892,912	35,194	0.0186	0.9814	52.39
32.5	1,692,386	25,498	0.0151	0.9849	51.42
33.5	1,574,771	20,348	0.0129	0.9871	50.64
34.5	1,436,369	16,679	0.0116	0.9884	49.99
35.5	1,307,151	14,613	0.0112	0.9888	49.41
36.5	1,222,074	13,148	0.0108	0.9892	48.86
37.5	1,018,133	11,832	0.0116	0.9884	48.33
38.5	826,979	8,650	0.0105	0.9895	47.77

PORTLAND GENERAL ELECTRIC

ACCOUNT 373.07 SENTINEL LIGHTING EQUIPMENT

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1956-2019 EXPERIENCE BAND 1956-2019

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	692,854	8,663	0.0125	0.9875	47.27
40.5	572,473	5,912	0.0103	0.9897	46.68
41.5	471,975	4,926	0.0104	0.9896	46.20
42.5	399,194	3,145	0.0079	0.9921	45.71
43.5	338,421	2,053	0.0061	0.9939	45.35
44.5	280,778	1,351	0.0048	0.9952	45.08
45.5	237,035	1,248	0.0053	0.9947	44.86
46.5	198,584	147	0.0007	0.9993	44.63
47.5	172,211	79	0.0005	0.9995	44.59
48.5	141,130		0.0000	1.0000	44.57
49.5	111,097		0.0000	1.0000	44.57
50.5	85,153		0.0000	1.0000	44.57
51.5	65,827		0.0000	1.0000	44.57
52.5	50,431		0.0000	1.0000	44.57
53.5	34,219		0.0000	1.0000	44.57
54.5	21,176		0.0000	1.0000	44.57
55.5	9,962		0.0000	1.0000	44.57
56.5					44.57

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)

EXHIBIT AWEC/106

PGE ELECTRIC INDUSTRY STATISTICS

(REDACTED)

Exhibit AWEC/106 contains Protected Information Subject to Order No. 21-017 and has been redacted in its entirety.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	))
	)
Detailed Depreciation Study of Electric Utility Properties.	))
	)

EXHIBIT AWEC/107

OPUC STAFF RESIDUAL SUM OF SQUARES CALCULATIONS

(REDACTED)

Exhibit AWEC/107 contains Protected Information Subject to Order No. 21-017 and has been redacted in its entirety.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)

EXHIBIT AWEC/108

HELICOPTER DEPRECIATION ARTICLE

AWEC/108
Kaufman/1

HELICOPTERS

Features Commercial Utility/Other

Depreciation – Fact or Fiction?

July 6, 2007

By Bill De Decker

Recently, we were taken to task by one of our friends who is an operator.

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Recently, we were taken to task by one of our friends who is an operator. He questioned the depreciation and the residual values we use
in the Helicopter Cost Evaluator and the Life Cycle Cost programs. His point was that, for example, a 20-year-old helicopter will sell for close to the same as the original purchase price, not the one third of the original purchase price that we show. So, he argued, why worry about depreciation?

Our
operator friend is of course absolutely right… and so are the values we show. The difference is the point of view. There are basically two ways of looking at depreciation and residual values. The first is how does the resale value compare with what was originally paid for the helicopter. That's the point of view that is important when you are

AWEC/108
Kaufman/2

financing or leasing an aircraft. Helicopters and aircraft in general are quite unique in this respect, since a thirty-year-old helicopter can be worth substantially more than its original selling price and depreciation truly is not a factor.

The other point of view is important if you are planning for future operations and want to know what it will cost to replace your current helicopter with a like machine at some point in the future. In that case, the focus is on the resale value as a percentage either of the replacement cost or as a percentage of the original purchase price adjusted for inflation. On that basis, helicopters steadily lose value, as they get older, as do all other pieces of transportation equipment and depreciation is a vital part of long term planning.

To get a better understanding of these numbers we analyzed the retail price histories for a variety of helicopters, as shown in the current HeliValue$ Blue Book as well as the Aircraft Blue Book Price Digest Helicopter section. Inflation used in the analysis is based on the Consumer Price Index, as published by the US Department of Commerce. And the new helicopter prices are as published in our Helicopter Cost evaluator. The results of this analysis are shown in Figure 1 (resale value as a function of the original price) and Figure 2 (resale value as a percentage either of the replacement cost or as a percentage of the original purchase price adjusted for inflation).

Looking at Figure 1 shows that on average, helicopters hold their value well and that beyond a certain age, their value starts to increase. For example, while a 10-year-old helicopter is worth about 65% of its original price, a 30-year-old machine can be worth more than 140% of its original selling price! There are a number of reasons for this startling trend. One reason for the high prices for old helicopters could be that helicopters do not yet have the serious regulatory noise problems (as is the case with old jets). In addition, newer helicopters are not markedly more fuel-efficient than the older ones, nor do they have significant aging aircraft problems. Thus, a well-maintained old helicopter can be just as cost effective as a new one. This, in turn helps maintain the price of old helicopters (a good example of this is the Bell 205).

On the other hand, not all helicopters maintain their value at the same rate. Not surprisingly, the helicopters that have the highest residual values are also the ones with a solid reputation for versatility and profit potential. Helicopters in this category include the Bell 206L and 407 series, the Eurocopter AS 350 series and the MD 500 series. One group of helicopters that has a low residual value is the light twins (BO 105, AS 355 and the older Agusta 109). The residual value for each of these is well below the average. The obvious reason is a mismatch between supply and demand. But the underlying reason is probably that while these helicopters provide a larger margin of safety when an engine fails, their payload and profit potential is not sufficient to support their higher cost when compared with single engine competitors of the equivalent size.

AWEC/108
Kaufman/4

In Figure 2 we looked at the cost of used aircraft as a function of their original purchase price adjusted for inflation, as measured by the CPI and we looked at the cost of helicopters as compared to their replacement cost. This is of course the measure that counts when planning on the cost of replacing your current aircraft. On this basis, helicopters steadily lose value as they age. For example, a 10-year-old helicopter is worth about 55% of its inflation adjusted or replacement value. A 20-year-old one is worth about 35% and a 30-year-old one is worth around 25%.

The figure also shows there is about a 10 to 15% difference between the residual values based on the inflation adjusted original purchase price and the residual value based on replacement cost. What this means is that the replacement cost of a helicopter is higher than you would expect based on the original purchase price adjusted for inflation. The reasons for this are a reflection of the increased capability and equipment installed in the replacement aircraft (even if it has the same model number) and the increased regulatory burden on newer aircraft. Other factors could include the increased cost of litigation, the demand for greater warranties and the demand for better shareholder value. Interestingly, the same difference between the two ways of calculating resale value is also found in jets and turboprops.

What all this means can be illustrated with the following example: Suppose you bought a new light single engine turbine helicopter in 1986 for about $715,000 and you want to replace it this year with a new, like kind of machine. Your 1986 helicopter will be worth about $575,000 on trade-in. This

AWEC/108
Kaufman/5

equates to about 80% of what you paid for it and matches what Figure 1 indicates for a 20 year old machine at the high end. However, the new helicopter will cost about $1,565,000. Put another way, the trade-in value is about 37% of the replacement value (note that Figure 2 suggests a value of about 30% to 40%). In short, to replace your 1986 machine with a new one with like capability will require the old machine plus $990,000. That equates to an effective depreciation of about $50,000 per year or about $100 per hour if you are flying 500 hours per year.

How can you use this information? Well, when you are talking to the bank about financing you talk about how these aircraft really hold their value. On the other hand when you are doing your cost analysis to get a good look at the rates you charge don't forget it takes $100 per hour to replace this machine in the future. In short in the one case (talking to the banks) depreciation is not a real factor. But if you are looking at the long term health of your operation, depreciation is very real!

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)

EXHIBIT AWEC/109

HELICOPTER VALUATION ARTICLE

Helicopters: A Different Type of Asset

SHARON DESFOR

When does a capital asset not look like one? When it's also a commodity.

Helicopters fit neatly into this "not-category." On the one hand, they are subject to federal legislation under the Title 14 of the Code of Federal Regulations, which requires federal oversight under the Federal Aviation Administration. They are also subject to manufacturers' interests by way of limitations on flight usage and on parts manufacturing. On the other hand, they enjoy a worldwide free market with a supply and demand relationship, a 3-year backlog on new production, and $90+ per barrel oil, all driving the need for helicopter services through the roof. What's an appraiser to do?

Understanding the Asset

Arguably the most famous definition of a helicopter is "an assembly of forty thousand loose pieces, flying more or less in formation." Outside of the wry humor of this definition, the concept itself actually has a profound implication in the residual life and value of a helicopter. A pressurized fixed-wing airplane expands and contracts each time it changes altitude, fatiguing the airframe with every flight. A helicopter is non-pressurized and so bears none of the hallmarks of airframe fatigue. Since it's literally just a frame with components attached, it has *no fixed economic useful life*.

Economic Useful Life

In the June 2005 issue of ***Rotorbreeze***, one manufacturer made it explicit. "Bell Helicopter designs and builds commercial aircraft airframes specifically with no need for a scheduled or finite retirement life, either in calendar time or in accumulated flight hours… by operating the aircraft in accordance with the Bell-approved maintenance and overhaul recommendations, complying with the applicable bulletins recommended by Bell, and using only parts and processes acceptable to Bell." Put simply, as long an operator can get parts for his helicopter, and he maintains it according to the approved maintenance manual, he can continue to fly it indefinitely.

But if there's no Economic Useful Life restriction, how does an appraiser determine the physical deterioration of a helicopter? Given a specific helicopter, the most important determinant of value is the ***components' time since overhaul or since new (TSO/TSN).*** This includes the dynamic components such as engines, transmissions, swashplate, main- and tail-rotor blades, driveshafts, and flight controls; the major airframe inspection; and consideration of whether any of the helicopter's components are on a Power by the Hour (PBH) contract. PBH is essentially a prepaid maintenance agreement in which the operator sends the manufacturer a fixed hourly payment, and the manufacturer provides all overhauls and replacement parts. Because it includes scheduled maintenance, it is far more than an insurance contract, and carries far more weight when valuing the helicopter.

Other items that need to be considered are the helicopter's mission and registration, equipment and avionics, major repairs and alterations (Forms 337), Supplemental Type Certificates, and compliance with application airworthiness directives and service bulletins. Most appraisers will take into account the helicopter's age and total airframe time, but only as an indicator of general usage and condition. Also considered are the machine's "cosmetic" condition for the paint, glass, and interior, in comparison to similar helicopters in the field.

All this information can be gleaned from the helicopter and its flight and maintenance logbooks, its component's historical records ("hard cards"), its Certificate of Airworthiness and Certificate of Registration. This year's winner of the Excellence in Communication award from the Helicopter Association International, Barry D. Desfor, has a pointed quip on this topic: "If the weight of the records doesn't equal the weight of the helicopter, it's obviously not airworthy."

The flight and maintenance logbooks are the records of a particular airframe or engine. They record every minute of flight time, every component change, every overhaul and inspection related to that particular airframe or engine. The hard cards are the flight and maintenance records for each individual component. Every serial-numbered component has a hard card that follows it throughout its life, from birth to death, regardless of what helicopter the component is installed in at any given moment. Components move frequently from inventory to airframe, and from one airframe to another. It's far faster to remove a component and replace it with a fresh one than to take a helicopter out of service while waiting weeks for an inspection or overhaul. This is as true of a small component such as a hydraulic servo as it is of a large one such as an engine. With so many component changes occurring at any time during a helicopter's operation, individual records are required for every component as well as for the helicopter itself.

These required records are absolutely critical to the operation of a helicopter and its resale value. Any FAA inspector can shut down the helicopter at any time if he requests a record that does not exist or is inaccurate. Questionable records could do more than shut down the helicopter, they could shut down an entire operation. Clean, detailed, accurate records are a point in favor of a helicopter at its time of resale.

The Helicopter Resale Market

What drives the helicopter market?

By far the largest driver of the helicopter market is offshore oil support. While not on a par with jets or business aircraft, the offshore operators fly far more than any other helicopter operators. For example, in the Gulf of Mexico, in an area only 125,000 square miles, there are 650 helicopters, supporting over 5000 platforms, and making 7500 trips per day. This comprises 2.1 million operations per year, carrying 2.6 million passengers per year in 380,000 flight hours. The North Sea fields even more helicopter operations. An average offshore helicopter flies 1000 hours per year. When you consider that each helicopter requires several hours of maintenance for each hour of flight time, that's an extraordinary effort.

The oil industry is stretching farther and farther, to big rigs 150 miles offshore. To make these trips, helicopter operators are buying ever-larger helicopters with long-range fuel reserves, sophisticated electronic cockpits, and large payloads. These operators are moving away from short-range machines costing one to five million dollars that can carry 6-10 people, and into medium twins that cost up to eighteen million dollars and can carry up to 20 passengers.

Another significant market is Emergency Medical Services. The EMS sector alone uses over a thousand helicopters ranging from million dollar single-turbine machines that barely fit a single stretcher up to six-million-dollar medium twins that can carry up to 5 patients at a time, or can instead be fit with a flying emergency room. A new, rapidly growing segment is Search and Rescue. SAR contracts are typically for ten- to twenty-million-dollar medium- to heavy twins with enough power to lift a great deal of sophisticated mission equipment including glass cockpits, icing conditions equipment, life rafts, Doppler auto-hover, rescue hoists and winches, emergency flotation gear, rappelling devices, and crews of 5 or more.

Other popular uses for helicopters include Electronic News Gathering, firefighting, construction, logging, aerial patrol, executive transport, mining, seismic survey and support, sightseeing, fish spotting, ranching, and agricultural spraying. These markets all play a role in determining marketability and therefore value as well, although none to the same extent as offshore oil support.

Cross-border transactions

The helicopter market is, and has been for decades, international in scope. A typical helicopter buyer thinks nothing of hopping on a flight to Singapore or Brazil to examine a helicopter he's considering for purchase. The costs to import a helicopter into a different country are inexpensive relative to the helicopter's value, usually around $50,000 for the freight and certification into the new country. Because purchasers have always looked for the helicopter that meets their needs anywhere in the world; a practical international market has come about in reality. And while not a usual factor, in a "hot" market such as we have today, helicopters occasionally become

commodities, reselling purely on their resale potential and commanding significant premiums just for the privilege of an early position on the factory's assembly line. Operations, as well, are international in scope. There are multi-national operators fulfilling contracts in multiple countries, both with units registered in each individual country as well as helicopters crossing borders to perform specific jobs. The demand exists for these cross-border operations, but in today's environment it is difficult to manage such operations due to restrictions written into their lease and finance contracts.

The main issue, obviously, is mitigation of the lender's/lessor's risk in allowing the helicopter to operate in multiple countries. Better regulations around the world, reciprocal agreements between the U.S. FAA and the civil aviation authorities of other countries, and treaties such as the Cape Town Convention and Aircraft Protocol, combined with the reputation of a high-quality operator, are all necessary when a lender or lessor is requested to permit cross-border operations across multiple countries.

Lender Comfort

Lenders and lessors, in turn, have their own set of responsibilities, whether the finance contract is restricted to one country or many. The lender needs to make sure his title is perfected, regardless of the country the helicopter is registered in or the countries it may operate in. He needs to track the asset quality on a regular basis. These means setting up *and following through* on a methodology and cost accommodation to monitor assets, including frequent appraisals. The lender should logically include the examination of the assets on a regular basis, whether setting up the inspection themselves or hiring an inspector or appraiser to do it for them. Because helicopters work in the field, away from convenient international airports, the lender's representative needs to visit the helicopter in the field (whether that's the jungle, the oil fields, or the construction site) in order to verify the maintenance and upkeep that will preserve and enhance the value of the unit.

Residual Values

In addition to the current asset value, lessors in particular are hungry for supportable residual projections. While a crystal ball would certainly come in handy, appraisers are generally stuck with past history and a strong knowledge of current and historical resale trends.

While every appraiser has his own approach to examining history in order to project future values, a fairly normal approach from a Blue Book's perspective would look something like this:

- Begin by obtaining sales pricing data from owners and operators, lenders and lessors, resellers, brokers and original equipment manufacturers worldwide and compiling them into the Blue Book.
- Assemble several decades' worth of Blue Book values into a further database of historical pricing.
- Adjust the historical data for inflation to current dollars.
- Perform one set of calculations comparing the 2007-dollar values to both current and trended historical replacement cost.
- Perform another set of calculations comparing the current Blue Book values to current replacement cost new (RCN).
- Compare the two sets of figures for reliability and feasibility and assess the results in light of historical and economic trends.
- Apply the resulting percentages to the (trended) RCN for the appropriate year of manufacture of the helicopter.
- Factor anticipated inflation into the results as defined by the lessor or lender.

Regulations

There are a three new(er) regulations and one major recent treaty that factor into a helicopter valuation: the new IRS guidelines for a "Qualified Appraiser," which may require the appraiser to acquire additional accreditations and/or continuing education units; FAS 157, which created a new definition of Fair Value which can't help but impact appraisers' and lenders' outlook on Fair Market Value and which was discussed extensively in the July-August issue of Valuation Strategies; and the forthcoming FASB/IASB revamp of FAS 13/IAS 17, which will redefine risk and reward lease accounting. Once the framework for the FAS 13 replacement is agreed to in principle, appraisers are likely to be inundated with requests for residual value analyses so that lessors can comply with the likely on-balance-sheet structure.

The recent treaty that factors into the value equation is the Cape Town Convention.

The Cape Town Convention

The Convention on International Interests in Mobile Equipment and Aircraft Protocol (the Cape Town Convention), which took effect in March 2006, has added yet another wrinkle to the way lenders, buyers, and sellers register their interests in aircraft in many countries. The Cape Town Convention was designed to create an international legal framework for the four main issues facing security interests in mobile assets: creating, prioritizing, and enforcing security interests, and the jurisdictional rules that govern them. The Convention has two main benefits. The first is the International Registry for the Aircraft Protocol. The other is the treaty itself. Each ratifying country is essentially agreeing to subordinate its own legal framework for ownership in favor of the agreed-upon legal framework in the Cape Town Convention, subject to various optional declarations adopted by each country.

There are four main features of the treaty: 1) the criteria for ***creating*** an "international interest" (a security agreement, title reservation agreement, or

> **PROTOCOL**
>
> **TO THE CONVENTION
> ON INTERNATIONAL INTERESTS IN MOBILE EQUIPMENT ON
> MATTERS SPECIFIC TO AIRCRAFT EQUIPMENT**
>
> THE STATES PARTIES TO THIS PROTOCOL,
>
> CONSIDERING it necessary to implement the *Convention on International Interests in Mobile Equipment* (hereinafter referred to as "the Convention") as it relates to aircraft equipment, in the light of the purposes set out in the preamble to the Convention,
>
> MINDFUL of the need to adapt the Convention to meet the particular requirements of aircraft finance and to extend the sphere of application of the Convention to include contracts of sale of aircraft equipment,
>
> MINDFUL of the principles and objectives of the *Convention on International Civil Aviation*, signed at Chicago on 7 December 1944,
>
> HAVE AGREED upon the following provisions relating to aircraft equipment:

leasing agreement); 2) a first-to-file ***priority*** rule based on the International Registry; 3) the default ***remedies*** for creditors and quiet possession rights for debtors; and 4) the ***jurisdictional rules***.

Imagine that, pre-Cape Town, a commercial bank in the US extended a loan on a helicopter into a country with a very different legal system than our own. If the borrower defaulted on the contract and the lender needed to repossess the asset, he was subject to the laws of the borrower's country as regards his rights to repossess. Yes, he had a contract, but he also knew that if things went badly he was going to have trouble getting the asset back without a great deal of time and money.

Under the Cape Town Convention, if the asset is registered in one of the ratifying countries, the lender or lessor will have clearly stated rights and remedies under the treaty. No repossession is ever simple, but it's certainly easier when the lender's/lessor's remedies aren't illegal by the standards of the country from which he's repossessing!

The rights of the creditor when the debtor is in default on an aircraft now include deregistering the aircraft and arranging its export, taking possession or control of the aircraft, selling or granting a lease in the aircraft, and collecting or receiving income or profits from the use or management of the aircraft.

The benefits of legal recourse to the lessor or lender seem fairly obvious. What are the benefits to the lessee or borrower? The economic theory is that if it is safer to lend or lease into other countries, then it will become more desirable to do so, which will in turn give easier credit access (and theoretically lower credit cost) to borrowers and lessees around the world. There is no evidence yet of these benefits developing, but there is hope that they should appear when the number of countries ratifying the convention passes a saturation point, particularly those capital-rich countries who might indeed lend or lease across borders.

Like the Uniform Commercial Code, the Aircraft International Registry (IR) is the listing of security interests on collateral involved in secure transactions. However, the Aircraft IR lists only one security interest for each asset. The interest listed is the first-to-file, not necessarily the primary lienholder. Interests registered with the Aircraft IR have legal priority over unregistered interests. Pre-existing interests are not applicable.

To date, machinery appraisers have not historically run a title search on the assets they appraise. The Cape Town Convention and its International Registry raise the question of whether appraisers will wish to add title searches to their research.

Conclusion

A helicopter is a fascinating but quirky asset, not exactly like airplanes, ships, yellow iron, or any other machinery. Although it bears much commonality with airplanes, it has several different properties. The more utilitarian viewpoint of its buyers makes it less vulnerable to wear-and-tear deductions from the value. The vast number of components, each with a separate maintenance schedule, makes careful, line-by-line component analysis a requirement. The different market sectors, utilizing their individual requirements to determine their "ideal" helicopter, combine with the pressure-cooker of today's high demand and low supply to create a complex web of betterments and detriments to a helicopter's value. And the maze of federal codes and agencies, regulations and treaties, insists upon a deeper-than-skin-layer analysis of consequences of potential acquisitions and potential uses in a variety of different countries and cultures. Understanding the helicopter and its resale market, its function in the world and the needs of its operators, and the needs and requirements of the lenders and lessors who bring life to this small industry, are all critical aspects to a viable determination of this odd little machine's value.

Sharon Desfor, ASA, is president of HeliValue$, Inc., (www.helivalues.com) publisher of ***The Official Helicopter Blue Book®*** *and the only full-time helicopter appraisal service in the world. Ms. Desfor is also Vice Chair of the Leasing and Financing Subcommittee of the Helicopter Association International.*

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

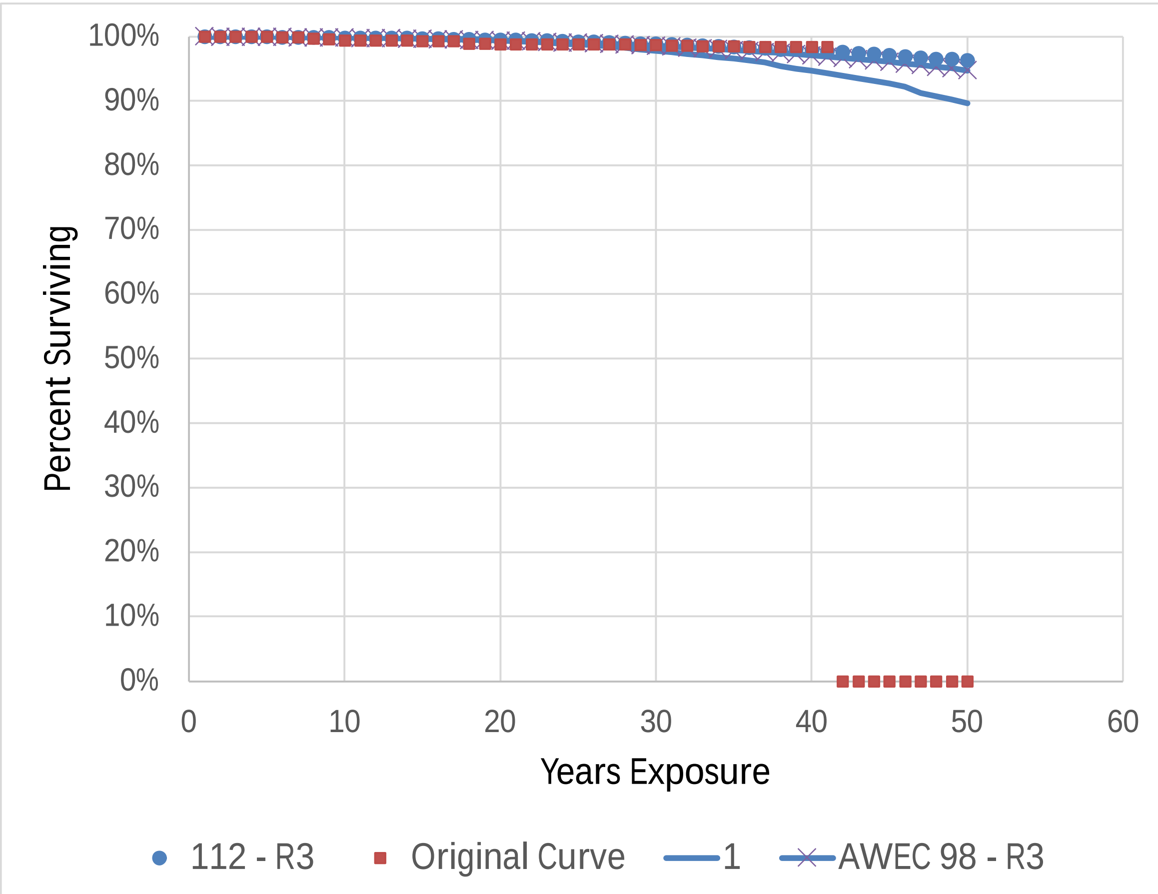
UM 2152

In the Matters of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
	)
	)
Detailed Depreciation Study of Electric Utility Properties.	)
	)
	)

EXHIBIT AWEC/110

RETIREMENT CURVE ANALYSIS

Account			31100				
STRUCTURES AND IMPROVEMENTS				Iowa Curve	Avg. Life	SSR	
Band			1	R3	112	0.00057	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	98	0.001064	AWEC Proposed
BEGIN	END	BEGIN	END	S1.5	90	0.007907	PGE Proposed
1980	2019	1980	2019			-87%	Change in SS

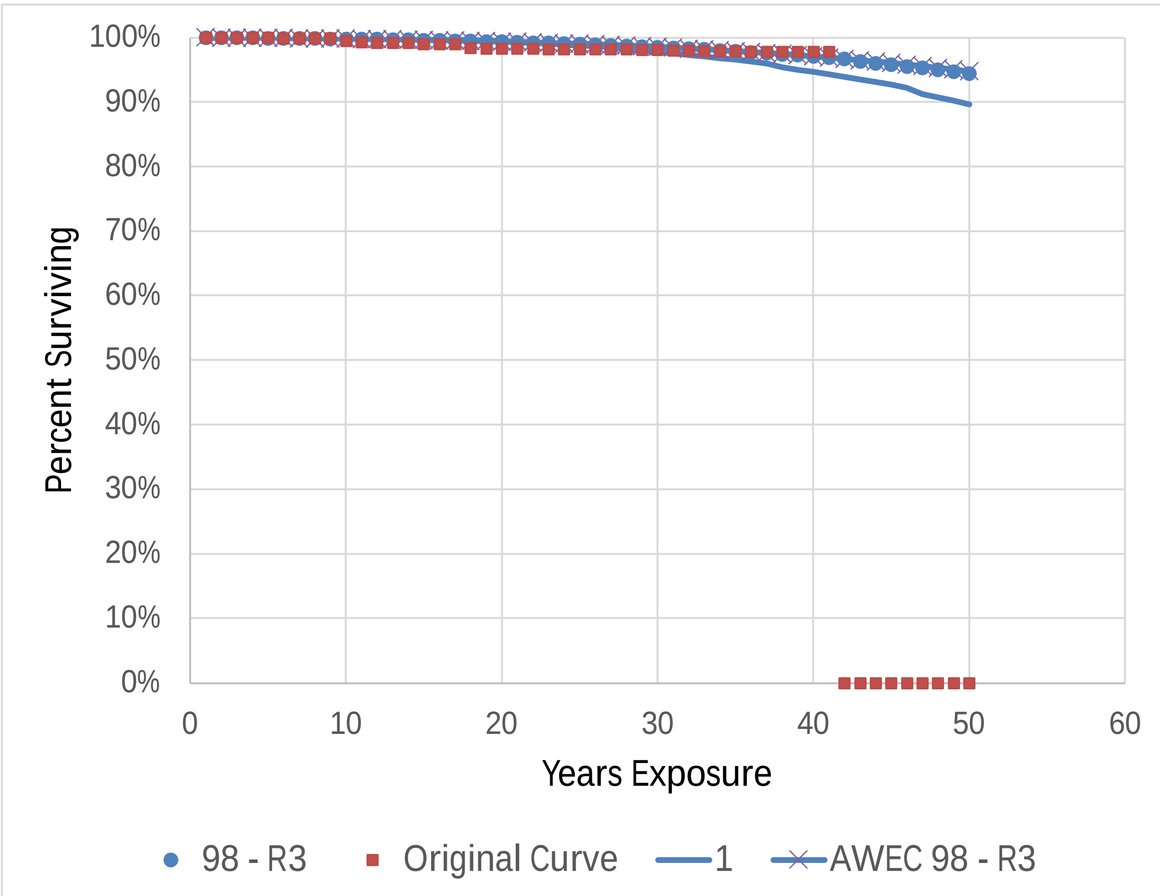


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	112 - R3	1	AWEC 98 - R3	Original Curve	112 - R3	1	AWEC 98 - R3
98.5	0.701	0.406	0.533				
97.5	0.712	0.417	0.562				
96.5	0.723	0.427	0.576				
95.5	0.733	0.437	0.590				
94.5	0.743	0.448	0.603				
93.5	0.743	0.458	0.616				
92.5	0.753	0.469	0.629				
91.5	0.762	0.479	0.642				
90.5	98.000	0.490	0.654				
89.5	0.780	0.510	0.667				
88.5	0.789	0.521	0.678				
87.5	0.797	0.531	0.690				
86.5	0.805	0.542	0.701				
85.5	0.813	0.552	0.712				
84.5	0.821	0.563	0.723				
83.5	0.821	0.573	0.733				
82.5	0.828	0.583	0.743				
81.5	0.835	0.594	0.753				
80.5	0.842	0.614	0.762				
79.5	0.849	0.624	0.771				
78.5	0.855	0.634	0.780				
77.5	0.861	0.644	0.789				
76.5	0.867	0.654	0.797				
75.5	0.873	0.664	0.805				
74.5	0.873	0.674	0.813				
73.5	0.878	0.683	0.821				
72.5	0.884	0.693	0.828				
71.5	0.889	0.711	0.835				
70.5	0.894	0.720	0.842				
69.5	0.899	0.730	0.849				
68.5	0.904	0.738	0.855				
67.5	0.908	0.747	0.861				
66.5	0.912	0.756	0.867				
65.5	0.912	0.764	0.873				
64.5	0.916	0.773	0.878				
63.5	0.921	0.781	0.884				
62.5	0.924	0.797	0.889				
61.5	0.928	0.805	0.894				
60.5	0.932	0.813	0.899				
59.5	0.935	0.820	0.904				
58.5	0.938	0.827	0.908				
57.5	0.942	0.834	0.912				
56.5	0.945	0.842	0.916				
55.5	0.945	0.848	0.921				

54.5	0.948	0.855	0.924				
53.5	0.950	0.868	0.928				
52.5	0.953	0.874	0.932				
51.5	0.956	0.880	0.935				
50.5	0.958	0.886	0.938				
49.5	0.961	0.892	0.942				
48.5	0.963	0.897	0.948				
47.5	0.965	0.902	0.950				
46.5	0.965	0.908	0.953				
45.5	0.967	0.913	0.956				
44.5	0.969	0.922	0.958				
43.5	0.971	0.926	0.961				
42.5	0.973	0.931	0.963				
41.5	0.974	0.935	0.965				
40.5	0.976	0.939	0.967				
39.5	0.978	0.943	0.969	0.984	0.000041	0.001690	0.000224
38.5	0.979	0.946	0.971	0.984	0.000024	0.001400	0.000171
37.5	0.980	0.950	0.973	0.984	0.000012	0.001149	0.000127
36.5	0.980	0.953	0.974	0.984	0.000012	0.000931	0.000092
35.5	0.982	0.960	0.976	0.984	0.000005	0.000587	0.000063
34.5	0.983	0.963	0.978	0.984	0.000001	0.000453	0.000041
33.5	0.984	0.965	0.979	0.985	0.000001	0.000396	0.000040
32.5	0.985	0.968	0.980	0.985	0.000000	0.000297	0.000024
31.5	0.986	0.971	0.982	0.985	0.000001	0.000217	0.000013
30.5	0.987	0.973	0.983	0.986	0.000002	0.000171	0.000009
29.5	0.988	0.975	0.984	0.986	0.000005	0.000119	0.000004
28.5	0.989	0.977	0.985	0.987	0.000007	0.000086	0.000002
27.5	0.989	0.979	0.986	0.987	0.000006	0.000055	0.000000
26.5	0.990	0.983	0.987	0.988	0.000006	0.000022	0.000000
25.5	0.991	0.985	0.988	0.988	0.000011	0.000009	0.000001
24.5	0.992	0.986	0.989	0.988	0.000015	0.000002	0.000002
23.5	0.992	0.988	0.990	0.988	0.000021	0.000000	0.000006
22.5	0.993	0.989	0.991	0.988	0.000026	0.000001	0.000009
21.5	0.994	0.990	0.992	0.988	0.000033	0.000005	0.000014
20.5	0.994	0.991	0.992	0.988	0.000035	0.000009	0.000016
19.5	0.995	0.992	0.993	0.988	0.000040	0.000015	0.000021
18.5	0.995	0.993	0.994	0.988	0.000040	0.000024	0.000027
17.5	0.995	0.995	0.994	0.989	0.000046	0.000042	0.000032
16.5	0.996	0.996	0.995	0.989	0.000046	0.000045	0.000033
15.5	0.996	0.996	0.995	0.993	0.000009	0.000010	0.000004
14.5	0.997	0.997	0.996	0.993	0.000012	0.000014	0.000007
13.5	0.997	0.997	0.996	0.993	0.000014	0.000017	0.000008
12.5	0.997	0.998	0.997	0.994	0.000014	0.000017	0.000009
11.5	0.998	0.998	0.997	0.994	0.000016	0.000021	0.000011
10.5	0.998	0.999	0.997	0.994	0.000018	0.000023	0.000013
9.5	0.998	0.999	0.998	0.994	0.000020	0.000025	0.000015
8.5	0.998	0.999	0.998	0.994	0.000020	0.000030	0.000017

7.5	0.999	1.000	0.998	0.996	0.000006	0.000012	0.000005
6.5	0.999	1.000	0.999	0.996	0.000006	0.000011	0.000005
5.5	0.999	1.000	0.999	0.999	0.000000	0.000001	0.000000
4.5	0.999	1.000	0.999	0.999	0.000000	0.000001	0.000000
3.5	0.999	1.000	0.999	1.000	0.000000	0.000000	0.000000
2.5	1.000	1.000	0.999	1.000	0.000000	0.000000	0.000000
1.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.000570	0.007907	0.001064

Account		31100				
STRUCTURES AND IMPROVEMENTS				Iowa Curve	Avg. Life	SSR
Band		2		R3	98	0.001413 Band 2 Best Fit
EXPERIENCE		PLACEMENT		R3	98	0.001413 AWEC Proposed
BEGIN	END	BEGIN	END	S1.5	90	0.005798 PGE Proposed
2000	2019	1980	2019			-76% Change in SS

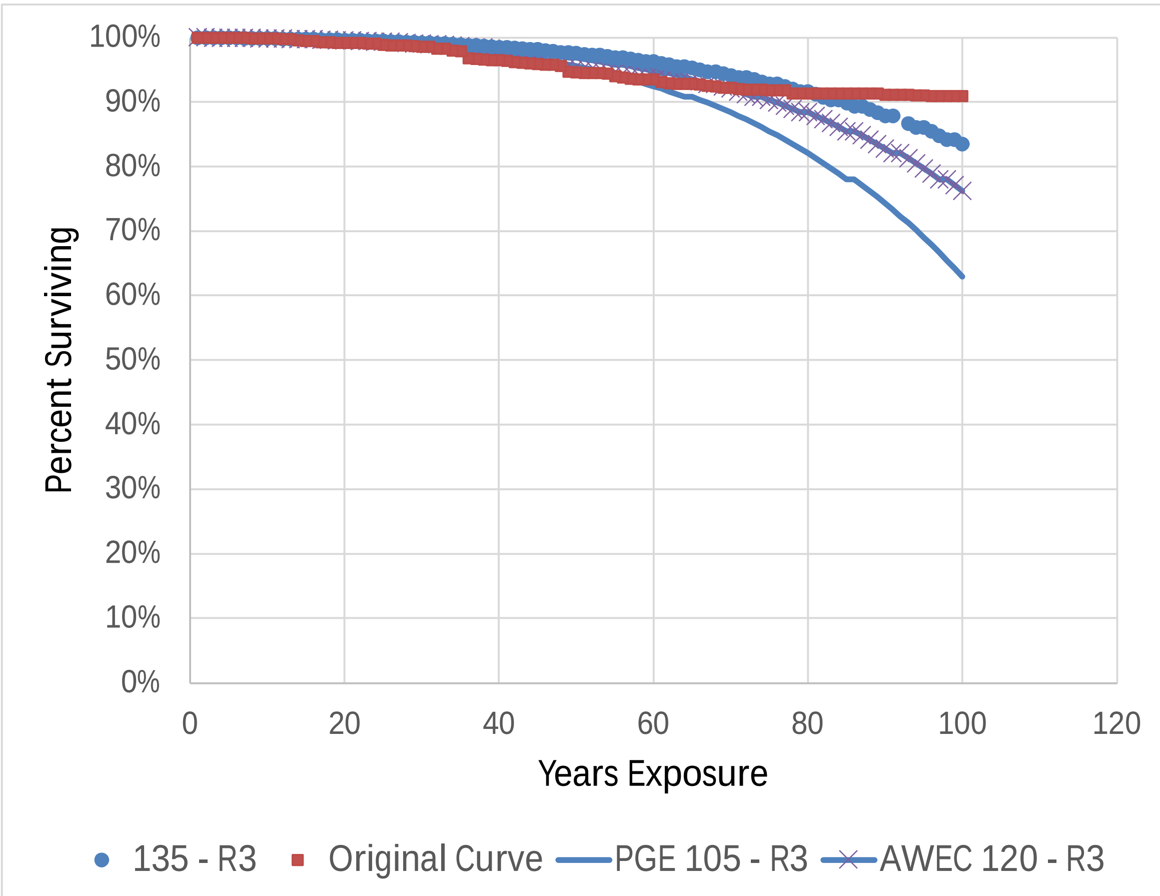


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	98 - R3	1	AWEC 98 - R3	Original Curve	98 - R3	1	AWEC 98 - R3
98.5	0.533	0.406	0.533				
97.5	0.547	0.417	0.562				
96.5	0.562	0.427	0.576				
95.5	0.576	0.437	0.590				
94.5	0.590	0.448	0.603				
93.5	0.603	0.458	0.616				
92.5	0.616	0.469	0.629				
91.5	0.629	0.479	0.642				
90.5	98.000	0.490	0.654				
89.5	0.654	0.510	0.667				
88.5	0.667	0.521	0.678				
87.5	0.678	0.531	0.690				
86.5	0.690	0.542	0.701				
85.5	0.701	0.552	0.712				
84.5	0.712	0.563	0.723				
83.5	0.723	0.573	0.733				
82.5	0.733	0.583	0.743				
81.5	0.753	0.594	0.753				
80.5	0.762	0.614	0.762				
79.5	0.771	0.624	0.771				
78.5	0.780	0.634	0.780				
77.5	0.789	0.644	0.789				
76.5	0.797	0.654	0.797				
75.5	0.805	0.664	0.805				
74.5	0.813	0.674	0.813				
73.5	0.821	0.683	0.821				
72.5	0.828	0.693	0.828				
71.5	0.835	0.711	0.835				
70.5	0.842	0.720	0.842				
69.5	0.849	0.730	0.849				
68.5	0.855	0.738	0.855				
67.5	0.861	0.747	0.861				
66.5	0.867	0.756	0.867				
65.5	0.873	0.764	0.873				
64.5	0.878	0.773	0.878				
63.5	0.884	0.781	0.884				
62.5	0.889	0.797	0.889				
61.5	0.894	0.805	0.894				
60.5	0.899	0.813	0.899				
59.5	0.904	0.820	0.904				
58.5	0.908	0.827	0.908				
57.5	0.912	0.834	0.912				
56.5	0.916	0.842	0.916				
55.5	0.921	0.848	0.921				

54.5	0.924	0.855	0.924				
53.5	0.928	0.868	0.928				
52.5	0.932	0.874	0.932				
51.5	0.935	0.880	0.935				
50.5	0.938	0.886	0.938				
49.5	0.942	0.892	0.942				
48.5	0.945	0.897	0.948				
47.5	0.948	0.902	0.950				
46.5	0.950	0.908	0.953				
45.5	0.953	0.913	0.956				
44.5	0.956	0.922	0.958				
43.5	0.958	0.926	0.961				
42.5	0.961	0.931	0.963				
41.5	0.963	0.935	0.965				
40.5	0.967	0.939	0.967				
39.5	0.969	0.943	0.969	0.978	0.000084	0.001246	0.000084
38.5	0.971	0.946	0.971	0.978	0.000053	0.001000	0.000053
37.5	0.973	0.950	0.973	0.978	0.000030	0.000789	0.000030
36.5	0.974	0.953	0.974	0.978	0.000014	0.000611	0.000014
35.5	0.976	0.960	0.976	0.978	0.000005	0.000339	0.000005
34.5	0.978	0.963	0.978	0.978	0.000000	0.000240	0.000000
33.5	0.979	0.965	0.979	0.980	0.000000	0.000199	0.000000
32.5	0.980	0.968	0.980	0.980	0.000001	0.000131	0.000001
31.5	0.982	0.971	0.982	0.980	0.000005	0.000080	0.000005
30.5	0.983	0.973	0.983	0.980	0.000008	0.000053	0.000008
29.5	0.984	0.975	0.984	0.980	0.000015	0.000026	0.000015
28.5	0.985	0.977	0.985	0.981	0.000021	0.000011	0.000021
27.5	0.986	0.979	0.986	0.981	0.000030	0.000003	0.000030
26.5	0.987	0.983	0.987	0.982	0.000031	0.000001	0.000031
25.5	0.988	0.985	0.988	0.982	0.000042	0.000008	0.000042
24.5	0.989	0.986	0.989	0.982	0.000053	0.000018	0.000053
23.5	0.990	0.988	0.990	0.982	0.000067	0.000032	0.000067
22.5	0.991	0.989	0.991	0.982	0.000077	0.000046	0.000077
21.5	0.992	0.990	0.992	0.982	0.000090	0.000064	0.000090
20.5	0.992	0.991	0.992	0.983	0.000096	0.000077	0.000096
19.5	0.993	0.992	0.993	0.983	0.000108	0.000094	0.000108
18.5	0.994	0.993	0.994	0.983	0.000121	0.000114	0.000121
17.5	0.994	0.995	0.994	0.983	0.000132	0.000150	0.000132
16.5	0.995	0.996	0.995	0.984	0.000122	0.000143	0.000122
15.5	0.995	0.996	0.995	0.990	0.000024	0.000035	0.000024
14.5	0.996	0.997	0.996	0.990	0.000029	0.000042	0.000029
13.5	0.996	0.997	0.996	0.990	0.000034	0.000049	0.000034
12.5	0.997	0.998	0.997	0.992	0.000024	0.000038	0.000024
11.5	0.997	0.998	0.997	0.992	0.000028	0.000043	0.000028
10.5	0.997	0.999	0.997	0.992	0.000032	0.000048	0.000032
9.5	0.998	0.999	0.998	0.993	0.000023	0.000036	0.000023
8.5	0.998	0.999	0.998	0.994	0.000013	0.000025	0.000013

7.5	0.998	1.000	0.998	0.998	0.000000	0.000001	0.000000
6.5	0.999	1.000	0.999	0.999	0.000000	0.000001	0.000000
5.5	0.999	1.000	0.999	0.999	0.000000	0.000000	0.000000
4.5	0.999	1.000	0.999	0.999	0.000000	0.000001	0.000000
3.5	0.999	1.000	0.999	1.000	0.000000	0.000000	0.000000
2.5	0.999	1.000	0.999	1.000	0.000000	0.000000	0.000000
1.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.001413	0.005798	0.001413

Account		33200				
RESERVOIRS, DAMS AND WATERWAYS				Iowa Curve	Avg. Life	SSR
Band			1	R3	135	0.059 Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	120	0.189 AWEC Proposed
BEGIN	END	BEGIN	END	R3	105	0.767 PGE Proposed
1906	2019	1906	2019			-75% Change in SS

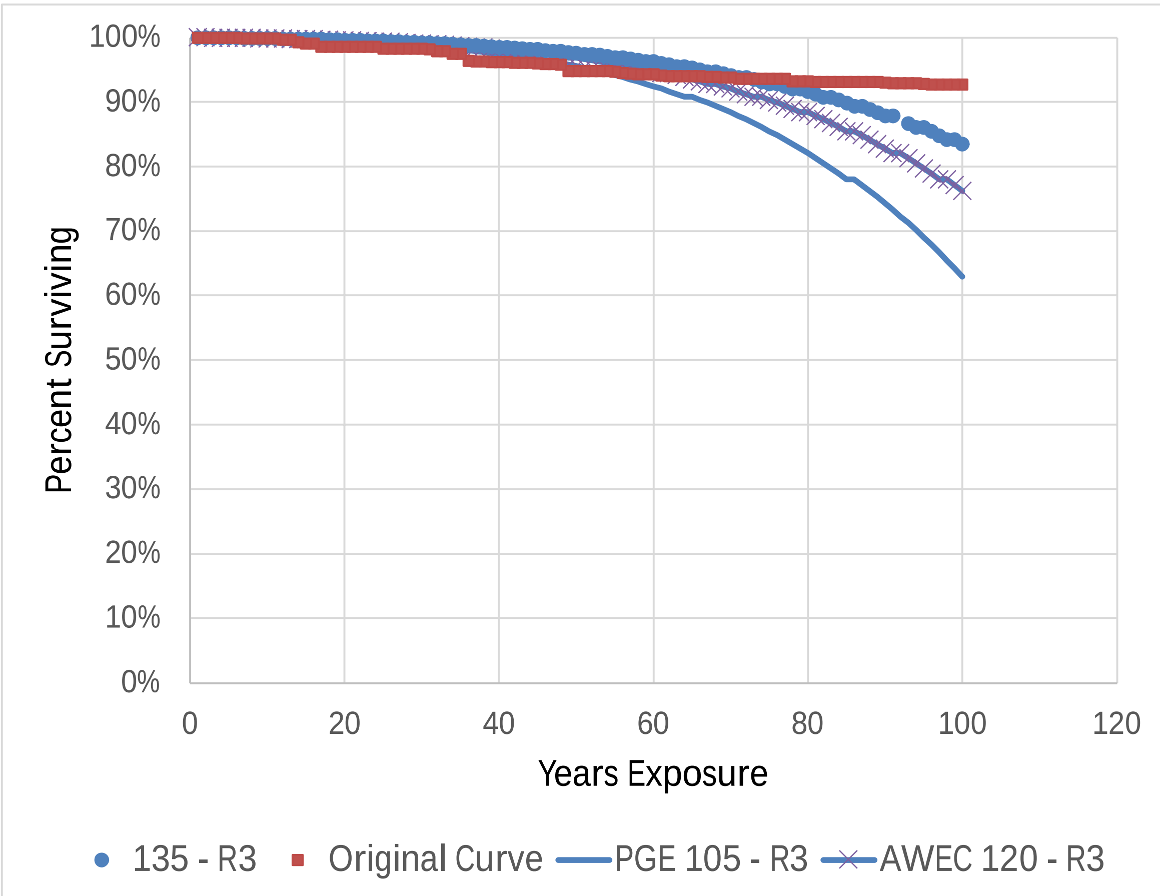


Years Exposure	Percent Surviving 135 - R3	PGE 105 - R3	AWEC 120 - R3	Original Curve	Sum of Squared Residuals 135 - R3	PGE 105 - R3	AWEC 120 - R3
98.5	0.835	0.629	0.762	0.910	0.006	0.079	0.022
97.5	0.842	0.642	0.771	0.910	0.005	0.072	0.019
96.5	0.842	0.654	0.780	0.910	0.005	0.065	0.017
95.5	0.849	0.667	0.780	0.910	0.004	0.059	0.017
94.5	0.855	0.678	0.789	0.910	0.003	0.054	0.015
93.5	0.861	0.690	0.797	0.911	0.002	0.049	0.013
92.5	0.861	0.701	0.805	0.911	0.002	0.044	0.011
91.5	0.867	0.712	0.813	0.912	0.002	0.040	0.010
90.5	98.000	0.723	0.821	0.912	9426.157	0.036	0.008
89.5	0.878	0.733	0.821	0.912	0.001	0.032	0.008
88.5	0.878	0.743	0.828	0.912	0.001	0.029	0.007
87.5	0.884	0.753	0.835	0.913	0.001	0.026	0.006
86.5	0.889	0.762	0.842	0.913	0.001	0.023	0.005
85.5	0.894	0.771	0.849	0.913	0.000	0.020	0.004
84.5	0.894	0.780	0.855	0.913	0.000	0.018	0.003
83.5	0.899	0.780	0.855	0.913	0.000	0.018	0.003
82.5	0.904	0.789	0.861	0.913	0.000	0.015	0.003
81.5	0.904	0.797	0.867	0.913	0.000	0.013	0.002
80.5	0.908	0.805	0.873	0.913	0.000	0.012	0.002
79.5	0.912	0.813	0.878	0.914	0.000	0.010	0.001
78.5	0.916	0.821	0.884	0.914	0.000	0.009	0.001
77.5	0.916	0.828	0.884	0.914	0.000	0.007	0.001
76.5	0.921	0.835	0.889	0.914	0.000	0.006	0.001
75.5	0.924	0.842	0.894	0.919	0.000	0.006	0.001
74.5	0.928	0.849	0.899	0.919	0.000	0.005	0.000
73.5	0.928	0.855	0.904	0.919	0.000	0.004	0.000
72.5	0.932	0.861	0.908	0.919	0.000	0.003	0.000
71.5	0.935	0.867	0.908	0.919	0.000	0.003	0.000
70.5	0.938	0.873	0.912	0.920	0.000	0.002	0.000
69.5	0.938	0.878	0.916	0.920	0.000	0.002	0.000
68.5	0.942	0.884	0.921	0.922	0.000	0.001	0.000
67.5	0.945	0.889	0.924	0.923	0.000	0.001	0.000
66.5	0.948	0.894	0.928	0.925	0.001	0.001	0.000
65.5	0.948	0.899	0.928	0.926	0.000	0.001	0.000
64.5	0.950	0.904	0.932	0.927	0.001	0.001	0.000
63.5	0.953	0.908	0.935	0.928	0.001	0.000	0.000
62.5	0.956	0.908	0.938	0.929	0.001	0.000	0.000
61.5	0.956	0.912	0.942	0.929	0.001	0.000	0.000
60.5	0.958	0.916	0.945	0.930	0.001	0.000	0.000
59.5	0.961	0.921	0.945	0.931	0.001	0.000	0.000
58.5	0.963	0.924	0.948	0.935	0.001	0.000	0.000
57.5	0.963	0.928	0.950	0.935	0.001	0.000	0.000
56.5	0.965	0.932	0.953	0.936	0.001	0.000	0.000
55.5	0.967	0.935	0.956	0.937	0.001	0.000	0.000

54.5	0.969	0.938	0.958	0.938	0.001	0.000	0.000
53.5	0.969	0.942	0.958	0.941	0.001	0.000	0.000
52.5	0.971	0.945	0.961	0.944	0.001	0.000	0.000
51.5	0.973	0.948	0.963	0.945	0.001	0.000	0.000
50.5	0.973	0.950	0.965	0.946	0.001	0.000	0.000
49.5	0.974	0.953	0.967	0.946	0.001	0.000	0.000
48.5	0.976	0.956	0.969	0.946	0.001	0.000	0.001
47.5	0.978	0.958	0.969	0.947	0.001	0.000	0.000
46.5	0.978	0.961	0.971	0.956	0.000	0.000	0.000
45.5	0.979	0.963	0.973	0.958	0.000	0.000	0.000
44.5	0.980	0.965	0.974	0.959	0.000	0.000	0.000
43.5	0.982	0.967	0.976	0.959	0.001	0.000	0.000
42.5	0.982	0.969	0.978	0.960	0.000	0.000	0.000
41.5	0.983	0.969	0.978	0.961	0.000	0.000	0.000
40.5	0.984	0.971	0.979	0.962	0.001	0.000	0.000
39.5	0.985	0.973	0.980	0.964	0.000436	0.000068	0.000255
38.5	0.985	0.974	0.982	0.965	0.000415	0.000089	0.000282
37.5	0.986	0.976	0.983	0.965	0.000447	0.000116	0.000315
36.5	0.987	0.978	0.984	0.966	0.000456	0.000132	0.000329
35.5	0.988	0.979	0.984	0.968	0.000429	0.000129	0.000274
34.5	0.988	0.980	0.985	0.969	0.000392	0.000141	0.000281
33.5	0.989	0.982	0.986	0.979	0.000106	0.000008	0.000055
32.5	0.990	0.983	0.987	0.980	0.000109	0.000011	0.000060
31.5	0.991	0.984	0.988	0.983	0.000067	0.000002	0.000031
30.5	0.991	0.985	0.989	0.983	0.000057	0.000004	0.000035
29.5	0.992	0.986	0.989	0.986	0.000031	0.000000	0.000010
28.5	0.992	0.987	0.990	0.986	0.000035	0.000001	0.000013
27.5	0.993	0.988	0.991	0.987	0.000034	0.000001	0.000013
26.5	0.993	0.989	0.992	0.988	0.000028	0.000002	0.000015
25.5	0.994	0.990	0.992	0.988	0.000034	0.000005	0.000020
24.5	0.994	0.991	0.993	0.988	0.000037	0.000008	0.000024
23.5	0.995	0.992	0.993	0.989	0.000038	0.000009	0.000019
22.5	0.995	0.992	0.994	0.991	0.000013	0.000001	0.000006
21.5	0.995	0.993	0.994	0.991	0.000015	0.000003	0.000008
20.5	0.996	0.993	0.995	0.992	0.000016	0.000002	0.000009
19.5	0.996	0.994	0.995	0.992	0.000019	0.000003	0.000012
18.5	0.996	0.994	0.996	0.992	0.000019	0.000006	0.000016
17.5	0.997	0.995	0.996	0.992	0.000021	0.000008	0.000014
16.5	0.997	0.995	0.996	0.993	0.000019	0.000007	0.000013
15.5	0.997	0.996	0.997	0.993	0.000018	0.000009	0.000015
14.5	0.997	0.996	0.997	0.995	0.000005	0.000001	0.000004
13.5	0.998	0.997	0.997	0.995	0.000006	0.000002	0.000005
12.5	0.998	0.997	0.998	0.996	0.000005	0.000001	0.000004
11.5	0.998	0.997	0.998	0.998	0.000000	0.000000	0.000000
10.5	0.998	0.998	0.998	0.998	0.000000	0.000000	0.000000
9.5	0.999	0.998	0.998	0.999	0.000000	0.000001	0.000000
8.5	0.999	0.998	0.999	0.999	0.000000	0.000001	0.000000

7.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
6.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
5.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
4.5	0.999	0.999	0.999	1.000	0.000000	0.000000	0.000000
3.5	0.999	0.999	0.999	1.000	0.000000	0.000000	0.000000
2.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
1.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			########	0.766701	0.189294

Account		33200					
RESERVOIRS, DAMS AND WATERWAYS				Iowa Curve	Avg. Life	SSR	
Band		2		R3	135	0.085	Band 2 Best Fit
EXPERIENCE		PLACEMENT		R3	120	0.269	AWEC Proposed
BEGIN	END	BEGIN	END	R3	105	0.941	PGE Proposed
1980	2019	1913	2019			-71%	Change in SS

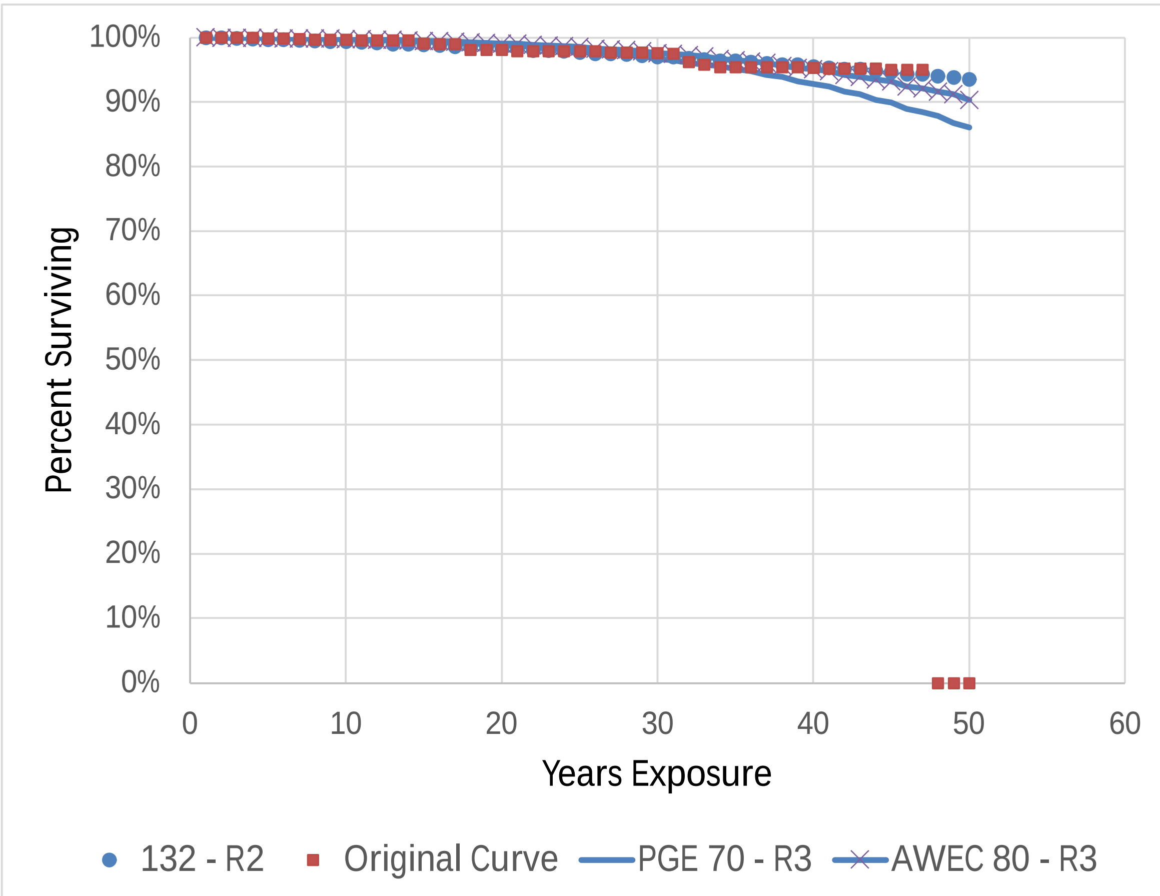


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	135 - R3	PGE 105 - R3	AWEC 120 - R3	Original Curve	135 - R3	PGE 105 - R3	AWEC 120 - R3
98.5	0.835	0.629	0.762	0.928	0.008601	0.089078	0.027413
97.5	0.842	0.642	0.771	0.928	0.007379	0.081653	0.024464
96.5	0.842	0.654	0.780	0.928	0.007379	0.074709	0.021765
95.5	0.849	0.667	0.780	0.928	0.006285	0.068225	0.021765
94.5	0.855	0.678	0.789	0.928	0.005311	0.062190	0.019302
93.5	0.861	0.690	0.797	0.929	0.004597	0.057097	0.017342
92.5	0.861	0.701	0.805	0.929	0.004610	0.051907	0.015307
91.5	0.867	0.712	0.813	0.930	0.003909	0.047311	0.013572
90.5	0.873	0.723	0.821	0.930	0.003221	0.042803	0.011868
89.5	0.878	0.733	0.821	0.930	0.002619	0.038640	0.011868
88.5	0.878	0.743	0.828	0.930	0.002660	0.034947	0.010408
87.5	0.884	0.753	0.835	0.931	0.002256	0.031866	0.009262
86.5	0.889	0.762	0.842	0.931	0.001790	0.028585	0.007992
85.5	0.894	0.771	0.849	0.931	0.001391	0.025571	0.006853
84.5	0.894	0.780	0.855	0.931	0.001391	0.022810	0.005834
83.5	0.899	0.780	0.855	0.931	0.001054	0.022810	0.005834
82.5	0.904	0.789	0.861	0.931	0.000773	0.020286	0.004928
81.5	0.908	0.797	0.867	0.931	0.000548	0.018007	0.004137
80.5	0.908	0.805	0.873	0.931	0.000548	0.015906	0.003428
79.5	0.912	0.813	0.878	0.932	0.000379	0.014090	0.002849
78.5	0.916	0.821	0.884	0.932	0.000237	0.012374	0.002314
77.5	0.921	0.828	0.884	0.932	0.000130	0.010799	0.002314
76.5	0.921	0.835	0.889	0.932	0.000130	0.009378	0.001841
75.5	0.924	0.842	0.894	0.937	0.000152	0.008987	0.001823
74.5	0.928	0.849	0.899	0.937	0.000076	0.007793	0.001442
73.5	0.928	0.855	0.904	0.937	0.000076	0.006704	0.001109
72.5	0.932	0.861	0.908	0.937	0.000026	0.005730	0.000830
71.5	0.935	0.867	0.908	0.937	0.000003	0.004861	0.000830
70.5	0.938	0.873	0.912	0.937	0.000003	0.004090	0.000599
69.5	0.938	0.878	0.916	0.937	0.000003	0.003408	0.000412
68.5	0.942	0.884	0.921	0.939	0.000008	0.003014	0.000331
67.5	0.945	0.889	0.924	0.939	0.000036	0.002471	0.000205
66.5	0.948	0.894	0.928	0.940	0.000061	0.002098	0.000137
65.5	0.948	0.899	0.928	0.940	0.000061	0.001679	0.000137
64.5	0.950	0.904	0.932	0.940	0.000108	0.001332	0.000069
63.5	0.953	0.908	0.935	0.940	0.000171	0.001025	0.000024
62.5	0.956	0.908	0.938	0.940	0.000245	0.001025	0.000002
61.5	0.956	0.912	0.942	0.940	0.000245	0.000766	0.000003
60.5	0.958	0.916	0.945	0.941	0.000307	0.000581	0.000016
59.5	0.961	0.921	0.945	0.942	0.000350	0.000453	0.000008
58.5	0.963	0.924	0.948	0.943	0.000379	0.000358	0.000018
57.5	0.963	0.928	0.950	0.943	0.000379	0.000231	0.000050
56.5	0.965	0.932	0.953	0.943	0.000467	0.000135	0.000096
55.5	0.967	0.935	0.956	0.944	0.000523	0.000081	0.000134

54.5	0.969	0.938	0.958	0.946	0.000541	0.000053	0.000155
53.5	0.969	0.942	0.958	0.948	0.000456	0.000036	0.000111
52.5	0.971	0.945	0.961	0.948	0.000517	0.000012	0.000154
51.5	0.973	0.948	0.963	0.948	0.000601	0.000000	0.000215
50.5	0.974	0.950	0.965	0.948	0.000672	0.000004	0.000273
49.5	0.974	0.953	0.967	0.948	0.000672	0.000022	0.000345
48.5	0.976	0.956	0.969	0.949	0.000754	0.000051	0.000418
47.5	0.978	0.958	0.969	0.949	0.000835	0.000091	0.000414
46.5	0.979	0.961	0.971	0.959	0.000415	0.000004	0.000150
45.5	0.979	0.963	0.973	0.959	0.000395	0.000013	0.000183
44.5	0.980	0.965	0.974	0.960	0.000436	0.000029	0.000220
43.5	0.982	0.967	0.976	0.960	0.000467	0.000047	0.000252
42.5	0.982	0.969	0.978	0.961	0.000441	0.000068	0.000282
41.5	0.983	0.969	0.978	0.961	0.000491	0.000066	0.000279
40.5	0.984	0.971	0.979	0.961	0.000531	0.000095	0.000319
39.5	0.985	0.973	0.980	0.962	0.000551	0.000117	0.000345
38.5	0.985	0.974	0.982	0.962	0.000532	0.000147	0.000380
37.5	0.986	0.976	0.983	0.962	0.000573	0.000184	0.000422
36.5	0.987	0.978	0.984	0.963	0.000598	0.000213	0.000452
35.5	0.988	0.979	0.984	0.964	0.000611	0.000236	0.000422
34.5	0.988	0.980	0.985	0.964	0.000591	0.000268	0.000452
33.5	0.989	0.982	0.986	0.975	0.000193	0.000041	0.000122
32.5	0.990	0.983	0.987	0.975	0.000215	0.000057	0.000143
31.5	0.991	0.984	0.988	0.979	0.000148	0.000030	0.000092
30.5	0.991	0.985	0.989	0.979	0.000136	0.000037	0.000100
29.5	0.992	0.986	0.989	0.982	0.000090	0.000018	0.000051
28.5	0.992	0.987	0.990	0.983	0.000096	0.000024	0.000057
27.5	0.993	0.988	0.991	0.983	0.000108	0.000033	0.000068
26.5	0.993	0.989	0.992	0.983	0.000102	0.000040	0.000076
25.5	0.994	0.990	0.992	0.983	0.000115	0.000051	0.000089
24.5	0.994	0.991	0.993	0.983	0.000125	0.000062	0.000100
23.5	0.995	0.992	0.993	0.983	0.000129	0.000067	0.000092
22.5	0.995	0.992	0.994	0.986	0.000082	0.000044	0.000063
21.5	0.995	0.993	0.994	0.986	0.000090	0.000052	0.000071
20.5	0.996	0.993	0.995	0.986	0.000097	0.000050	0.000078
19.5	0.996	0.994	0.995	0.986	0.000106	0.000059	0.000088
18.5	0.996	0.994	0.996	0.986	0.000106	0.000069	0.000097
17.5	0.997	0.995	0.996	0.986	0.000111	0.000075	0.000093
16.5	0.997	0.995	0.996	0.986	0.000115	0.000080	0.000098
15.5	0.997	0.996	0.997	0.986	0.000123	0.000089	0.000107
14.5	0.997	0.996	0.997	0.991	0.000037	0.000024	0.000033
13.5	0.998	0.997	0.997	0.991	0.000041	0.000028	0.000037
12.5	0.998	0.997	0.998	0.993	0.000029	0.000019	0.000026
11.5	0.998	0.997	0.998	0.996	0.000003	0.000001	0.000002
10.5	0.998	0.998	0.998	0.996	0.000004	0.000002	0.000003
9.5	0.999	0.998	0.998	0.999	0.000000	0.000001	0.000000
8.5	0.999	0.998	0.999	0.999	0.000000	0.000000	0.000000

7.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
6.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
5.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
4.5	0.999	0.999	0.999	0.999	0.000000	0.000000	0.000000
3.5	0.999	0.999	0.999	1.000	0.000000	0.000000	0.000000
2.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
1.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.084957	0.940676	0.268963

Account		34100				
STRUCTURES AND IMPROVEMENTS				Iowa Curve	Avg. Life	SSR
Band			1	R2	132	0.001 Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	80	0.004 AWEC Proposed
BEGIN	END	BEGIN	END	R3	70	0.019 PGE Proposed
1959	2019	1959	2019			-79% Change in SS

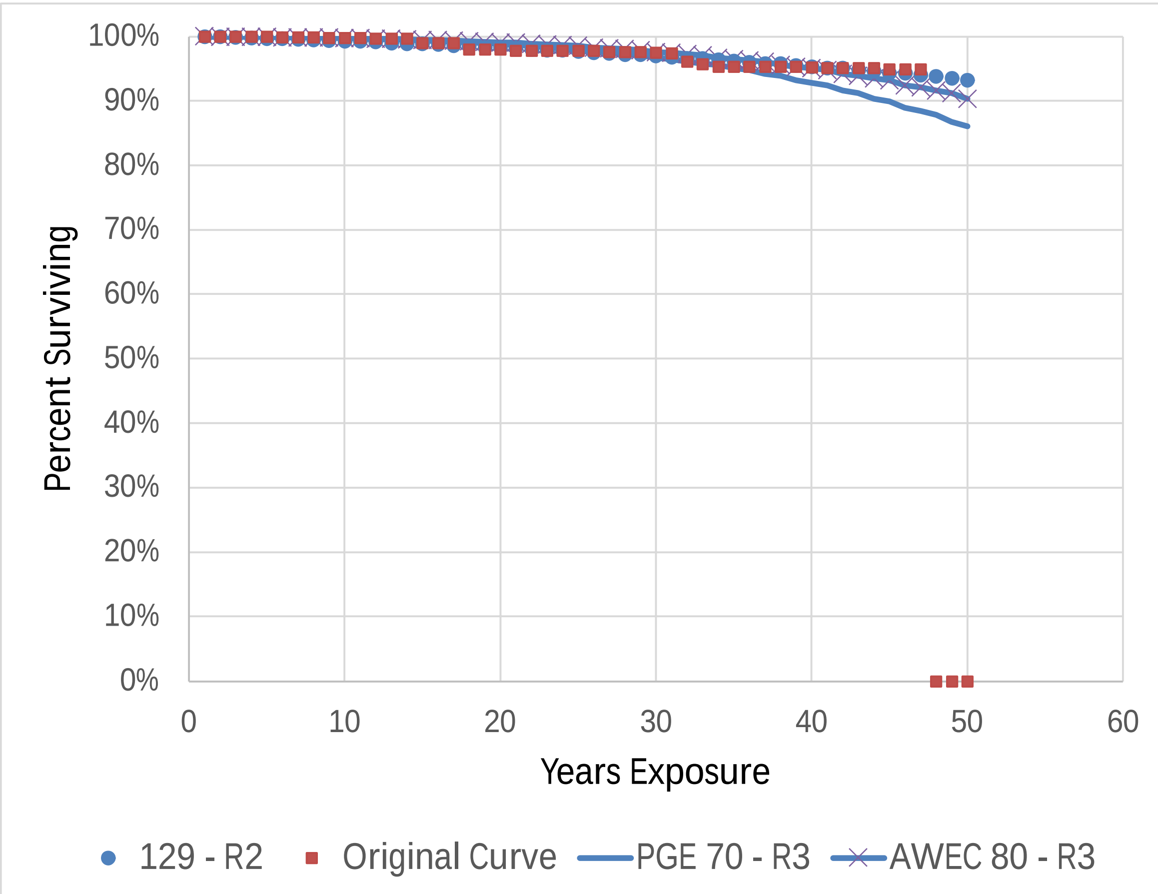


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	132 - R2	PGE 70 - R3	AWEC 80 - R3	Original Curve	132 - R2	PGE 70 - R3	AWEC 80 - R3
98.5	0.757	0.048	0.208				
97.5	0.764	0.059	0.221				
96.5	0.771	0.065	0.234				
95.5	0.777	0.079	0.262				
94.5	0.777	0.086	0.276				
93.5	0.784	0.094	0.290				
92.5	0.790	0.111	0.305				
91.5	0.796	0.120	0.335				
90.5	98.000	0.139	0.350				
89.5	0.802	0.150	0.365				
88.5	0.808	0.172	0.381				
87.5	0.814	0.184	0.412				
86.5	0.814	0.196	0.427				
85.5	0.820	0.221	0.443				
84.5	0.825	0.234	0.458				
83.5	0.831	0.262	0.488				
82.5	0.831	0.276	0.503				
81.5	0.836	0.305	0.518				
80.5	0.841	0.320	0.533				
79.5	0.846	0.335	0.562				
78.5	0.846	0.365	0.576				
77.5	0.851	0.381	0.590				
76.5	0.856	0.412	0.603				
75.5	0.861	0.427	0.629				
74.5	0.866	0.458	0.642				
73.5	0.866	0.473	0.654				
72.5	0.870	0.488	0.667				
71.5	0.875	0.518	0.690				
70.5	0.879	0.533	0.701				
69.5	0.879	0.562	0.712				
68.5	0.883	0.576	0.723				
67.5	0.887	0.603	0.743				
66.5	0.891	0.616	0.753				
65.5	0.891	0.629	0.762				
64.5	0.895	0.654	0.771				
63.5	0.899	0.667	0.789				
62.5	0.903	0.690	0.797				
61.5	0.903	0.701	0.805				
60.5	0.906	0.723	0.813				
59.5	0.910	0.733	0.828				
58.5	0.913	0.743	0.835				
57.5	0.913	0.762	0.842				
56.5	0.917	0.771	0.849				
55.5	0.920	0.789	0.861				

54.5	0.923	0.797	0.867				
53.5	0.923	0.813	0.873				
52.5	0.926	0.821	0.878				
51.5	0.929	0.828	0.889				
50.5	0.932	0.842	0.894				
49.5	0.932	0.849	0.899				
48.5	0.935	0.861	0.904				
47.5	0.938	0.867	0.912				
46.5	0.941	0.878	0.916				
45.5	0.943	0.884	0.921	0.950	0.000	0.004	0.001
44.5	0.943	0.889	0.924	0.950	0.000	0.004	0.001
43.5	0.946	0.899	0.932	0.950	0.000	0.003	0.000
42.5	0.948	0.904	0.935	0.952	0.000	0.002	0.000
41.5	0.951	0.912	0.938	0.952	0.000	0.002	0.000
40.5	0.951	0.916	0.942	0.952	0.000	0.001	0.000
39.5	0.953	0.924	0.948	0.953	0.000001	0.000791	0.000024
38.5	0.956	0.928	0.950	0.953	0.000005	0.000635	0.000008
37.5	0.958	0.932	0.953	0.954	0.000016	0.000489	0.000001
36.5	0.958	0.938	0.956	0.954	0.000015	0.000242	0.000003
35.5	0.960	0.942	0.961	0.954	0.000037	0.000154	0.000042
34.5	0.962	0.948	0.963	0.954	0.000065	0.000043	0.000075
33.5	0.964	0.950	0.965	0.954	0.000101	0.000015	0.000115
32.5	0.964	0.956	0.967	0.954	0.000101	0.000002	0.000163
31.5	0.966	0.958	0.971	0.959	0.000060	0.000000	0.000152
30.5	0.968	0.961	0.973	0.962	0.000035	0.000003	0.000107
29.5	0.970	0.965	0.974	0.975	0.000027	0.000108	0.000001
28.5	0.970	0.967	0.976	0.976	0.000034	0.000080	0.000000
27.5	0.972	0.971	0.979	0.977	0.000023	0.000034	0.000005
26.5	0.974	0.973	0.980	0.977	0.000009	0.000017	0.000013
25.5	0.975	0.976	0.982	0.977	0.000002	0.000001	0.000022
24.5	0.975	0.978	0.983	0.979	0.000013	0.000003	0.000015
23.5	0.977	0.979	0.985	0.979	0.000004	0.000000	0.000038
22.5	0.979	0.982	0.986	0.979	0.000000	0.000006	0.000051
21.5	0.980	0.983	0.987	0.979	0.000001	0.000014	0.000066
20.5	0.980	0.985	0.988	0.979	0.000001	0.000037	0.000083
19.5	0.982	0.986	0.990	0.979	0.000007	0.000050	0.000116
18.5	0.983	0.988	0.991	0.981	0.000008	0.000059	0.000105
17.5	0.985	0.989	0.992	0.981	0.000013	0.000063	0.000106
16.5	0.985	0.990	0.992	0.981	0.000013	0.000077	0.000121
15.5	0.986	0.992	0.994	0.990	0.000017	0.000001	0.000010
14.5	0.988	0.992	0.994	0.990	0.000008	0.000004	0.000014
13.5	0.989	0.994	0.995	0.991	0.000003	0.000009	0.000017
12.5	0.990	0.994	0.995	0.996	0.000028	0.000002	0.000000
11.5	0.990	0.995	0.996	0.996	0.000028	0.000000	0.000000
10.5	0.991	0.996	0.997	0.996	0.000016	0.000000	0.000001
9.5	0.993	0.996	0.997	0.996	0.000009	0.000000	0.000002
8.5	0.994	0.997	0.997	0.997	0.000009	0.000000	0.000000

7.5	0.994	0.997	0.998	0.997	0.000010	0.000000	0.000001
6.5	0.995	0.998	0.998	0.997	0.000004	0.000001	0.000002
5.5	0.996	0.998	0.999	0.998	0.000005	0.000000	0.000000
4.5	0.997	0.999	0.999	0.999	0.000003	0.000000	0.000000
3.5	0.997	0.999	0.999	0.999	0.000005	0.000000	0.000000
2.5	0.998	0.999	0.999	0.999	0.000002	0.000000	0.000000
1.5	0.999	1.000	1.000	1.000	0.000001	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.000870	0.019021	0.003987

Account		34100					
STRUCTURES AND IMPROVEMENTS				Iowa Curve	Avg. Life	SSR	
Band		2		R2	129	0.001	Band 2 Best Fit
EXPERIENCE		PLACEMENT		R3	80	0.004	AWEC Proposed
BEGIN	END	BEGIN	END	R3	70	0.018	PGE Proposed
1990	2019	1959	2019			-78%	Change in SS

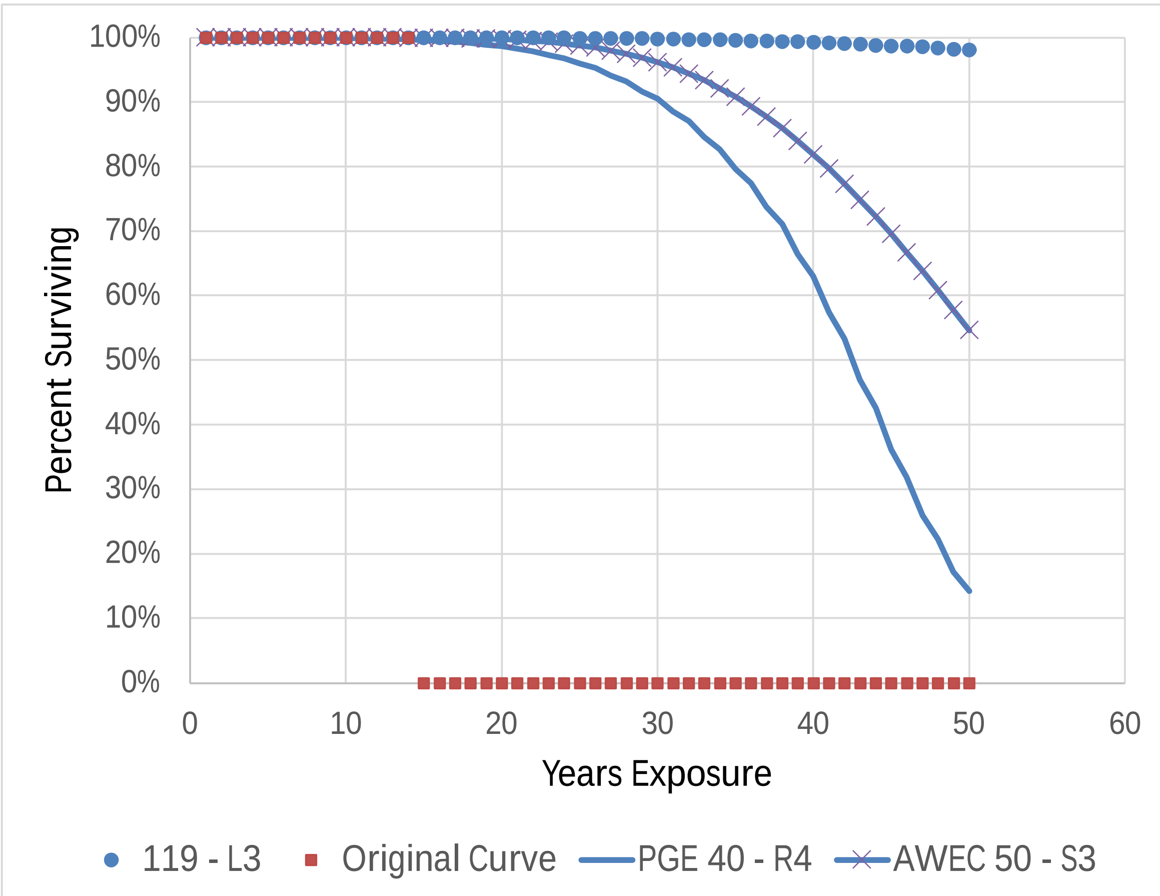


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	129 - R2	PGE 70 - R3	AWEC 80 - R3	Original Curve	129 - R2	PGE 70 - R3	AWEC 80 - R3
98.5	0.750	0.048	0.208				
97.5	0.750	0.059	0.221				
96.5	0.757	0.065	0.234				
95.5	0.764	0.079	0.262				
94.5	0.771	0.086	0.276				
93.5	0.777	0.094	0.290				
92.5	0.777	0.111	0.305				
91.5	0.784	0.120	0.335				
90.5	98.000	0.139	0.350				
89.5	0.796	0.150	0.365				
88.5	0.796	0.172	0.381				
87.5	0.802	0.184	0.412				
86.5	0.808	0.196	0.427				
85.5	0.814	0.221	0.443				
84.5	0.814	0.234	0.458				
83.5	0.820	0.262	0.488				
82.5	0.825	0.276	0.503				
81.5	0.831	0.305	0.518				
80.5	0.836	0.320	0.533				
79.5	0.836	0.335	0.562				
78.5	0.841	0.365	0.576				
77.5	0.846	0.381	0.590				
76.5	0.851	0.412	0.603				
75.5	0.851	0.427	0.629				
74.5	0.856	0.458	0.642				
73.5	0.861	0.473	0.654				
72.5	0.866	0.488	0.667				
71.5	0.870	0.518	0.690				
70.5	0.870	0.533	0.701				
69.5	0.875	0.562	0.712				
68.5	0.879	0.576	0.723				
67.5	0.883	0.603	0.743				
66.5	0.883	0.616	0.753				
65.5	0.887	0.629	0.762				
64.5	0.891	0.654	0.771				
63.5	0.895	0.667	0.789				
62.5	0.899	0.690	0.797				
61.5	0.899	0.701	0.805				
60.5	0.903	0.723	0.813				
59.5	0.906	0.733	0.828				
58.5	0.910	0.743	0.835				
57.5	0.910	0.762	0.842				
56.5	0.913	0.771	0.849				
55.5	0.917	0.789	0.861				

54.5	0.920	0.797	0.867				
53.5	0.923	0.813	0.873				
52.5	0.923	0.821	0.878				
51.5	0.926	0.828	0.889				
50.5	0.929	0.842	0.894				
49.5	0.932	0.849	0.899				
48.5	0.932	0.861	0.904				
47.5	0.935	0.867	0.912				
46.5	0.938	0.878	0.916				
45.5	0.941	0.884	0.921	0.949	0.000	0.004	0.001
44.5	0.943	0.889	0.924	0.949	0.000	0.004	0.001
43.5	0.943	0.899	0.932	0.949	0.000	0.003	0.000
42.5	0.946	0.904	0.935	0.951	0.000	0.002	0.000
41.5	0.948	0.912	0.938	0.951	0.000	0.002	0.000
40.5	0.951	0.916	0.942	0.952	0.000	0.001	0.000
39.5	0.951	0.924	0.948	0.952	0.000000	0.000741	0.000016
38.5	0.953	0.928	0.950	0.952	0.000001	0.000590	0.000004
37.5	0.956	0.932	0.953	0.953	0.000007	0.000450	0.000000
36.5	0.958	0.938	0.956	0.953	0.000023	0.000215	0.000007
35.5	0.958	0.942	0.961	0.953	0.000023	0.000132	0.000055
34.5	0.960	0.948	0.963	0.953	0.000047	0.000032	0.000091
33.5	0.962	0.950	0.965	0.953	0.000079	0.000008	0.000135
32.5	0.964	0.956	0.967	0.953	0.000120	0.000006	0.000187
31.5	0.966	0.958	0.971	0.958	0.000075	0.000000	0.000175
30.5	0.966	0.961	0.973	0.961	0.000024	0.000001	0.000126
29.5	0.968	0.965	0.974	0.974	0.000037	0.000088	0.000000
28.5	0.970	0.967	0.976	0.975	0.000023	0.000063	0.000001
27.5	0.972	0.971	0.979	0.976	0.000015	0.000025	0.000010
26.5	0.972	0.973	0.980	0.976	0.000015	0.000010	0.000021
25.5	0.974	0.976	0.982	0.976	0.000006	0.000000	0.000031
24.5	0.975	0.978	0.983	0.978	0.000007	0.000000	0.000024
23.5	0.977	0.979	0.985	0.978	0.000001	0.000001	0.000051
22.5	0.979	0.982	0.986	0.978	0.000000	0.000012	0.000066
21.5	0.979	0.983	0.987	0.978	0.000000	0.000023	0.000084
20.5	0.980	0.985	0.988	0.978	0.000004	0.000049	0.000100
19.5	0.982	0.986	0.990	0.978	0.000013	0.000065	0.000138
18.5	0.983	0.988	0.991	0.980	0.000014	0.000074	0.000125
17.5	0.983	0.989	0.992	0.980	0.000009	0.000078	0.000126
16.5	0.985	0.990	0.992	0.980	0.000020	0.000093	0.000142
15.5	0.986	0.992	0.994	0.990	0.000010	0.000004	0.000017
14.5	0.988	0.992	0.994	0.990	0.000004	0.000008	0.000022
13.5	0.989	0.994	0.995	0.990	0.000001	0.000015	0.000026
12.5	0.989	0.994	0.995	0.997	0.000070	0.000010	0.000004
11.5	0.990	0.995	0.996	0.997	0.000050	0.000004	0.000001
10.5	0.991	0.996	0.997	0.997	0.000034	0.000002	0.000000
9.5	0.993	0.996	0.997	0.998	0.000025	0.000002	0.000000
8.5	0.993	0.997	0.997	0.998	0.000030	0.000001	0.000001

7.5	0.994	0.997	0.998	0.998	0.000019	0.000001	0.000000
6.5	0.995	0.998	0.998	0.999	0.000013	0.000000	0.000000
5.5	0.996	0.998	0.999	0.999	0.000006	0.000000	0.000000
4.5	0.997	0.999	0.999	0.999	0.000003	0.000000	0.000000
3.5	0.997	0.999	0.999	0.999	0.000005	0.000000	0.000000
2.5	0.998	0.999	0.999	0.999	0.000002	0.000000	0.000000
1.5	0.999	1.000	1.000	1.000	0.000001	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.001016	0.018308	0.004072

Account		34101				
STRUCTURES AND IMPROVEMENTS - WIND				Iowa Curve	Avg. Life	SSR
Band		1		L3	119	0.00000 Band 1 Best Fit
EXPERIENCE		PLACEMENT		S3	50	0.00000 AWEC Proposed
BEGIN	END	BEGIN	END	R4	40	0.00002 PGE Proposed
2007	2019	2007	2019			-100% Change in SS



	Percent Surviving				Sum of Squared Residuals		
Years Exposure	119 - L3	PGE 40 - R4	AWEC 50 - S3	Original Curve	119 - L3	PGE 40 - R4	AWEC 50 - S3
98.5	0.668	0.000	0.000				
97.5	0.682	0.000	0.000				
96.5	0.696	0.000	0.000				
95.5	0.709	0.000	0.000				
94.5	0.723	0.000	0.000				
93.5	0.736	0.000	0.000				
92.5	0.736	0.000	0.000				
91.5	0.749	0.000	0.000				
90.5	98.000	0.000	0.000				
89.5	0.773	0.000	0.000				
88.5	0.785	0.000	0.000				
87.5	0.797	0.000	0.000				
86.5	0.797	0.000	0.000				
85.5	0.808	0.000	0.001				
84.5	0.819	0.000	0.001				
83.5	0.830	0.000	0.001				
82.5	0.840	0.000	0.002				
81.5	0.849	0.000	0.003				
80.5	0.849	0.000	0.004				
79.5	0.859	0.000	0.005				
78.5	0.868	0.000	0.007				
77.5	0.876	0.000	0.009				
76.5	0.884	0.000	0.012				
75.5	0.892	0.000	0.016				
74.5	0.892	0.000	0.020				
73.5	0.899	0.000	0.025				
72.5	0.906	0.000	0.031				
71.5	0.912	0.000	0.038				
70.5	0.918	0.000	0.047				
69.5	0.924	0.000	0.056				
68.5	0.924	0.000	0.067				
67.5	0.929	0.000	0.079				
66.5	0.934	0.000	0.092				
65.5	0.939	0.000	0.107				
64.5	0.943	0.000	0.123				
63.5	0.947	0.000	0.141				
62.5	0.951	0.000	0.160				
61.5	0.951	0.000	0.181				
60.5	0.955	0.000	0.203				
59.5	0.958	0.000	0.227				
58.5	0.961	0.001	0.251				
57.5	0.964	0.001	0.277				
56.5	0.967	0.004	0.305				
55.5	0.967	0.008	0.333				

54.5	0.970	0.016	0.362				
53.5	0.972	0.025	0.392				
52.5	0.975	0.041	0.422				
51.5	0.977	0.056	0.453				
50.5	0.979	0.082	0.484				
49.5	0.979	0.104	0.516				
48.5	0.981	0.142	0.547				
47.5	0.982	0.172	0.578				
46.5	0.984	0.222	0.608				
45.5	0.986	0.259	0.638				
44.5	0.987	0.319	0.667				
43.5	0.987	0.361	0.695				
42.5	0.988	0.426	0.723				
41.5	0.990	0.470	0.749				
40.5	0.991	0.533	0.773				
39.5	0.992	0.574	0.797				
38.5	0.993	0.630	0.819				
37.5	0.994	0.664	0.840				
36.5	0.994	0.710	0.859				
35.5	0.994	0.738	0.877				
34.5	0.995	0.774	0.893				
33.5	0.996	0.796	0.908				
32.5	0.997	0.827	0.921				
31.5	0.997	0.845	0.933				
30.5	0.997	0.870	0.944				
29.5	0.998	0.885	0.953				
28.5	0.998	0.905	0.962				
27.5	0.998	0.916	0.969				
26.5	0.999	0.932	0.975				
25.5	0.999	0.941	0.980				
24.5	0.999	0.953	0.984				
23.5	0.999	0.959	0.988				
22.5	0.999	0.968	0.991				
21.5	1.000	0.973	0.993				
20.5	1.000	0.979	0.995				
19.5	1.000	0.982	0.996				
18.5	1.000	0.986	0.997				
17.5	1.000	0.989	0.998				
16.5	1.000	0.991	0.999				
15.5	1.000	0.993	0.999				
14.5	1.000	0.995	0.999				
13.5	1.000	0.996	1.000				
12.5	1.000	0.997	1.000	1.000	0.000000	0.000009	0.000000
11.5	1.000	0.998	1.000	1.000	0.000000	0.000006	0.000000
10.5	1.000	0.998	1.000	1.000	0.000000	0.000003	0.000000
9.5	1.000	0.999	1.000	1.000	0.000000	0.000002	0.000000
8.5	1.000	0.999	1.000	1.000	0.000000	0.000001	0.000000

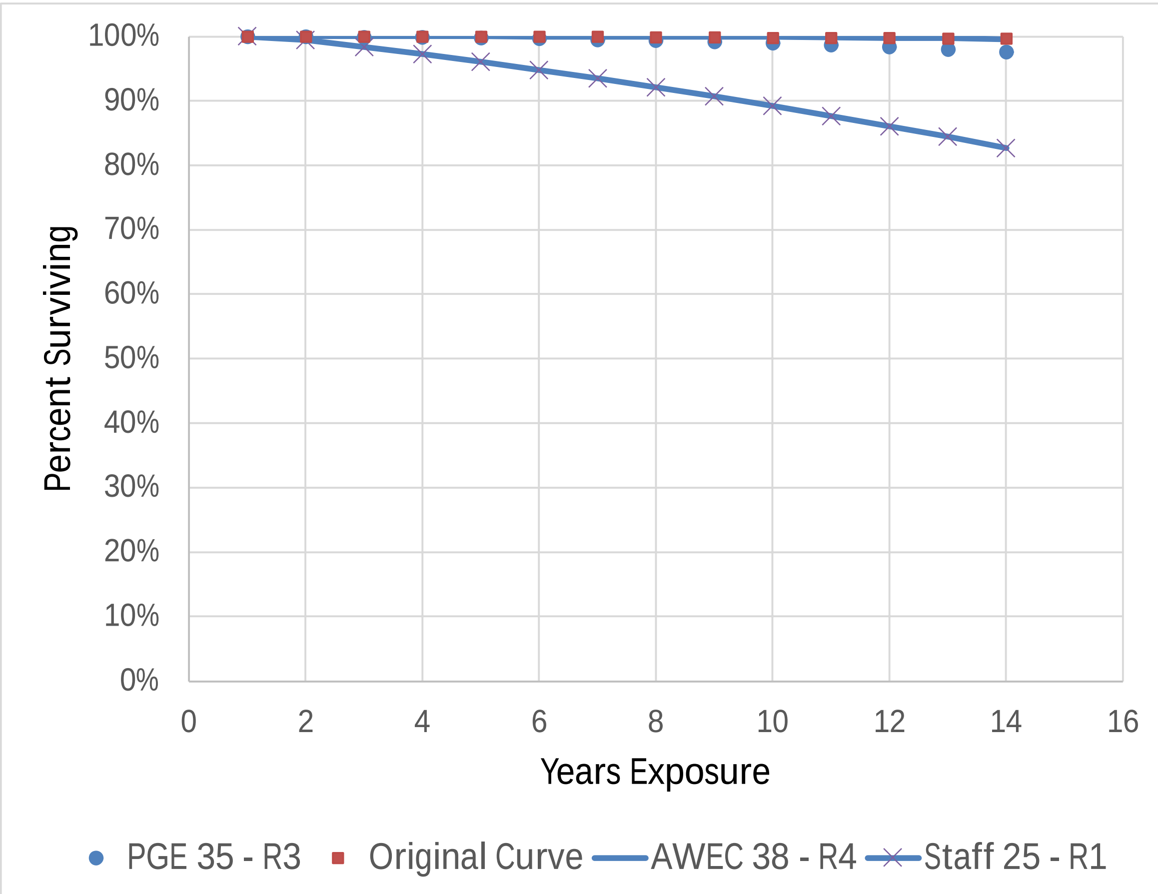
7.5	1.000	0.999	1.000	1.000	0.000000	0.000000	0.000000
6.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
5.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
4.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
3.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
2.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
1.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.000000	0.000021	0.000000

Account		34401	
GENERATORS - WIND			
Band		1	
		EXPERIENCE	
BEGIN	END	BEGIN	END
2007	2019	2007	2019

	Iowa Curve	Avg. Life	SSR	
16	R3	35	0.001194856	PGE Proposed
16	R3	30	0.00264968	Stipulating Parties
12	R1	25	0.121098045	Staff Proposed
17	R4	38	2.0855E-06	AWEC Proposed
			-100%	Change in SS

	Iowa Curve	Avg. Life	SS
1	L0	131	0.0017051
3	L1	132	0.0001278
5	L2	81	0.0000009
7	L3	45	0.0000052
8	L4	28	0.0000123
9	L5	25	0.0000321
10	R1	132	0.0024220
12	R2	132	0.0002567
14	R3	105	0.0000012
15	R4	38	0.0000017
16	R5	25	0.0000290
17	S0	132	0.0001783
19	S1	95	0.0000012
21	S2	47	0.0000038
23	S3	32	0.0000083
24	S4	25	0.0000244
25	S5	18	0.0000195
26	S6	16	0.0000228
27	O1	132	0.0092035
28	O2	132	0.0117441
29	O3	132	0.0261921
30	O4	132	0.0488317

Account		34401					
GENERATORS - WIND				Iowa Curve	Avg. Life	SSR	
Band		1		R3	35	0.00119	PGE Proposed
EXPERIENCE		PLACEMENT		R3	30	0.00265	Stipulating Parties
BEGIN	END	BEGIN	END	R1	25	0.12110	Staff Proposed
2007	2019	2007	2019	R4	38	0.00000	AWEC Proposed
						-100%	Change in SS



	Percent Surviving					Sum of Squai	
Years		AWEC 38 -	Parties	Staff 25 -	Original		AWEC 38 -
Exposure	PGE 35 - R3	R4	30 - R3	R1	Curve	PGE 35 - R3	R4
98.5	0.000	0.000	0.000	0.000			
97.5	0.000	0.000	0.000	0.000			
96.5	0.000	0.000	0.000	0.000			
95.5	0.000	0.000	0.000	0.000			
94.5	0.000	0.000	0.000	0.000			
93.5	0.000	0.000	0.000	0.000			
92.5	0.000	0.000	0.000	0.000			
91.5	0.000	0.000	0.000	0.000			
90.5	98.000	0.000	0.000	0.000			
89.5	0.000	0.000	0.000	0.000			
88.5	0.000	0.000	0.000	0.000			
87.5	0.000	0.000	0.000	0.000			
86.5	0.000	0.000	0.000	0.000			
85.5	0.000	0.000	0.000	0.000			
84.5	0.000	0.000	0.000	0.000			
83.5	0.000	0.000	0.000	0.000			
82.5	0.000	0.000	0.000	0.000			
81.5	0.000	0.000	0.000	0.000			
80.5	0.000	0.000	0.000	0.000			
79.5	0.000	0.000	0.000	0.000			
78.5	0.000	0.000	0.000	0.000			
77.5	0.000	0.000	0.000	0.000			
76.5	0.000	0.000	0.000	0.000			
75.5	0.000	0.000	0.000	0.000			
74.5	0.000	0.000	0.000	0.000			
73.5	0.000	0.000	0.000	0.000			
72.5	0.000	0.000	0.000	0.000			
71.5	0.000	0.000	0.000	0.000			
70.5	0.000	0.000	0.000	0.000			
69.5	0.000	0.000	0.000	0.000			
68.5	0.000	0.000	0.000	0.000			
67.5	0.000	0.000	0.000	0.000			
66.5	0.000	0.000	0.000	0.000			
65.5	0.000	0.000	0.000	0.000			
64.5	0.000	0.000	0.000	0.000			
63.5	0.000	0.000	0.000	0.000			
62.5	0.000	0.000	0.000	0.000			
61.5	0.000	0.000	0.000	0.000			
60.5	0.000	0.000	0.000	0.000			
59.5	0.000	0.000	0.000	0.000			
58.5	0.000	0.000	0.000	0.000			
57.5	0.000	0.000	0.000	0.000			
56.5	0.001	0.000	0.000	0.000			
55.5	0.002	0.001	0.000	0.000			

54.5	0.004	0.002	0.000	0.000			
53.5	0.009	0.004	0.000	0.000			
52.5	0.015	0.010	0.000	0.000			
51.5	0.023	0.016	0.000	0.000			
50.5	0.034	0.030	0.000	0.000			
49.5	0.048	0.048	0.000	0.000			
48.5	0.059	0.064	0.001	0.002			
47.5	0.079	0.093	0.003	0.006			
46.5	0.102	0.129	0.006	0.011			
45.5	0.129	0.157	0.010	0.018			
44.5	0.161	0.204	0.020	0.028			
43.5	0.196	0.259	0.030	0.039			
42.5	0.234	0.298	0.043	0.053			
41.5	0.262	0.361	0.065	0.069			
40.5	0.305	0.404	0.086	0.088			
39.5	0.350	0.470	0.111	0.109			
38.5	0.396	0.533	0.150	0.131			
37.5	0.443	0.574	0.184	0.156			
36.5	0.488	0.630	0.221	0.182			
35.5	0.533	0.680	0.276	0.209			
34.5	0.562	0.710	0.320	0.238			
33.5	0.603	0.750	0.365	0.267			
32.5	0.642	0.774	0.427	0.297			
31.5	0.678	0.807	0.473	0.328			
30.5	0.712	0.836	0.518	0.359			
29.5	0.743	0.854	0.576	0.391			
28.5	0.771	0.878	0.616	0.422			
27.5	0.789	0.898	0.654	0.453			
26.5	0.813	0.911	0.701	0.484			
25.5	0.835	0.927	0.733	0.514			
24.5	0.855	0.941	0.762	0.544			
23.5	0.873	0.949	0.797	0.573			
22.5	0.889	0.959	0.821	0.601			
21.5	0.904	0.965	0.842	0.628			
20.5	0.912	0.973	0.867	0.654			
19.5	0.924	0.979	0.884	0.679			
18.5	0.935	0.982	0.899	0.703			
17.5	0.945	0.986	0.916	0.726			
16.5	0.953	0.990	0.928	0.748			
15.5	0.961	0.991	0.938	0.769			
14.5	0.967	0.994	0.950	0.789			
13.5	0.971	0.995	0.958	0.808			
12.5	0.976	0.996	0.965	0.827	0.997	0.000443	0.000001
11.5	0.980	0.997	0.973	0.844	0.997	0.000277	0.000000
10.5	0.984	0.998	0.978	0.861	0.998	0.000189	0.000000
9.5	0.987	0.999	0.982	0.877	0.998	0.000113	0.000000
8.5	0.990	0.999	0.986	0.892	0.998	0.000063	0.000001

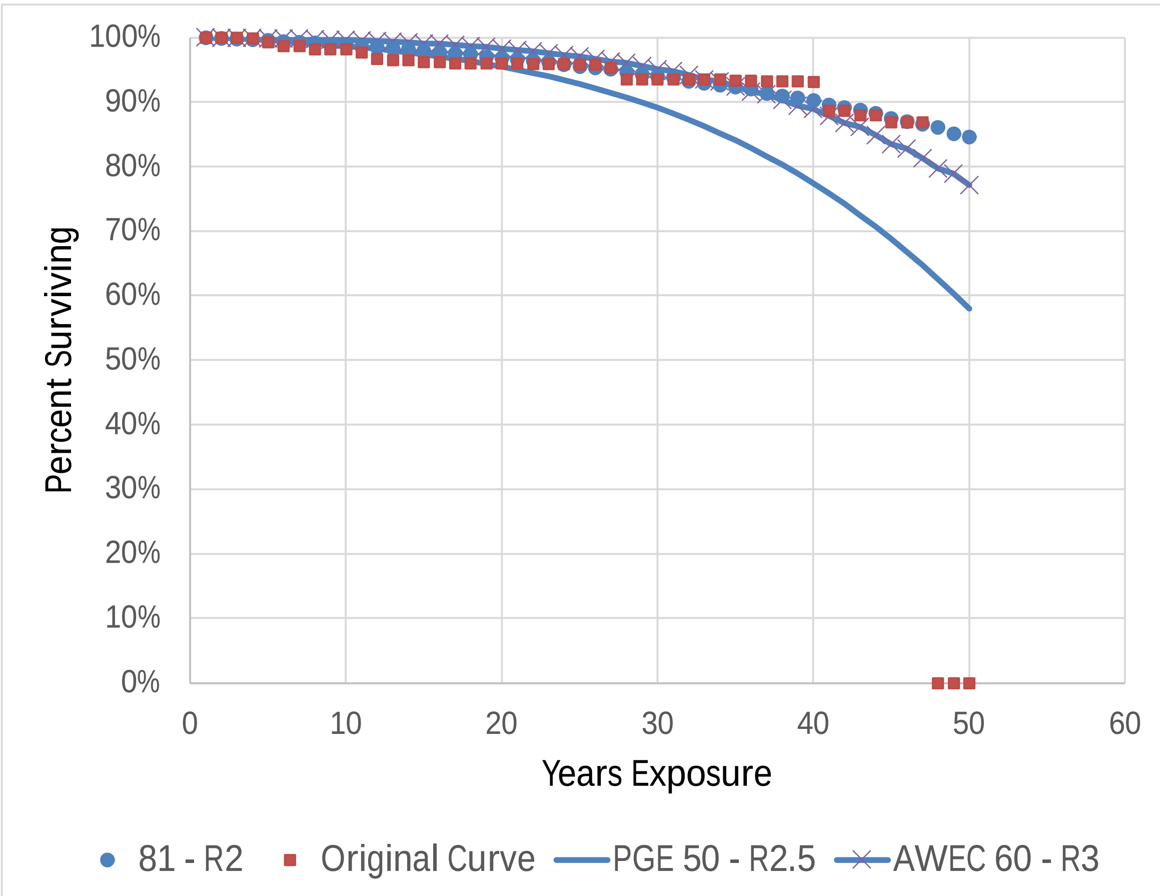
7.5	0.992	0.999	0.989	0.907	0.999	0.000043	0.000000
6.5	0.994	0.999	0.992	0.921	0.999	0.000031	0.000000
5.5	0.995	1.000	0.994	0.935	1.000	0.000020	0.000000
4.5	0.997	1.000	0.996	0.948	1.000	0.000009	0.000000
3.5	0.998	1.000	0.997	0.961	1.000	0.000004	0.000000
2.5	0.999	1.000	0.998	0.973	1.000	0.000002	0.000000
1.5	0.999	1.000	0.999	0.984	1.000	0.000000	0.000000
0.5	1.000	1.000	1.000	0.995	1.000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	1.000	0.000000	0.000000
			Sum of Squared Residuals			0.001195	0.000002

red Residuals	
Parties 30 - R3	Staff 25 - R1

0.001029	0.029016
0.000594	0.023381
0.000416	0.018805
0.000266	0.014697
0.000136	0.011206

0.000094	0.008458
0.000058	0.006089
0.000030	0.004204
0.000016	0.002673
0.000007	0.001532
0.000003	0.000753
0.000001	0.000257
0.000000	0.000027
0.000000	0.000000
0.002650	0.121098

Account		34500					
ACCESSORY ELECTRIC EQUIPMENT				Iowa Curve	Avg. Life	SSR	
Band		1		R2	81	0.006	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R3	60	0.024	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	50	0.339	PGE Proposed
1974	2019	1959	2019			-93%	Change in SS

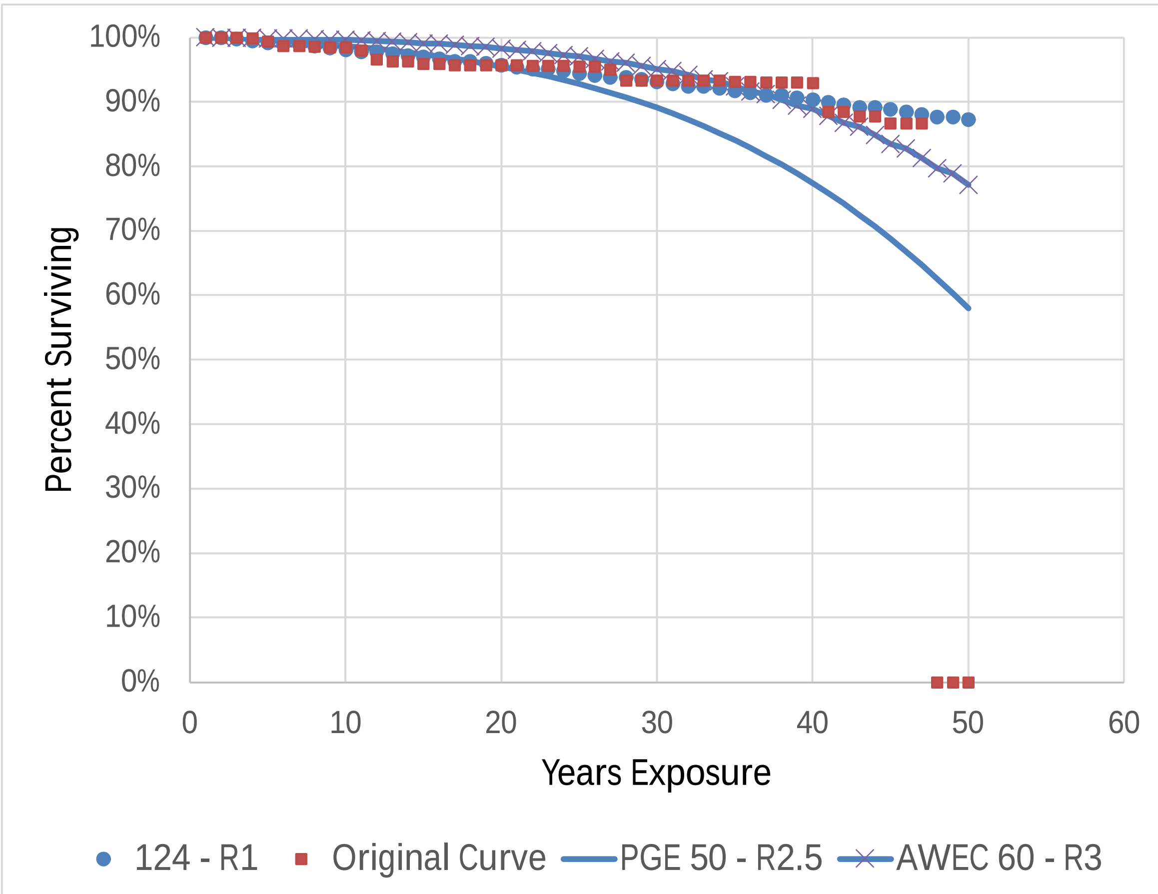


	Percent Surviving				Sum of Squared Residuals		
Years		PGE 50 -	AWEC 60 -	Original		PGE 50 -	AWEC 60 -
Exposure	81 - R2	R2.5	R3	Curve	81 - R2	R2.5	R3
98.5	0.314	0.000	0.000				
97.5	0.325	0.000	0.000				
96.5	0.336	0.000	0.001				
95.5	0.347	0.000	0.002				
94.5	0.368	0.000	0.003				
93.5	0.379	0.000	0.004				
92.5	0.390	0.000	0.007				
91.5	0.401	0.000	0.009				
90.5	98.000	0.000	0.012				
89.5	0.434	0.000	0.017				
88.5	0.445	0.001	0.020				
87.5	0.456	0.001	0.026				
86.5	0.467	0.002	0.034				
85.5	0.488	0.003	0.038				
84.5	0.499	0.005	0.048				
83.5	0.509	0.007	0.059				
82.5	0.520	0.009	0.065				
81.5	0.540	0.011	0.079				
80.5	0.550	0.014	0.094				
79.5	0.561	0.018	0.102				
78.5	0.571	0.023	0.120				
77.5	0.590	0.028	0.139				
76.5	0.600	0.034	0.150				
75.5	0.609	0.040	0.172				
74.5	0.619	0.048	0.196				
73.5	0.628	0.057	0.208				
72.5	0.646	0.066	0.234				
71.5	0.655	0.077	0.262				
70.5	0.664	0.089	0.276				
69.5	0.672	0.102	0.305				
68.5	0.689	0.116	0.335				
67.5	0.697	0.132	0.350				
66.5	0.705	0.149	0.381				
65.5	0.713	0.167	0.412				
64.5	0.728	0.186	0.427				
63.5	0.736	0.206	0.458				
62.5	0.743	0.228	0.488				
61.5	0.750	0.251	0.503				
60.5	0.757	0.274	0.533				
59.5	0.771	0.299	0.562				
58.5	0.777	0.324	0.576				
57.5	0.784	0.350	0.603				
56.5	0.790	0.376	0.629				
55.5	0.802	0.402	0.642				

54.5	0.808	0.428	0.667				
53.5	0.814	0.455	0.690				
52.5	0.820	0.481	0.701				
51.5	0.831	0.506	0.723				
50.5	0.836	0.531	0.743				
49.5	0.841	0.556	0.753				
48.5	0.846	0.580	0.771				
47.5	0.851	0.603	0.789				
46.5	0.861	0.626	0.797				
45.5	0.866	0.647	0.813	0.869	0.000	0.049	0.003
44.5	0.870	0.668	0.828	0.869	0.000	0.041	0.002
43.5	0.875	0.688	0.835	0.869	0.000	0.033	0.001
42.5	0.883	0.707	0.849	0.880	0.000	0.030	0.001
41.5	0.887	0.725	0.861	0.880	0.000	0.024	0.000
40.5	0.891	0.742	0.867	0.887	0.000	0.021	0.000
39.5	0.895	0.759	0.878	0.887	0.000070	0.016458	0.000070
38.5	0.903	0.774	0.889	0.931	0.000823	0.024748	0.001799
37.5	0.906	0.789	0.894	0.932	0.000679	0.020602	0.001475
36.5	0.910	0.803	0.904	0.932	0.000507	0.016777	0.000835
35.5	0.913	0.816	0.912	0.933	0.000374	0.013585	0.000415
34.5	0.920	0.829	0.916	0.933	0.000169	0.010877	0.000273
33.5	0.923	0.841	0.924	0.933	0.000096	0.008540	0.000074
32.5	0.926	0.852	0.932	0.935	0.000079	0.006952	0.000012
31.5	0.929	0.862	0.935	0.935	0.000034	0.005296	0.000000
30.5	0.932	0.872	0.942	0.935	0.000008	0.003939	0.000041
29.5	0.938	0.882	0.948	0.935	0.000008	0.002843	0.000153
28.5	0.941	0.891	0.950	0.936	0.000024	0.002027	0.000213
27.5	0.943	0.899	0.956	0.936	0.000057	0.001343	0.000394
26.5	0.946	0.907	0.961	0.936	0.000103	0.000828	0.000610
25.5	0.951	0.914	0.963	0.953	0.000004	0.001488	0.000095
24.5	0.953	0.921	0.967	0.958	0.000022	0.001341	0.000081
23.5	0.956	0.928	0.971	0.958	0.000007	0.000918	0.000160
22.5	0.958	0.934	0.973	0.959	0.000001	0.000620	0.000188
21.5	0.962	0.940	0.976	0.959	0.000011	0.000367	0.000291
20.5	0.964	0.945	0.979	0.959	0.000029	0.000191	0.000403
19.5	0.966	0.950	0.980	0.960	0.000038	0.000100	0.000411
18.5	0.968	0.955	0.983	0.960	0.000066	0.000029	0.000522
17.5	0.970	0.959	0.985	0.960	0.000100	0.000001	0.000634
16.5	0.974	0.963	0.986	0.960	0.000183	0.000009	0.000683
15.5	0.975	0.967	0.988	0.960	0.000233	0.000045	0.000790
14.5	0.977	0.970	0.990	0.962	0.000233	0.000073	0.000793
13.5	0.979	0.974	0.991	0.962	0.000282	0.000137	0.000833
12.5	0.982	0.977	0.992	0.965	0.000280	0.000133	0.000735
11.5	0.983	0.980	0.994	0.965	0.000324	0.000200	0.000796
10.5	0.985	0.982	0.994	0.967	0.000319	0.000229	0.000740
9.5	0.986	0.985	0.995	0.978	0.000077	0.000050	0.000316
8.5	0.989	0.987	0.996	0.982	0.000054	0.000027	0.000213

7.5	0.990	0.989	0.997	0.982	0.000074	0.000052	0.000226
6.5	0.991	0.991	0.997	0.982	0.000086	0.000073	0.000230
5.5	0.993	0.993	0.998	0.987	0.000033	0.000031	0.000124
4.5	0.994	0.994	0.998	0.987	0.000042	0.000047	0.000121
3.5	0.996	0.996	0.999	0.993	0.000007	0.000005	0.000031
2.5	0.997	0.997	0.999	0.999	0.000003	0.000004	0.000000
1.5	0.998	0.998	0.999	1.000	0.000004	0.000003	0.000000
0.5	0.999	0.999	1.000	1.000	0.000001	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.005678	0.338509	0.023516

Account		34500					
ACCESSORY ELECTRIC EQUIPMENT				Iowa Curve	Avg. Life	SSR	
Band		2		R1	124	0.006	Band 2 Best Fit
EXPERIENCE		PLACEMENT		R3	60	0.024	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	50	0.328	PGE Proposed
1990	2019	1973	2019			-93%	Change in SS

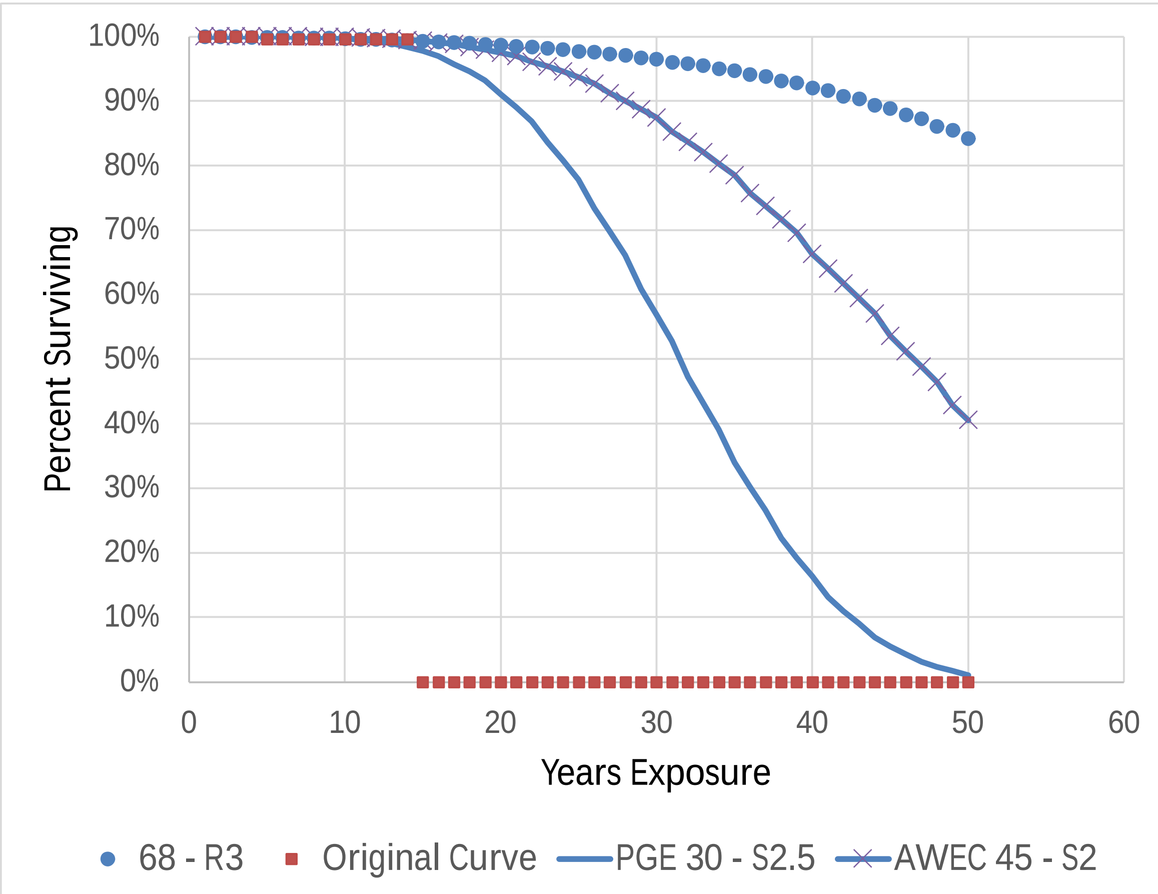


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	124 - R1	PGE 50 - R2.5	AWEC 60 - R3	Original Curve	124 - R1	PGE 50 - R2.5	AWEC 60 - R3
98.5	0.667	0.000	0.000				
97.5	0.673	0.000	0.000				
96.5	0.679	0.000	0.001				
95.5	0.685	0.000	0.002				
94.5	0.691	0.000	0.003				
93.5	0.691	0.000	0.004				
92.5	0.697	0.000	0.007				
91.5	0.703	0.000	0.009				
90.5	98.000	0.000	0.012				
89.5	0.715	0.000	0.017				
88.5	0.715	0.001	0.020				
87.5	0.720	0.001	0.026				
86.5	0.726	0.002	0.034				
85.5	0.732	0.003	0.038				
84.5	0.737	0.005	0.048				
83.5	0.743	0.007	0.059				
82.5	0.743	0.009	0.065				
81.5	0.748	0.011	0.079				
80.5	0.754	0.014	0.094				
79.5	0.759	0.018	0.102				
78.5	0.764	0.023	0.120				
77.5	0.764	0.028	0.139				
76.5	0.769	0.034	0.150				
75.5	0.774	0.040	0.172				
74.5	0.779	0.048	0.196				
73.5	0.784	0.057	0.208				
72.5	0.784	0.066	0.234				
71.5	0.789	0.077	0.262				
70.5	0.794	0.089	0.276				
69.5	0.799	0.102	0.305				
68.5	0.804	0.116	0.335				
67.5	0.804	0.132	0.350				
66.5	0.808	0.149	0.381				
65.5	0.813	0.167	0.412				
64.5	0.818	0.186	0.427				
63.5	0.822	0.206	0.458				
62.5	0.822	0.228	0.488				
61.5	0.827	0.251	0.503				
60.5	0.831	0.274	0.533				
59.5	0.835	0.299	0.562				
58.5	0.840	0.324	0.576				
57.5	0.844	0.350	0.603				
56.5	0.844	0.376	0.629				
55.5	0.848	0.402	0.642				

54.5	0.853	0.428	0.667				
53.5	0.857	0.455	0.690				
52.5	0.861	0.481	0.701				
51.5	0.861	0.506	0.723				
50.5	0.865	0.531	0.743				
49.5	0.869	0.556	0.753				
48.5	0.873	0.580	0.771				
47.5	0.877	0.603	0.789				
46.5	0.877	0.626	0.797				
45.5	0.881	0.647	0.813	0.867	0.000	0.048	0.003
44.5	0.885	0.668	0.828	0.867	0.000	0.040	0.002
43.5	0.888	0.688	0.835	0.867	0.000	0.032	0.001
42.5	0.892	0.707	0.849	0.878	0.000	0.029	0.001
41.5	0.892	0.725	0.861	0.878	0.000	0.023	0.000
40.5	0.896	0.742	0.867	0.885	0.000	0.020	0.000
39.5	0.900	0.759	0.878	0.885	0.000219	0.015949	0.000041
38.5	0.903	0.774	0.889	0.929	0.000677	0.024092	0.001625
37.5	0.907	0.789	0.894	0.930	0.000546	0.020004	0.001318
36.5	0.911	0.803	0.904	0.930	0.000390	0.016237	0.000718
35.5	0.911	0.816	0.912	0.931	0.000402	0.013100	0.000334
34.5	0.914	0.829	0.916	0.931	0.000282	0.010444	0.000208
33.5	0.918	0.841	0.924	0.931	0.000175	0.008156	0.000043
32.5	0.921	0.852	0.932	0.933	0.000142	0.006606	0.000002
31.5	0.925	0.862	0.935	0.933	0.000072	0.004995	0.000004
30.5	0.925	0.872	0.942	0.933	0.000072	0.003680	0.000072
29.5	0.928	0.882	0.948	0.933	0.000025	0.002623	0.000210
28.5	0.931	0.891	0.950	0.933	0.000003	0.001791	0.000299
27.5	0.935	0.899	0.956	0.933	0.000003	0.001153	0.000509
26.5	0.938	0.907	0.961	0.933	0.000026	0.000680	0.000751
25.5	0.938	0.914	0.963	0.950	0.000146	0.001287	0.000155
24.5	0.942	0.921	0.967	0.955	0.000190	0.001151	0.000136
23.5	0.945	0.928	0.971	0.956	0.000115	0.000762	0.000235
22.5	0.948	0.934	0.973	0.956	0.000067	0.000492	0.000270
21.5	0.951	0.940	0.976	0.956	0.000025	0.000271	0.000390
20.5	0.951	0.945	0.979	0.956	0.000025	0.000124	0.000518
19.5	0.954	0.950	0.980	0.957	0.000009	0.000054	0.000528
18.5	0.957	0.955	0.983	0.957	0.000000	0.000007	0.000653
17.5	0.961	0.959	0.985	0.957	0.000010	0.000003	0.000777
16.5	0.964	0.963	0.986	0.958	0.000037	0.000032	0.000832
15.5	0.964	0.967	0.988	0.958	0.000037	0.000089	0.000949
14.5	0.967	0.970	0.990	0.960	0.000051	0.000120	0.000934
13.5	0.970	0.974	0.991	0.960	0.000102	0.000202	0.000983
12.5	0.973	0.977	0.992	0.963	0.000088	0.000183	0.000848
11.5	0.975	0.980	0.994	0.963	0.000145	0.000260	0.000913
10.5	0.978	0.982	0.994	0.966	0.000160	0.000270	0.000812
9.5	0.978	0.985	0.995	0.980	0.000004	0.000018	0.000224
8.5	0.981	0.987	0.996	0.985	0.000016	0.000002	0.000121

7.5	0.984	0.989	0.997	0.985	0.000002	0.000013	0.000130
6.5	0.987	0.991	0.997	0.986	0.000001	0.000023	0.000132
5.5	0.989	0.993	0.998	0.987	0.000008	0.000035	0.000131
4.5	0.989	0.994	0.998	0.987	0.000007	0.000052	0.000130
3.5	0.992	0.996	0.999	0.994	0.000003	0.000003	0.000026
2.5	0.995	0.997	0.999	0.999	0.000017	0.000004	0.000000
1.5	0.997	0.998	0.999	1.000	0.000007	0.000003	0.000000
0.5	1.000	0.999	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.005771	0.328206	0.023916

Account		34501					
ACCESSORY ELECTRIC EQUIPMENT - WIND				Iowa Curve	Avg. Life	SSR	
Band		1		R3	68	0.00004	Band 1 Best Fit
EXPERIENCE		PLACEMENT		S2	45	0.00011	AWEC Proposed
BEGIN	END	BEGIN	END	S2.5	30	0.00029	PGE Proposed
2007	2019	2007	2019			-60%	Change in SS

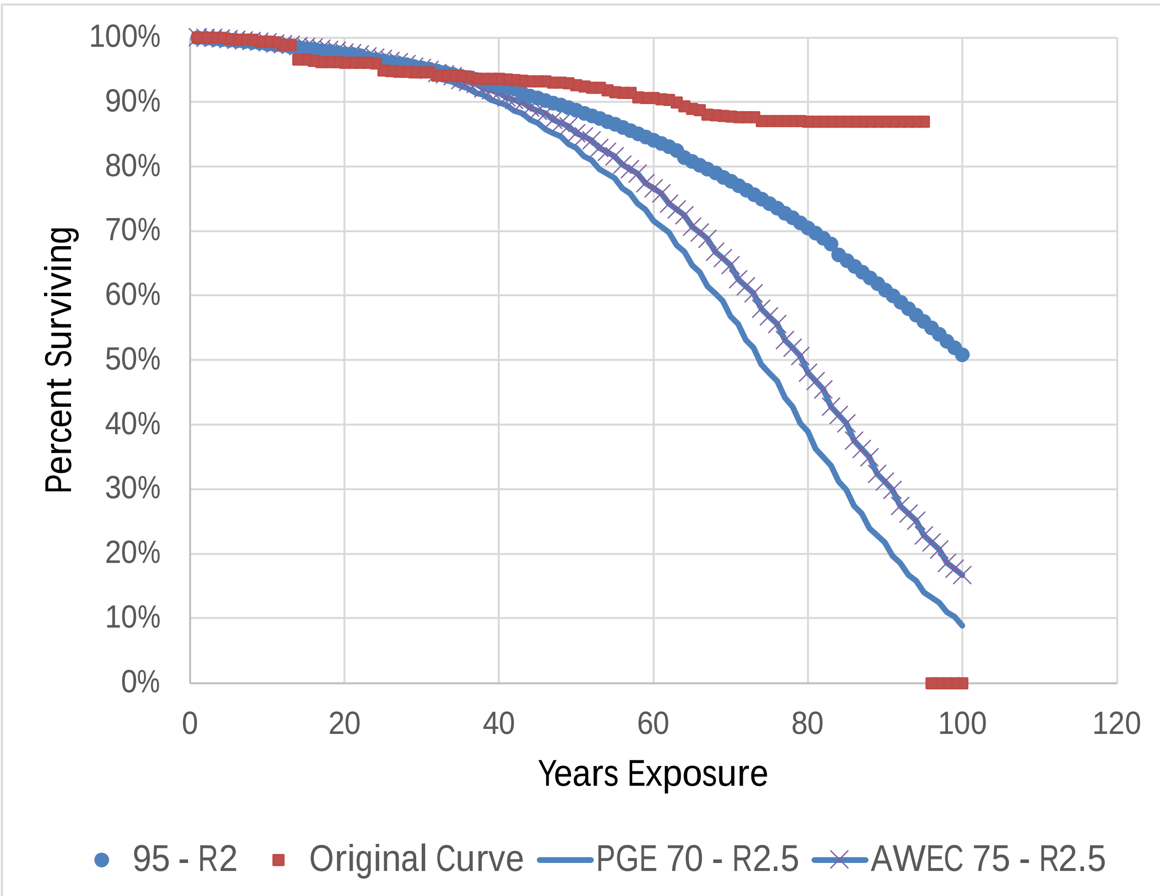


	Percent Surviving				Sum of Squared Residuals		
Years		PGE 30 -	AWEC 45 -	Original		PGE 30 -	AWEC 45 -
Exposure	68 - R3	S2.5	S2	Curve	68 - R3	S2.5	S2
98.5	0.030	0.000	0.000				
97.5	0.034	0.000	0.000				
96.5	0.043	0.000	0.000				
95.5	0.048	0.000	0.000				
94.5	0.059	0.000	0.000				
93.5	0.065	0.000	0.000				
92.5	0.072	0.000	0.000				
91.5	0.086	0.000	0.000				
90.5	98.000	0.000	0.000				
89.5	0.111	0.000	0.000				
88.5	0.120	0.000	0.000				
87.5	0.139	0.000	0.000				
86.5	0.150	0.000	0.000				
85.5	0.172	0.000	0.000				
84.5	0.184	0.000	0.000				
83.5	0.208	0.000	0.000				
82.5	0.221	0.000	0.001				
81.5	0.248	0.000	0.001				
80.5	0.262	0.000	0.002				
79.5	0.290	0.000	0.002				
78.5	0.305	0.000	0.004				
77.5	0.335	0.000	0.005				
76.5	0.350	0.000	0.007				
75.5	0.381	0.000	0.009				
74.5	0.396	0.000	0.012				
73.5	0.427	0.000	0.017				
72.5	0.443	0.000	0.021				
71.5	0.458	0.000	0.025				
70.5	0.488	0.000	0.031				
69.5	0.503	0.000	0.040				
68.5	0.533	0.000	0.047				
67.5	0.547	0.000	0.055				
66.5	0.576	0.000	0.063				
65.5	0.590	0.000	0.073				
64.5	0.616	0.000	0.088				
63.5	0.629	0.000	0.100				
62.5	0.654	0.000	0.113				
61.5	0.667	0.000	0.126				
60.5	0.690	0.000	0.148				
59.5	0.701	0.000	0.163				
58.5	0.723	0.000	0.180				
57.5	0.733	0.000	0.197				
56.5	0.753	0.000	0.215				
55.5	0.762	0.000	0.243				

54.5	0.780	0.000	0.263				
53.5	0.789	0.001	0.283				
52.5	0.805	0.002	0.305				
51.5	0.813	0.003	0.337				
50.5	0.821	0.005	0.360				
49.5	0.835	0.008	0.382				
48.5	0.842	0.011	0.405				
47.5	0.855	0.017	0.429				
46.5	0.861	0.023	0.464				
45.5	0.873	0.030	0.488				
44.5	0.878	0.043	0.512				
43.5	0.889	0.054	0.536				
42.5	0.894	0.068	0.571				
41.5	0.904	0.090	0.595				
40.5	0.908	0.109	0.618				
39.5	0.916	0.131	0.640				
38.5	0.921	0.164	0.663				
37.5	0.928	0.192	0.695				
36.5	0.932	0.222	0.717				
35.5	0.938	0.266	0.737				
34.5	0.942	0.302	0.757				
33.5	0.948	0.339	0.785				
32.5	0.950	0.391	0.803				
31.5	0.956	0.432	0.820				
30.5	0.958	0.473	0.837				
29.5	0.961	0.528	0.852				
28.5	0.965	0.568	0.874				
27.5	0.967	0.609	0.887				
26.5	0.971	0.661	0.900				
25.5	0.973	0.698	0.912				
24.5	0.976	0.734	0.927				
23.5	0.978	0.778	0.937				
22.5	0.980	0.808	0.945				
21.5	0.982	0.836	0.953				
20.5	0.984	0.869	0.960				
19.5	0.985	0.891	0.969				
18.5	0.987	0.910	0.975				
17.5	0.988	0.932	0.979				
16.5	0.990	0.946	0.983				
15.5	0.991	0.957	0.988				
14.5	0.992	0.970	0.991				
13.5	0.993	0.977	0.993				
12.5	0.994	0.983	0.995	0.996	0.000002	0.000158	0.000001
11.5	0.995	0.989	0.996	0.996	0.000001	0.000043	0.000000
10.5	0.996	0.992	0.998	0.996	0.000000	0.000010	0.000004
9.5	0.996	0.995	0.998	0.996	0.000000	0.000001	0.000008
8.5	0.997	0.997	0.999	0.996	0.000001	0.000002	0.000012

7.5	0.997	0.998	0.999	0.996	0.000003	0.000007	0.000014
6.5	0.998	0.999	1.000	0.996	0.000004	0.000012	0.000017
5.5	0.998	1.000	1.000	0.996	0.000007	0.000016	0.000018
4.5	0.999	1.000	1.000	0.996	0.000009	0.000018	0.000019
3.5	0.999	1.000	1.000	0.996	0.000012	0.000019	0.000019
2.5	0.999	1.000	1.000	1.000	0.000000	0.000000	0.000000
1.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0.5	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.000041	0.000285	0.000113

Account		35200				
STRUCTURES AND IMPROVEMENTS			Iowa Curve	Avg. Life	SSR	
Band		1	R2	95	0.004	Band 1 Best Fit
EXPERIENCE		PLACEMENT	R2.5	75	5.697	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	70	8.409	PGE Proposed
1906	2019	1906	2019			-32%	Change in SS

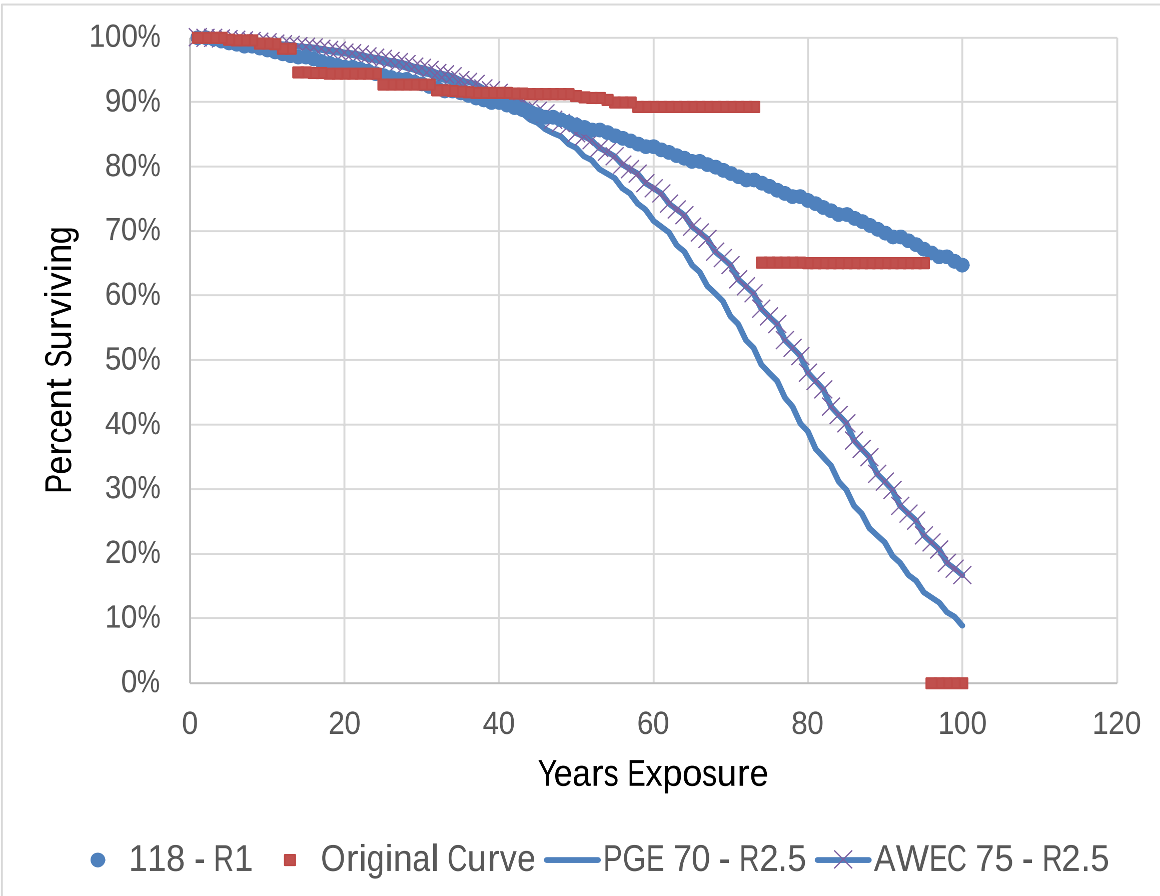


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	95 - R2	PGE 70 - R2.5	AWEC 75 - R2.5	Original Curve	95 - R2	PGE 70 - R2.5	AWEC 75 - R2.5
98.5	0.509	0.089	0.167				
97.5	0.520	0.102	0.176				
96.5	0.530	0.109	0.186				
95.5	0.540	0.124	0.206				
94.5	0.550	0.132	0.217				
93.5	0.561	0.140	0.228	0.870	0.096	0.533	0.412
92.5	0.571	0.158	0.251	0.870	0.090	0.508	0.383
91.5	0.580	0.167	0.262	0.870	0.084	0.495	0.369
90.5	0.590	0.186	0.274	0.870	0.078	0.468	0.355
89.5	0.600	0.196	0.299	0.870	0.073	0.454	0.326
88.5	0.609	0.217	0.311	0.870	0.068	0.426	0.312
87.5	0.619	0.228	0.324	0.870	0.063	0.412	0.298
86.5	0.628	0.239	0.350	0.870	0.059	0.398	0.271
85.5	0.637	0.262	0.363	0.870	0.054	0.369	0.258
84.5	0.646	0.274	0.376	0.870	0.050	0.355	0.244
83.5	0.655	0.299	0.402	0.870	0.046	0.326	0.219
82.5	0.664	0.311	0.415	0.870	0.043	0.312	0.207
81.5	0.681	0.337	0.428	0.870	0.036	0.284	0.195
80.5	0.689	0.350	0.455	0.870	0.033	0.271	0.173
79.5	0.697	0.363	0.468	0.870	0.030	0.258	0.162
78.5	0.705	0.389	0.481	0.870	0.027	0.232	0.152
77.5	0.713	0.402	0.506	0.871	0.025	0.220	0.133
76.5	0.721	0.428	0.519	0.871	0.022	0.196	0.124
75.5	0.728	0.441	0.531	0.871	0.020	0.184	0.115
74.5	0.736	0.468	0.556	0.871	0.018	0.162	0.099
73.5	0.743	0.481	0.568	0.871	0.016	0.152	0.091
72.5	0.750	0.493	0.580	0.871	0.015	0.142	0.084
71.5	0.757	0.519	0.603	0.877	0.014	0.128	0.075
70.5	0.764	0.531	0.615	0.877	0.013	0.119	0.069
69.5	0.771	0.556	0.626	0.877	0.011	0.103	0.063
68.5	0.777	0.568	0.647	0.877	0.010	0.096	0.053
67.5	0.784	0.592	0.658	0.879	0.009	0.083	0.049
66.5	0.790	0.603	0.668	0.880	0.008	0.076	0.045
65.5	0.796	0.615	0.688	0.881	0.007	0.071	0.037
64.5	0.802	0.637	0.697	0.888	0.007	0.063	0.036
63.5	0.808	0.647	0.707	0.890	0.007	0.059	0.033
62.5	0.814	0.668	0.725	0.894	0.006	0.051	0.029
61.5	0.825	0.678	0.734	0.900	0.006	0.049	0.028
60.5	0.831	0.697	0.742	0.904	0.005	0.042	0.026
59.5	0.836	0.707	0.759	0.905	0.005	0.039	0.021
58.5	0.841	0.716	0.766	0.906	0.004	0.036	0.020
57.5	0.846	0.734	0.774	0.907	0.004	0.030	0.018
56.5	0.851	0.742	0.789	0.908	0.003	0.027	0.014
55.5	0.856	0.759	0.796	0.915	0.003	0.024	0.014

54.5	0.861	0.766	0.803	0.915	0.003	0.022	0.013
53.5	0.866	0.782	0.816	0.915	0.002	0.018	0.010
52.5	0.870	0.789	0.823	0.919	0.002	0.017	0.009
51.5	0.875	0.796	0.829	0.922	0.002	0.016	0.009
50.5	0.879	0.810	0.841	0.922	0.002	0.013	0.007
49.5	0.883	0.816	0.846	0.924	0.002	0.012	0.006
48.5	0.887	0.829	0.852	0.927	0.002	0.010	0.006
47.5	0.891	0.835	0.862	0.930	0.001	0.009	0.005
46.5	0.895	0.846	0.868	0.930	0.001	0.007	0.004
45.5	0.899	0.852	0.872	0.931	0.001	0.006	0.003
44.5	0.903	0.857	0.882	0.932	0.001	0.006	0.003
43.5	0.906	0.868	0.886	0.932	0.001	0.004	0.002
42.5	0.910	0.872	0.891	0.933	0.001	0.004	0.002
41.5	0.913	0.882	0.899	0.933	0.000	0.003	0.001
40.5	0.920	0.886	0.903	0.935	0.000	0.002	0.001
39.5	0.923	0.895	0.907	0.936	0.000157	0.001654	0.000822
38.5	0.926	0.899	0.914	0.936	0.000092	0.001351	0.000461
37.5	0.929	0.903	0.918	0.936	0.000046	0.001086	0.000329
36.5	0.932	0.911	0.921	0.936	0.000015	0.000646	0.000220
35.5	0.935	0.914	0.928	0.937	0.000002	0.000487	0.000074
34.5	0.938	0.921	0.931	0.940	0.000002	0.000328	0.000072
33.5	0.941	0.925	0.934	0.940	0.000001	0.000231	0.000035
32.5	0.943	0.931	0.940	0.941	0.000006	0.000100	0.000002
31.5	0.946	0.934	0.942	0.942	0.000020	0.000056	0.000001
30.5	0.948	0.937	0.945	0.942	0.000047	0.000022	0.000012
29.5	0.951	0.942	0.950	0.946	0.000025	0.000012	0.000018
28.5	0.953	0.945	0.952	0.946	0.000050	0.000001	0.000039
27.5	0.956	0.950	0.955	0.946	0.000085	0.000014	0.000070
26.5	0.958	0.952	0.959	0.947	0.000122	0.000032	0.000151
25.5	0.960	0.957	0.961	0.947	0.000168	0.000097	0.000198
24.5	0.962	0.959	0.963	0.948	0.000193	0.000117	0.000221
23.5	0.964	0.961	0.967	0.949	0.000227	0.000143	0.000314
22.5	0.966	0.965	0.969	0.960	0.000038	0.000025	0.000074
21.5	0.968	0.967	0.970	0.961	0.000053	0.000036	0.000091
20.5	0.972	0.970	0.974	0.961	0.000118	0.000087	0.000159
19.5	0.974	0.972	0.975	0.961	0.000155	0.000117	0.000194
18.5	0.975	0.975	0.977	0.961	0.000198	0.000192	0.000235
17.5	0.977	0.977	0.980	0.962	0.000236	0.000223	0.000315
16.5	0.979	0.978	0.981	0.962	0.000285	0.000264	0.000359
15.5	0.980	0.981	0.982	0.962	0.000334	0.000352	0.000401
14.5	0.982	0.982	0.985	0.965	0.000303	0.000311	0.000402
13.5	0.983	0.985	0.986	0.966	0.000300	0.000340	0.000383
12.5	0.985	0.986	0.987	0.966	0.000348	0.000379	0.000423
11.5	0.986	0.988	0.989	0.989	0.000006	0.000001	0.000000
10.5	0.988	0.989	0.990	0.989	0.000002	0.000000	0.000001
9.5	0.989	0.990	0.991	0.993	0.000018	0.000012	0.000006
8.5	0.990	0.992	0.993	0.994	0.000012	0.000004	0.000001

7.5	0.991	0.993	0.993	0.994	0.000008	0.000003	0.000001
6.5	0.993	0.994	0.994	0.997	0.000020	0.000009	0.000009
5.5	0.994	0.995	0.996	0.997	0.000012	0.000005	0.000002
4.5	0.995	0.996	0.996	0.997	0.000006	0.000001	0.000001
3.5	0.996	0.997	0.997	0.998	0.000003	0.000000	0.000000
2.5	0.997	0.998	0.998	1.000	0.000008	0.000005	0.000003
1.5	0.998	0.999	0.999	1.000	0.000003	0.000001	0.000001
0.5	0.999	0.999	0.999	1.000	0.000001	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			1.194462	8.409422	5.697151

Account		35200					
STRUCTURES AND IMPROVEMENTS				Iowa Curve	Avg. Life	SSR	
Band		2		R1	118	0.005	Band 2 Best Fit
EXPERIENCE		PLACEMENT		R2.5	75	2.299	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	70	4.070	PGE Proposed
2000	2019	1913	2019			-44%	Change in SS

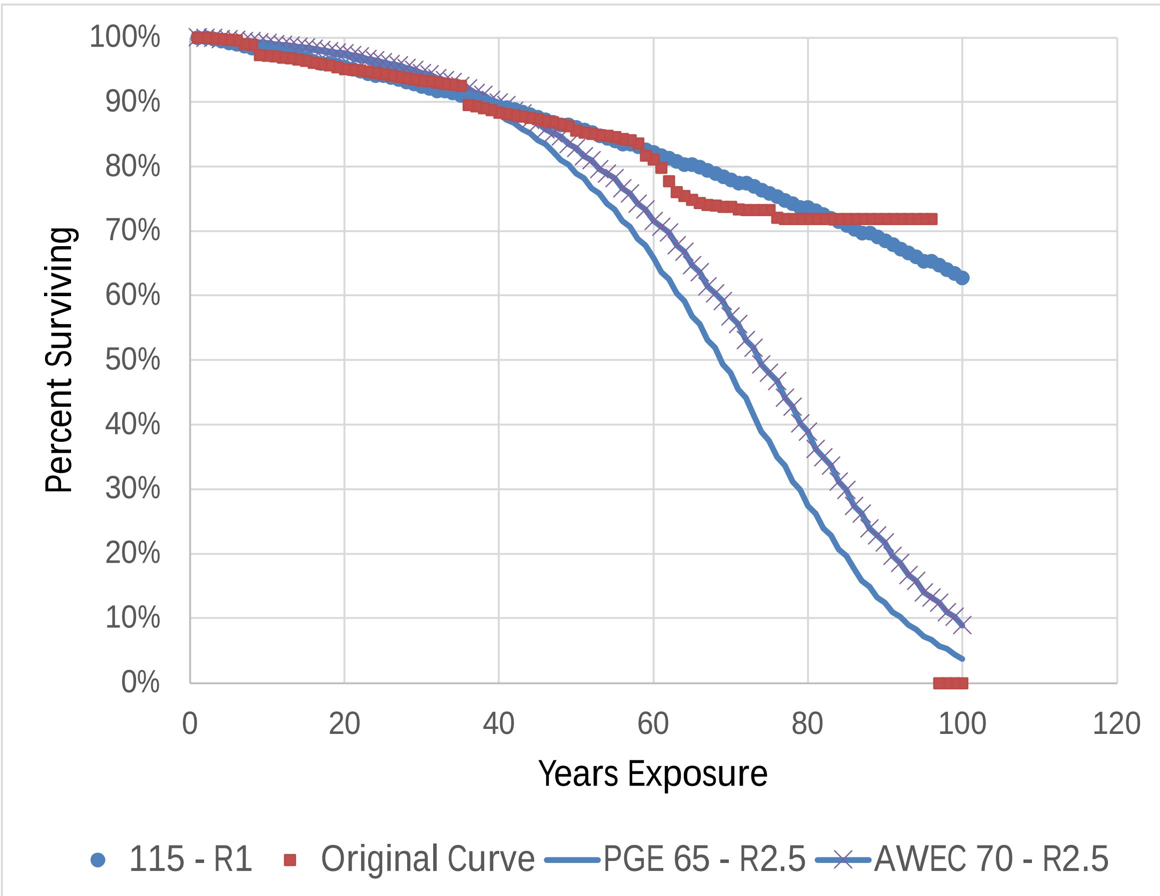


	Percent Surviving				Sum of Squared Residuals		
Years Exposure	118 - R1	PGE 70 - R2.5	AWEC 75 - R2.5	Original Curve	118 - R1	PGE 70 - R2.5	AWEC 75 - R2.5
98.5	0.647	0.089	0.167				
97.5	0.654	0.102	0.176				
96.5	0.660	0.109	0.186				
95.5	0.660	0.124	0.206				
94.5	0.667	0.132	0.217				
93.5	0.673	0.140	0.228	0.651	0.000	0.260	0.178
92.5	0.679	0.158	0.251	0.651	0.001	0.243	0.160
91.5	0.685	0.167	0.262	0.651	0.001	0.234	0.151
90.5	0.691	0.186	0.274	0.651	0.002	0.216	0.141
89.5	0.691	0.196	0.299	0.651	0.002	0.206	0.124
88.5	0.697	0.217	0.311	0.651	0.002	0.188	0.115
87.5	0.703	0.228	0.324	0.651	0.003	0.178	0.107
86.5	0.709	0.239	0.350	0.651	0.003	0.169	0.091
85.5	0.715	0.262	0.363	0.651	0.004	0.151	0.083
84.5	0.720	0.274	0.376	0.651	0.005	0.141	0.076
83.5	0.726	0.299	0.402	0.651	0.006	0.124	0.062
82.5	0.726	0.311	0.415	0.651	0.006	0.115	0.055
81.5	0.732	0.337	0.428	0.651	0.007	0.098	0.049
80.5	0.737	0.350	0.455	0.651	0.008	0.091	0.038
79.5	0.743	0.363	0.468	0.651	0.009	0.083	0.033
78.5	0.748	0.389	0.481	0.651	0.010	0.069	0.029
77.5	0.754	0.402	0.506	0.652	0.010	0.063	0.021
76.5	0.754	0.428	0.519	0.652	0.010	0.050	0.018
75.5	0.759	0.441	0.531	0.652	0.011	0.044	0.015
74.5	0.764	0.468	0.556	0.652	0.013	0.034	0.009
73.5	0.769	0.481	0.568	0.652	0.014	0.029	0.007
72.5	0.774	0.493	0.580	0.652	0.015	0.025	0.005
71.5	0.779	0.519	0.603	0.893	0.013	0.140	0.084
70.5	0.779	0.531	0.615	0.893	0.013	0.131	0.077
69.5	0.784	0.556	0.626	0.893	0.012	0.113	0.071
68.5	0.789	0.568	0.647	0.893	0.011	0.105	0.060
67.5	0.794	0.592	0.658	0.893	0.010	0.091	0.055
66.5	0.799	0.603	0.668	0.893	0.009	0.084	0.051
65.5	0.804	0.615	0.688	0.893	0.008	0.077	0.042
64.5	0.808	0.637	0.697	0.893	0.007	0.066	0.038
63.5	0.808	0.647	0.707	0.893	0.007	0.060	0.035
62.5	0.813	0.668	0.725	0.893	0.006	0.051	0.028
61.5	0.818	0.678	0.734	0.893	0.006	0.046	0.025
60.5	0.822	0.697	0.742	0.893	0.005	0.038	0.023
59.5	0.827	0.707	0.759	0.893	0.004	0.035	0.018
58.5	0.831	0.716	0.766	0.893	0.004	0.031	0.016
57.5	0.831	0.734	0.774	0.893	0.004	0.025	0.014
56.5	0.835	0.742	0.789	0.893	0.003	0.023	0.011
55.5	0.840	0.759	0.796	0.900	0.004	0.020	0.011

54.5	0.844	0.766	0.803	0.900	0.003	0.018	0.009
53.5	0.848	0.782	0.816	0.900	0.003	0.014	0.007
52.5	0.853	0.789	0.823	0.903	0.003	0.013	0.007
51.5	0.857	0.796	0.829	0.906	0.002	0.012	0.006
50.5	0.857	0.810	0.841	0.906	0.002	0.009	0.004
49.5	0.861	0.816	0.846	0.908	0.002	0.008	0.004
48.5	0.865	0.829	0.852	0.910	0.002	0.007	0.003
47.5	0.869	0.835	0.862	0.912	0.002	0.006	0.002
46.5	0.873	0.846	0.868	0.912	0.002	0.004	0.002
45.5	0.877	0.852	0.872	0.912	0.001	0.004	0.002
44.5	0.877	0.857	0.882	0.913	0.001	0.003	0.001
43.5	0.881	0.868	0.886	0.913	0.001	0.002	0.001
42.5	0.885	0.872	0.891	0.913	0.001	0.002	0.000
41.5	0.888	0.882	0.899	0.913	0.001	0.001	0.000
40.5	0.892	0.886	0.903	0.914	0.000	0.001	0.000
39.5	0.896	0.895	0.907	0.915	0.000358	0.000391	0.000060
38.5	0.900	0.899	0.914	0.915	0.000231	0.000245	0.000000
37.5	0.900	0.903	0.918	0.915	0.000231	0.000136	0.000010
36.5	0.903	0.911	0.921	0.915	0.000133	0.000016	0.000043
35.5	0.907	0.914	0.928	0.915	0.000062	0.000000	0.000172
34.5	0.911	0.921	0.931	0.916	0.000028	0.000031	0.000231
33.5	0.914	0.925	0.934	0.916	0.000005	0.000070	0.000314
32.5	0.918	0.931	0.940	0.918	0.000000	0.000182	0.000494
31.5	0.918	0.934	0.942	0.918	0.000000	0.000253	0.000593
30.5	0.921	0.937	0.945	0.918	0.000009	0.000354	0.000728
29.5	0.925	0.942	0.950	0.927	0.000006	0.000239	0.000533
28.5	0.928	0.945	0.952	0.927	0.000001	0.000327	0.000648
27.5	0.931	0.950	0.955	0.927	0.000020	0.000533	0.000770
26.5	0.935	0.952	0.959	0.927	0.000062	0.000648	0.001031
25.5	0.935	0.957	0.961	0.927	0.000062	0.000898	0.001167
24.5	0.938	0.959	0.963	0.927	0.000125	0.001031	0.001308
23.5	0.942	0.961	0.967	0.927	0.000210	0.001167	0.001594
22.5	0.945	0.965	0.969	0.945	0.000000	0.000419	0.000582
21.5	0.948	0.967	0.970	0.945	0.000012	0.000499	0.000668
20.5	0.951	0.970	0.974	0.945	0.000042	0.000663	0.000841
19.5	0.954	0.972	0.975	0.945	0.000093	0.000751	0.000933
18.5	0.954	0.975	0.977	0.945	0.000093	0.000933	0.001026
17.5	0.957	0.977	0.980	0.945	0.000163	0.001026	0.001213
16.5	0.961	0.978	0.981	0.945	0.000252	0.001120	0.001308
15.5	0.964	0.981	0.982	0.945	0.000354	0.001300	0.001394
14.5	0.967	0.982	0.985	0.945	0.000468	0.001379	0.001563
13.5	0.970	0.985	0.986	0.946	0.000543	0.001462	0.001551
12.5	0.970	0.986	0.987	0.947	0.000534	0.001535	0.001622
11.5	0.973	0.988	0.989	0.983	0.000115	0.000020	0.000031
10.5	0.975	0.989	0.990	0.983	0.000063	0.000030	0.000041
9.5	0.978	0.990	0.991	0.990	0.000139	0.000000	0.000000
8.5	0.981	0.992	0.993	0.991	0.000089	0.000001	0.000004

7.5	0.984	0.993	0.993	0.991	0.000055	0.000001	0.000004
6.5	0.987	0.994	0.994	0.996	0.000086	0.000004	0.000004
5.5	0.987	0.995	0.996	0.996	0.000086	0.000001	0.000000
4.5	0.989	0.996	0.996	0.996	0.000044	0.000000	0.000000
3.5	0.992	0.997	0.997	0.997	0.000020	0.000000	0.000000
2.5	0.995	0.998	0.998	1.000	0.000027	0.000005	0.000003
1.5	0.997	0.999	0.999	1.000	0.000007	0.000001	0.000001
0.5	1.000	0.999	0.999	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.296472	4.070157	2.298719

Account		35600					
OVERHEAD CONDUCTORS AND DEVICES				Iowa Curve	Avg. Life	SSR	
Band		1		R1	115	0.002	Band 1 Best Fit
EXPERIENCE		PLACEMENT		R2.5	70	4.610	AWEC Proposed
BEGIN	END	BEGIN	END	R2.5	65	7.134	PGE Proposed
1887	2019	1887	2019			-35%	Change in SS



	Percent Surviving				Sum of Squared Residuals		
Years Exposure	115 - R1	PGE 65 - R2.5	AWEC 70 - R2.5	Original Curve	115 - R1	PGE 65 - R2.5	AWEC 70 - R2.5
98.5	0.628	0.037	0.089				
97.5	0.634	0.044	0.102				
96.5	0.641	0.052	0.109				
95.5	0.647	0.057	0.124				
94.5	0.654	0.066	0.132	0.719	0.004	0.426	0.344
93.5	0.654	0.072	0.140	0.719	0.004	0.419	0.335
92.5	0.660	0.083	0.158	0.719	0.003	0.404	0.315
91.5	0.667	0.089	0.167	0.719	0.003	0.397	0.305
90.5	0.673	0.102	0.186	0.719	0.002	0.380	0.284
89.5	0.679	0.109	0.196	0.719	0.002	0.372	0.273
88.5	0.685	0.124	0.217	0.719	0.001	0.354	0.252
87.5	0.691	0.132	0.228	0.719	0.001	0.344	0.241
86.5	0.697	0.149	0.239	0.719	0.000	0.325	0.230
85.5	0.697	0.158	0.262	0.719	0.000	0.315	0.208
84.5	0.703	0.176	0.274	0.719	0.000	0.294	0.198
83.5	0.709	0.196	0.299	0.719	0.000	0.273	0.176
82.5	0.715	0.206	0.311	0.719	0.000	0.262	0.166
81.5	0.720	0.228	0.337	0.719	0.000	0.241	0.146
80.5	0.726	0.239	0.350	0.719	0.000	0.230	0.136
79.5	0.732	0.262	0.363	0.719	0.000	0.208	0.127
78.5	0.737	0.274	0.389	0.719	0.000	0.198	0.109
77.5	0.737	0.299	0.402	0.719	0.000	0.176	0.100
76.5	0.743	0.311	0.428	0.719	0.001	0.166	0.084
75.5	0.748	0.337	0.441	0.719	0.001	0.146	0.077
74.5	0.754	0.350	0.468	0.721	0.001	0.138	0.064
73.5	0.759	0.376	0.481	0.733	0.001	0.128	0.064
72.5	0.764	0.389	0.493	0.733	0.001	0.118	0.057
71.5	0.769	0.415	0.519	0.733	0.001	0.101	0.046
70.5	0.774	0.441	0.531	0.733	0.002	0.085	0.041
69.5	0.774	0.455	0.556	0.734	0.002	0.078	0.032
68.5	0.779	0.481	0.568	0.737	0.002	0.066	0.029
67.5	0.784	0.493	0.592	0.738	0.002	0.060	0.021
66.5	0.789	0.519	0.603	0.740	0.002	0.049	0.019
65.5	0.794	0.531	0.615	0.741	0.003	0.044	0.016
64.5	0.799	0.556	0.637	0.744	0.003	0.035	0.011
63.5	0.804	0.568	0.647	0.749	0.003	0.033	0.010
62.5	0.804	0.592	0.668	0.755	0.002	0.027	0.008
61.5	0.808	0.603	0.678	0.761	0.002	0.025	0.007
60.5	0.813	0.626	0.697	0.778	0.001	0.023	0.006
59.5	0.818	0.637	0.707	0.798	0.000	0.026	0.008
58.5	0.822	0.658	0.716	0.811	0.000	0.024	0.009
57.5	0.827	0.678	0.734	0.817	0.000	0.019	0.007
56.5	0.831	0.688	0.742	0.836	0.000	0.022	0.009
55.5	0.835	0.707	0.759	0.841	0.000	0.018	0.007

54.5	0.835	0.716	0.766	0.843	0.000	0.016	0.006
53.5	0.840	0.734	0.782	0.846	0.000	0.013	0.004
52.5	0.844	0.742	0.789	0.848	0.000	0.011	0.004
51.5	0.848	0.759	0.796	0.849	0.000	0.008	0.003
50.5	0.853	0.766	0.810	0.851	0.000	0.007	0.002
49.5	0.857	0.782	0.816	0.853	0.000	0.005	0.001
48.5	0.861	0.789	0.829	0.856	0.000	0.005	0.001
47.5	0.865	0.803	0.835	0.863	0.000	0.004	0.001
46.5	0.865	0.810	0.846	0.866	0.000	0.003	0.000
45.5	0.869	0.823	0.852	0.869	0.000	0.002	0.000
44.5	0.873	0.835	0.857	0.871	0.000	0.001	0.000
43.5	0.877	0.841	0.868	0.873	0.000	0.001	0.000
42.5	0.881	0.852	0.872	0.876	0.000	0.001	0.000
41.5	0.885	0.857	0.882	0.878	0.000	0.000	0.000
40.5	0.888	0.868	0.886	0.880	0.000	0.000	0.000
39.5	0.892	0.872	0.895	0.882	0.000107	0.000088	0.000175
38.5	0.892	0.882	0.899	0.884	0.000063	0.000005	0.000224
37.5	0.896	0.886	0.903	0.888	0.000070	0.000001	0.000245
36.5	0.900	0.895	0.911	0.891	0.000077	0.000018	0.000399
35.5	0.903	0.899	0.914	0.894	0.000092	0.000030	0.000430
34.5	0.907	0.907	0.921	0.896	0.000124	0.000126	0.000654
33.5	0.911	0.911	0.925	0.925	0.000221	0.000214	0.000000
32.5	0.914	0.918	0.931	0.927	0.000166	0.000082	0.000016
31.5	0.918	0.925	0.934	0.929	0.000124	0.000017	0.000027
30.5	0.918	0.928	0.937	0.930	0.000160	0.000006	0.000044
29.5	0.921	0.934	0.942	0.932	0.000117	0.000004	0.000109
28.5	0.925	0.937	0.945	0.933	0.000077	0.000012	0.000137
27.5	0.928	0.942	0.950	0.935	0.000049	0.000054	0.000225
26.5	0.931	0.945	0.952	0.937	0.000033	0.000062	0.000233
25.5	0.935	0.950	0.957	0.939	0.000018	0.000121	0.000319
24.5	0.938	0.952	0.959	0.941	0.000010	0.000124	0.000317
23.5	0.942	0.957	0.961	0.943	0.000004	0.000184	0.000316
22.5	0.942	0.959	0.965	0.946	0.000017	0.000182	0.000379
21.5	0.945	0.963	0.967	0.947	0.000007	0.000248	0.000381
20.5	0.948	0.965	0.970	0.949	0.000001	0.000262	0.000464
19.5	0.951	0.969	0.972	0.950	0.000001	0.000350	0.000488
18.5	0.954	0.972	0.975	0.951	0.000009	0.000428	0.000569
17.5	0.957	0.974	0.977	0.954	0.000009	0.000372	0.000499
16.5	0.961	0.977	0.978	0.957	0.000013	0.000389	0.000448
15.5	0.961	0.978	0.981	0.959	0.000002	0.000367	0.000478
14.5	0.964	0.981	0.982	0.961	0.000007	0.000394	0.000447
13.5	0.967	0.982	0.985	0.964	0.000009	0.000340	0.000434
12.5	0.970	0.985	0.986	0.966	0.000013	0.000344	0.000387
11.5	0.973	0.986	0.988	0.968	0.000024	0.000323	0.000405
10.5	0.975	0.988	0.989	0.969	0.000038	0.000343	0.000382
9.5	0.978	0.989	0.990	0.971	0.000060	0.000333	0.000369
8.5	0.981	0.991	0.992	0.972	0.000090	0.000363	0.000397

7.5	0.981	0.992	0.993	0.973	0.000068	0.000351	0.000384
6.5	0.984	0.993	0.994	0.989	0.000027	0.000017	0.000024
5.5	0.987	0.995	0.995	0.990	0.000013	0.000020	0.000020
4.5	0.989	0.996	0.996	0.996	0.000039	0.000000	0.000000
3.5	0.992	0.997	0.997	0.997	0.000020	0.000000	0.000000
2.5	0.995	0.998	0.998	0.997	0.000007	0.000000	0.000000
1.5	0.997	0.999	0.999	0.999	0.000001	0.000000	0.000000
0.5	1.000	0.999	0.999	1.000	0.000000	0.000000	0.000000
0	1.000	1.000	1.000	1.000	0.000000	0.000000	0.000000
		Sum of Squared Residuals			0.055240	7.133597	4.610387