ATHENA
ACTUARIAL CONSULTING

Pension Insurance Modeling System (PIMS) Peer Review

Pension Benefit Guaranty Corporation (PBGC)

Peer Review on Single Employer and Plan Contributions

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Executive Summary

The Moving Ahead for Progress in the 21st Century Act (MAP-21, Pub. L. No. 112-141) was enacted on July 6, 2012. Section 40233(a) of MAP-21 requires the Pension Benefit Guaranty Corporation (PBGC) to contract with a capable agency or organization that is independent of PBGC to conduct annual peer reviews of the Single-Employer (SE) Pension Insurance Modeling System (PIMS) and Multiemployer (ME) PIMS.

This report presents our team's findings from a targeted review of the assumptions and methods used by the PIMS models to project pension plan contributions. The overall objective of our review was to assess whether the assumptions and methods currently employed to model employers' contribution behavior achieve the models' intended purposes.

The primary tasks of our review for SE-PIMS included:

- A review of the current SE employer contribution assumption and PBGC's internal SE back-testing analysis
- A review of and assessment of the assumed utilization of available credit balances for satisfying contribution requirements
- An analysis of plans with funded ratios in excess of 100% that continue to make contributions
- A review and assessment of the assumed contribution adjustment applied when modeling plans projected to undergo a distress termination

The primary tasks of our review for ME-PIMS included:

- A review and assessment of the assumptions and methods used to project Contribution Base Units (CBUs), per-capita contribution rate increases, and withdrawal liability payments
- A back-testing analysis of the CBU, contribution rate, and withdrawal liability assumptions

For both SE-PIMS and ME-PIMS we also reviewed additional market information not currently used in projecting employer contributions, analyzed the existing stress and sensitivity tests related to contributions, reviewed against the Actuarial Standards of Practice.

The results of our review related to these objectives have been documented in this report. Key findings from our review are the following:

SE Findings

The single employer contribution policy is complex in that targets vary based on a plan's funded status and plan sponsors' behaviors vary with respect to discretionary contribution amounts. Overall, the current contribution assumption policy appears to capture the appropriate targets and range of anticipated sponsor contributions.

In addition to the statutory minimum required contribution, certain targets are intuitive such as improving funding status in order to avoid benefit restrictions or improving funded status to avoid the PBGC variable rate premium. Other targets are difficult to measure since they represent

discretionary amounts where the targets are not clearly defined and may differ across plan sponsors.

Based on the back-testing set of plans, expected contributions were generally higher than observed. Using the current contribution framework, adjustments to the policy parameters were explored to introduce possible levers to consider in future modeling. In general, these adjustments appear to be workable within PBGC's flexible framework.

ME Findings

Overall PBGC's ME contribution assumptions are clearly documented and supported by rationale based on analyses and professional judgement. The assumptions in aggregate appear reasonable but may be slightly conservative compared to historical experience. No individual parameter requires immediate adjustment; however, continued back-testing including parameter testing, monitoring of post-SFA behavior, and targeted sensitivity testing are recommended to support ongoing reasonability and refinement.

SE Contribution Assumption Review

Approach

We have reviewed the single-employer contribution policy assumption and recent experience to assess how well the contribution policy has estimated expected contributions. In each year, a sponsor's contribution strategy is expected to be driven by the then current funded status. A plan's funded status changes each year not only as a result of plan contribution amounts but due to normal operations and market movement (asset returns and interest rate movement). Funded status measures that align with the minimum funding requirements provide some volatility management due to interest rate and asset smoothing.

As a floor, the contribution policy assumption assumes plans will contribute the statutory minimum required contribution. Additional contribution strategies are outlined in the SE contribution policy assumption. We have outlined the policy and our testing results below.

Document Review

To support our review, PBGC provided documentation, analyses, and reference files used for the SE-PIMS model. These materials provided assumptions, calculations detail, and rationale used to develop the contribution projections. A brief description of each document relied on is described below:

- *PBGC Projections Report FY 2024*: The PBGC Projections Report FY 2024 (FY 2024 report) was the source document used to identify the current contribution assumption policy for SE plans. The Contributions and Credit Balances section of the report (pages 57 through 59) discloses the specific methodologies and parameters used to project future SE contributions. This includes references to the February 2021 PRAD Single-Employer Contribution Policy Assumption memorandum (available on PBGC's website) and to the Changes from the Prior Year section of the report's Appendix. There were no reported changes to the contribution assumption since FY 2023.
- *February 2021 PRAD Single-Employer Contribution Policy Assumption memorandum (February 2021 memorandum)*: The February 2021 memorandum outlines the expected future contributions to be made to the pension plan for sponsors of SE pension plans. The memo provides the general framework for the expected contribution behaviors, provides rationale for the assumptions, and identifies specific parameters used in projecting future contributions.
- *PBGC T-PIMS model documentation*: The employer contribution assumptions described in section 8.8, Contribution Policy Calculations, of the T-PIMS Model Calculations Methodology and Assumptions 20250923.doc provides calculation detail for the contributions used in the PIMS modeling system. Though Legacy PIMS was used for PBGC's Projections Report FY 2024 for SE plans, it is our understanding that the contribution assumptions are generally the same as the T-PIMS model. This document provides additional technical detail that supplements the February 2021 memorandum by 1) providing additional calculation details for the application of the contribution policy, and 2) documenting any changes made for the FY 2024 report (i.e., changes to the contribution assumption made subsequent to the February 2021 memorandum). This document furthered our understanding of the assumption and was used to clarify calculations and confirm consistency with the assumption disclosures presented in the PBGC Projections Report FY 2024.

- *PRAD Back-testing files used in the PBGC Projections Report FY 2024*: The back-testing files were used to confirm how contributions are expected to be calculated by comparing the methodologies, formulas, and tables against the current contribution assumption (as provided in the February 2021 memorandum with updates as documented in the PBGC Projections Report FY 2024). While actual contributions are developed in PIMS (and not in the Excel back-testing files), the back-testing files were used to verify how the assumptions were expected to operate in PIMS. For this purpose, we note that the back-testing files are the PRAD data analysis files for the most recent Form 5500 filings where reported contributions are compared against assumed amounts to try to see how well a contribution policy fit the data. (Back-testing does not pretend that it only uses what PIMS knows as of the date of the projections report.)

  Second, the data summarized in the back-testing files were used to prepare our analysis of the actual contributions in order to compare plan sponsors' actual behaviors against the expected contributions. The plans included in the SE back-testing files are a subset of the single employer defined benefit plans. The subset has been limited to larger plans. Further, the subsets include only those plans for which both a Form 5500 Schedule SB and PBGC Variable Rate Premium (VRP) filing were available at the time of the testing. This subset was determined by PRAD and was used as provided since it is expected to be representative of the liability covered by the PBGC.

- *List of PBGC Trusteed Plans*: PBGC's PRAD team also provided us with a link to the list of current trusteed plans. The SE contribution policy assumption provides that for plan sponsors that experience bankruptcy in the projection period, contributions for the three-year period prior to bankruptcy are reduced to zero. This file was used to identify recent trusteed plans in order to review their contributions in the period just prior to bankruptcy.
- *Form 5500 Datasets:* Publicly available datasets that include historical Form 5500 data and attachments data on SE plans.
- *Ad hoc support from PRAD:* We also relied on information provided by the Policy, Research, and Analysis Department (PRAD). Throughout the course of this engagement, we received clarification to confirm our understanding of the contribution assumption policy, the model documentation, and the testing files.

Analysis and Testing

Using the data sources noted above, we began with a review of the back-testing files. The back-testing files were used to further our understanding of the contribution policy, confirm consistency between the stated contribution policy assumption and the back-testing review, and to use its data to review how well the assumption is performing. Back-testing files for the period 2019 through 2023 were included in our review.

We used the list of trusteed plans to identify plans that became trusteed plans during the three-year period 2021 to 2023. From this group, we identified plans with 100 or more participants and used this group as a proxy for future bankruptcies modeled in the PIMS system. For this group we gathered contribution data for the five-year period prior to bankruptcy. This data was reviewed to confirm the reasonableness of the current assumption.

In addition to the data analysis, our review considered other strategies that may impact the contribution decision making for single employer plans. We offer our conclusions and recommendations related to the current assumption and opportunities going forward.

SE Contribution Policy Assumption Analysis

Contribution Policy Assumption

Background on the Contribution Policy Assumption

The February 2021 PRAD Single-Employer Contribution Policy Assumption memorandum (February 2021 memorandum) outlines the expected future contributions to be made to the pension plan for sponsors of SE pension plans. The memo provides the general framework for the expected contribution behaviors, provides rationale for the assumptions, and identifies specific parameters used in projecting future contributions. The February 2021 memorandum is referenced in the PBGC Projections Report FY 2024 and can be found on the PBGC's website.

The February 2021 memorandum provided background and rationale for the change made to the contribution assumption. The memo noted that plan sponsors were contributing more than anticipated compared to the contribution policy at that time. Therefore, to better align future expected contributions with observed experience, the contribution assumption was updated.

The contribution framework outlined in the February 2021 memorandum considers that funding decisions vary based on a plan's funded status with key drivers including reaching an Adjusted Funding Target Attainment Percent (AFTAP) of 80% (the level needed to avoid certain benefit restrictions); amounts to reduce or avoid the PBGC VRP (including recognizing this utility declines for plans where the premium amount is reduced based on a per participant cap and as a result additional contributions may not reduce the VRP); or maintaining or restoring the plan's funded status to past higher funding level for plans more than 80% funded.

Further, the assumption provides for a blend of contribution level elections to recognize that plan sponsors may choose to make different funding decisions though in a similar financial position to another plan. Our analysis was applied consistent with the PBGC's framework of modeling employer contributions where the methodology is applied consistently regardless of plan size.

Overall, the framework appears to be performing well. It allows for a blend of contributions and a parameter driven framework that provides ease of updating to respond to changes in observed contribution behaviors or to model future changes, for example, to model the impact on contribution behaviors resulting from changes in the VRP rate or due to legislative changes in the minimum funding rules. As such, the model is flexible as it allows minor annual adjustments based on current funding behaviors as well as updates that may stem from PBGC VRP changes or legislative updates.

Contribution Policy Update Process

The contribution assumption is reviewed annually through the back-testing process. The back-testing process captures the most recent year of plan contribution data and PBGC variable rate premium data.

Specifically, the PBGC Projections Report FY 2024 back-testing reflects the 2023 plan year Form 5500 Schedule SB data and the 2024 VRP filing data. Since the Form 5500 filing is due eight and a half months after the *end of the plan year,* the filing due on September 15, 2024 for the 2023 plan year represented the most recent filing for calendar year plans. Since the VRP filing is due on the 15th day of the 10th full calendar month *in the plan year*, the 2024 VRP filing

due on October 15, 2024 for calendar year plans was the most recent VRP filing. The VRP premium filing data is used to identify the "current" funded status of the plan (using both the plan's filing liability and estimated market liability measures calculated using the Standard Premium Funding Target).

The back-testing process includes measuring expected contributions against actual contributions. The PRAD team also considers updates to the contribution assumption parameters and tests any proposed changes using the back-testing data. Additional testing files serve to document the parameters reviewed and the testing results. PRAD also uses email exchanges to vet results and document decisions. No changes were made to the contribution policy assumption between FY 2023 and FY 2024.

Summary of the Current Contribution Policy

We have added Appendix 1. FY 2024 SE Contribution Policy Assumption to summarize the current contribution policy. It is intended as a supplement to the February 2021 memorandum to

1. expand upon the definition of terms and variables used in the contribution policy assumption,
2. document changes since the February 2021 memorandum that are included in the PBGC Projections Report FY 2024 report, and
3. provide additional details on the back-testing measures used in the annual testing process.

An overview of the current contribution policy assumption is shown in SE Figure 1 below.

SE Figure 1. Current SE Contribution Policy Assumption

Funded Level	Percent of plan sponsors using each approach[3]				
	AFTAP	MRC[2]	UVBL	MAXP3	TNC
0% - 70% AFTAP and <100%[1] in all of last 3 yrs		100%			
70% - 75% AFTAP and <100%[1] in all of last 3 yrs	50%	50%			
75% - 80% AFTAP and <100%[1] in all of last 3 yrs	100%	0%			
80+% AFTAP and and <100%[1] in all of last 3 yrs		1-VRP%	VRP% applied to the greater of UVBL and MAXP3		
100%+[1] in any of last 3 yrs		0%	100% applied to the greater of UVBL, MAXP3, TNC		
Floor contribution	Floor contributions are set equal to the minimum required contributions reflecting "maximum allowable credit balance"; no contributions in excess of the floor are assumed for plans over 125% funded (Standard VBL basis).				
Distress termination claims	Zero contributions for the three years prior to termination				

[1] The 100% Funded Level is calculated as the estimated current market funded status using the Standard Premium Funding Target (Standard VBL) and market value of assets.
[2] The MRC is the statutory minimum required contribution after 90% of available credit balances are applied.
[3] The Variable Rate Premium Percent (VRP%), Unfunded Vested Benefit Liability (UVBL), Maximum in Prior Three Years (MAXP3), and Target Normal Cost (TNC) contribution strategies and amounts are defined further below and in Appendix 1. FY 2024 Contribution Policy Assumption.

- Supporting documentation – PBGC Projections Report FY 2024

The February 2021 memorandum continues to be a key resource document for the contribution policy assumption since it identifies the basic framework and rationale for the contribution policy assumption. Certain parameters within this framework have been updated since the original issue. Thus, the current contribution policy assumptions are those shown in the PBGC Projections Report FY 2024. Based on our understanding, we assumed that the statutory minimum would continue to apply in all cases.

The PBGC Projections Report FY 2024 states that the projections for future single employer contributions are made using the February 2021 memorandum with the following updates noted in the FY 2024 Projections Report:

1. Plans with a funded status greater than 125% are assumed to contribute zero. This is measured using the Standard VBL (i.e., the estimated market funded status calculated using the Standard Premium Funding Target).
2. Plans with AFTAP of 80% or more and with less than 100% Standard VBL funded status in any of the last three years, are assumed to contribute the following:

   (1-VRP%) * MRC + (VRP%)* (greater of UVBL or MAXP3)

   The February 2021 memorandum provided the UVBL and MAXP3 contributions amounts were summed (not greater of).
3. The Target Normal Cost (TNC) contribution strategy was updated to assume the multiplier is always 1.0 and to assume the TNC will be based on the Standard VBL method (as a proxy for market measure) whereas the February 2021 memorandum provided multipliers that varied by market funded status.

- These updates were first made and documented in the PBGC Projections Report FY 2023. No additional discussion or rationale was provided in the report regarding these changes. Supporting documentation – PBGC T-PIMS model documentation

The PBGC T-PIMS model documentation and the PBGC Projections Report FY 2024 supplement the February 2021 memorandum with additional detail. For example, the contributions policy assumption includes funded status metrics under different measures. For market measures, liabilities are estimated using the PBGC Standard Premium Funding Target liabilities. The PBGC Projections Report FY 2024 and the PBGC T-PIMS model documentation clarify specifically how these and other measures are estimated and applied.

A comparison of these documents identified three additional considerations with respect to the modeling of credit balances and minimum required contributions.

1. Where “MRC” is noted as a contribution strategy in the FY 2024 Projections Report,

it is defined as the statutory minimum required contribution reduced by 90% of the available credit balance. The February 2021 memorandum provided that the lesser of 90% of the available credit balance or 90% of the minimum required contribution (prior to applying any available credit balance) would be funded by the credit balance.
2. For the floor contribution, the PBGC Projections Report FY 2024 documents that this is the minimum required contribution reflecting "maximum allowable credit balance".
3. Currently, the T-PIMS model documentation assumes 100% of the available excess contributions will be added to the prefunding balance. The PBGC Projections Report FY 2024 appears to be silent on this with respect to the SE plans.

- Supporting documentation - back-testing

We used the back-testing files to confirm that the back-testing file parameters and methodologies align with the SE contribution policy assumptions. Back-testing files are produced annually to review the actual contributions in the most recent reporting year against the expected amounts.

We confirmed that the back-testing file for FY 2024 generally aligns with Appendix 1. FY 2024 SE Contribution Policy Assumption with the following exceptions (comparisons between the back-testing model, Analysis_2023Contribs_2025_02_06_New Method.xlsx, and the current assumption):

1. For the unfunded vested benefit liability contribution strategy (UVBL), a plan's Standard VBL Funded % is used to look up the applicable percentage of the UVBL to be funded whereas the back-testing file uses the plan's premium filing VBL Funded%. In T-PIMS, per 8.8.5.1.b of the T-PIMS model documentation, "Actual UVBL (standard or alternative) is used to calculate the estimated UVB while the standard VBL% is used for determining the UVBL reduction."
2. For the contribution strategy to restore a plan's funded status to a past higher level (MAXP3), the VBL Funded % and amount of unfunded liability were calculated using the 2024 reported assets. For back-testing purposes, assets were expected to be reduced by the receivable contributions in order to estimate amounts prior to 2024 funding.
3. For the MAXP3 contribution strategy, the funded ratio for the immediately preceding year was calculated using the plan's filing liability from the prior year instead of the estimated Standard VBL.
4. For the target normal cost contribution strategy (TNC), the funding target normal cost is used and is assumed to be a proxy for the Standard VBL target normal cost described in the contribution policy assumption.
5. The normal cost multiplier for the TNC funding strategy was set using the FY 2022 parameters shown in Appendix 1. FY 2024 SE Contribution Policy Assumption for testing whereas 1.0 was ultimately used for FY 2024 for all funded levels. The normal cost multiplier parameters could be used to approximate the Standard VBL target normal cost using the funding target normal cost.
6. The floor contribution was calculated by applying 90% of the available credit balances instead of the maximum available credit balance.

SE Contribution Assumption Testing

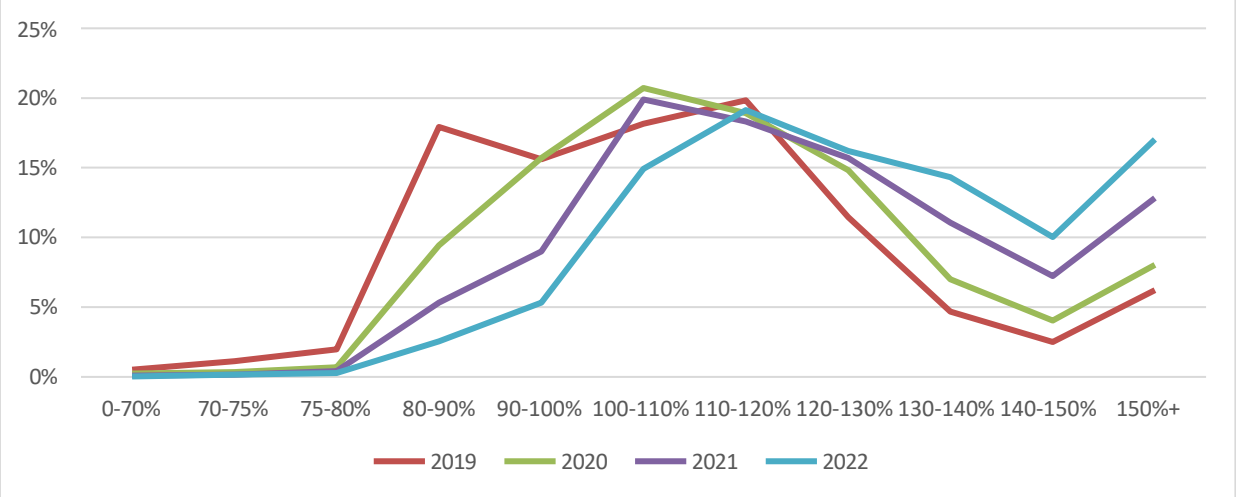
Overview
The back-testing calculations were reviewed against the current contribution assumption as summarized in Appendix 1. FY 2024 SE Contribution Policy Assumption. The goal of our analysis was to review the SE contribution assumptions to confirm they are still reasonable and/or to identify changes to the assumptions that might be considered in order to improve the predictions for future employer contributions.

For this analysis, we examined the contribution behaviors of plan sponsors against the assumptions. In addition to the annual testing completed by PRAD, we looked at the contribution behaviors for years 2019 through 2023, including tracing plans over the four-year period in order to review how a plan's funded status changed year over year and to review the impact excess contributions had toward reducing or eliminating the VRP (i.e., the impact of contributions over the minimum required contribution amounts).

Unless noted otherwise, the SE Figures (charts and tables) below include those plans included in the SE back-testing group for FY 2024 and that were also included in the prior four years of back-testing (3,282 plans).

During the period 2019 through 2022, we noted an overall improved funded status for the plans included in the analysis (as seen in the chart below as the distribution shifts from left to the right for plans with an AFTAP less than 100%). For this purpose, we used the AFTAP measure of funded status (i.e., the plan's funding target, based on 24-month average segment rates and subject to a permissible corridor, and smoothed actuarial value of assets; these are the measures used to determine the statutory minimum required contribution). In the contribution policy assumption, reaching a funded status of 80% on an AFTAP basis is assumed to be a key driver for plans at or below this level.

SE Figure 2. Distribution of Plans by AFTAP Range (2019-2022)

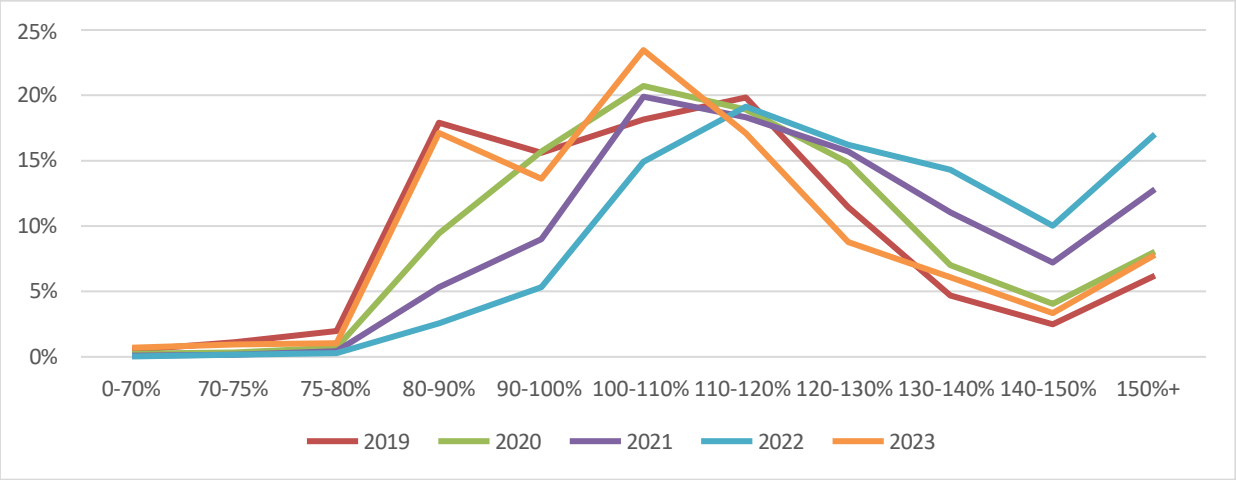


During this period, the effective interest rates moved down slightly but market returns were generally favorable. Funded status likely improved due to a combination of favorable market

conditions and due to employer contributions in excess of minimum required amounts. Overall, the trend was toward fewer plans with less than 80% AFTAP.

We also observed that the AFTAP funded status of many plans included in the study declined between 2022 and 2023 as effective interest rates moved downward (and liabilities increased) and market returns were less favorable. As a result, the 2023 funded status for plans with an AFTAP less than 100% slid back to align more closely with 2019 levels, as shown in SE Figure 3 below.

SE Figure 3. Distribution of Plans by AFTAP Range (2019-2023)



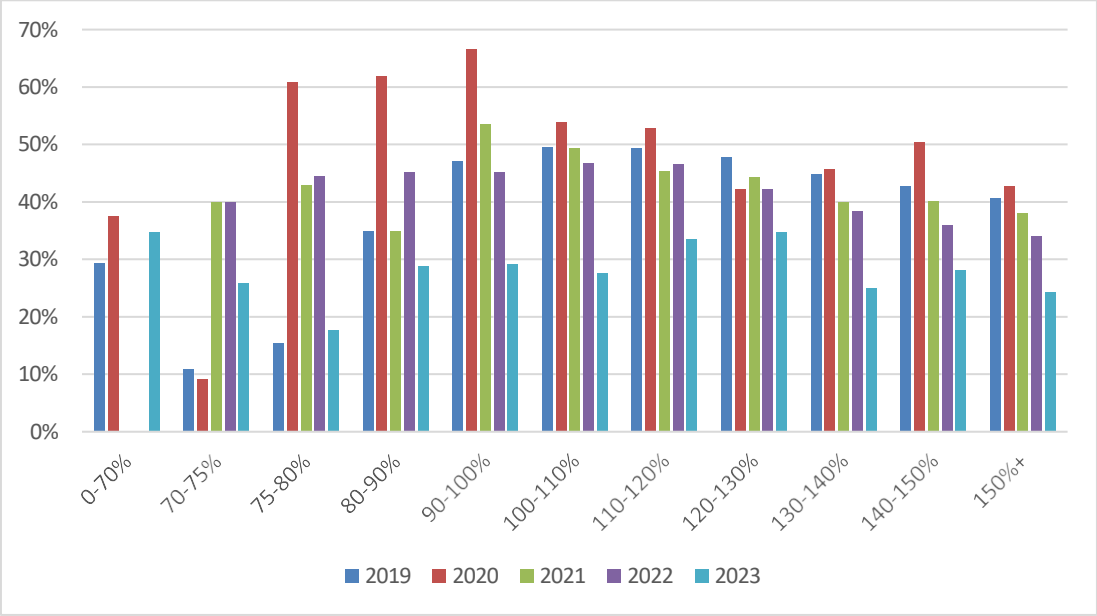
Though plans may have achieved a higher funded status in the past, under the contribution policy assumption, we expect contribution behavior in each year will be influenced by targets relevant to the plan based on their current funded status.

Current contribution assumption framework

The contribution assumption policy assumes a floor in plan contributions of the amount necessary to meet the statutory minimum required contribution amounts except for those plans in bankruptcy. In addition, plans are assumed to contribute in excess of the minimum required contribution according to SE Figure 1 presented earlier.

The estimated number of plans that elected to fund in excess of the minimum required amount (i.e., where cash contributions plus applied funding credit balances were in excess of the statutory minimum required contribution) by year are shown in SE Figure 4A below. SE Figure 4A groups each plan by its AFTAP funded status to align with the contribution policy assumption.

SE Figure 4A. Percent of Plans Electing to Contribute in Excess of the Minimum Required Contribution (2019-2023)



SE Figure 4B. Average percent of plans electing to contribute in excess of the minimum required contribution amount (2019-2023)

AFTAP Range	0-70%	70-75%	75-80%	80-90%	90-100%	100-110%	110-120%	120-130%	130-140%	140-150%	150% +
Average % of plans	31%	19%	28%	38%	49%	45%	46%	43%	39%	39%	36%

With the exception of plans below 80% funded, we note that across funded status levels, plan sponsors are fairly consistent in their elections to fund in excess of minimum required amounts (and likewise, plan sponsors are choosing contributions only in amounts necessary to meet the minimum required amounts fairly consistently across funded status levels).

Contributions for Plans Less than 80% AFTAP

We began by reviewing the plans in the back-testing analysis that were less than 80% funded. These plans are assumed to contribute according to the following assumption:

SE Figure 5. Current SE Contribution Policy Assumption For Plans with AFTAP Less Than 80%

Funded Status	% of plan sponsors using each approach	
	80% AFTAP	MRC*
0% - 70%	0%	100%
70% - 75%	50%	50%
75% - 80%	100%	0%

* The MRC is the statutory minimum required contribution after 90% of available funding credit balances are applied.

The February 2021 memorandum provides that for plans with an AFTAP less than 80%, the primary funding targets are to eliminate benefit restrictions by attaining an 80% funded status and to limit cash outlay by funding only the minimum required amounts.

From SE Figure 4B, we noted that for plans 0-70% funded, 31% of plans funded in excess of the minimum (more than the 0% assumed). For plans 70-75% funded, 19% of plans funded in excess of the minimum as did 28% of plans 75-80% funded; for these funded status levels, fewer plans than assumed contributed more than the minimum.

We also looked at the number of plans that were able to hit the 80% AFTAP target in the following year, as shown below in SE Figure 6.

SE Figure 6. Percentage of Plans Reaching 80% AFTAP
In the Following Year

AFTAP	2019	2020	2021	2022	2019-2022
0-70%	24%	13%	0%	0%	17%
70-75%	51%	27%	60%	40%	47%
75-80%	89%	74%	64%	11%	77%

If we consider only those plans that contributed in excess of the minimum required contribution amounts during the 2019 through 2022 period, the SE Figure 6 table would update the percentage of plans reaching the 80% AFTAP in the subsequent year to 25%, 44% and 68% for the 0-70%, 70-75% and 75-80% AFTAP ranges, respectively. This data highlights that some plan sponsors may be hitting the 80% target on the basis of the minimum required contribution alone.

In addition, for those plans that contributed in excess of the minimum required amounts, the observed change in funded status from year to year are shown in SE Figure 7 below.

SE Figure 7. Change in AFTAP from Prior Year
For Plans with Contributions in Excess of the Minimum Required Contribution

Median improvement in funded status percentage points from prior year					
	from:	2019	2020	2021	2022
AFTAP	*to:*	2020	2021	2022	2023
0-70%*		1%-20%	0%-7%	n/a	n/a
70-75%*		4%-26%	3%-4%	1%-2%	0%-31%
75-80%		5%	3%	1%	-5%
80-90%		6%	4%	6%	-4%
90-100%		6%	7%	9%	-11%
100-110%		4%	7%	8%	-12%
110-120%		4%	7%	7%	-14%
120-130%		5%	10%	7%	-16%
130-140%		5%	10%	7%	-20%
140-150%		4%	13%	8%	-23%
150%+		13%	18%	8%	-29%

* Range from minimum to maximum is shown due to the small number of plans at these funded levels

SE Figure 7 shows the change in funded status from the prior year for those plans who were in the AFTAP range shown in the first column at the beginning of the prior year (the "from" year). For example, the highlighted cell represents the median change in funded status from 2020 to 2021 for those plans that were 75-80% funded in 2020.

Investment performance and liability interest rates are significant contributors to the change in funded status from one year to the next and likely drove 2022-2023 funded status changes. In the right-hand column, we see that despite excess contributions, the median improvement was negative or zero for nearly all funded status levels. Thus, though excess contributions were made by a number of plans in the 70-75% and 75-80% ranges, not all plans succeeded in reaching an 80% AFTAP target.

We also considered PRAD's annual back-testing analyses. From PRAD's annual back-testing, we summarize their findings from the past three years with respect to the total expected contributions under the contribution policy assumption versus the actual contributions (using the total back-testing populations from each year). For 2022 and 2023, PRAD's annual back-testing files summarized results by AFTAP funded status. For 2021, we summarized the results by AFTAP funded status using PRAD's back-testing data. For the funded status levels shown below, the contribution assumption policy was consistent across all years.

SE Figure 8. Summary of Prior Annual Testing
Actual Contributions / Expected Contributions by Year

	2023		2022		2021	
Funded status	# plans	A/E*	# plans	A/E	# plans	A/E
0% - 70%	30	0.79	1	n/a	12	4.27
70% - 75%	35	0.32	8	1.64	11	1.30
75% - 80%	41	0.58	13	0.52	34	0.91

*A/E = actual contributions / expected contributions

We noted that there appears to be more variability in contributions versus expected amounts across the 0-70% and 70%-75% categories. Contributions for the 75% - 80% consistently fell short of expected amounts across all three years. This is consistent with our observation that fewer plans than assumed are contributing in excess of the minimum required contribution. Overall, while the number of plans for each category is small, we believe the contribution policy targets of 80% AFTAP or MRC continue to represent intuitive targets as plans will seek to avoid benefit restrictions and avoid funding deficiencies. The assumed contribution target for plans less than 70% is the MRC. Consideration may be given to assigning some plans additional contributions (i.e., targets in excess of the minimum required contribution) though few plans appeared to contribute in sufficient amounts to reach 80% AFTAP level. For plans 70-75% funded, only 19% funded in excess of the MRC (versus the 50% assumed) and where excess contributions were made, they hit the 80% AFTAP target slightly less than half the time. For plans 75-80%, assuming more plans elect to fund at the MRC level may help to align expected amounts more closely with the observed contributions. Due to the small number of plans in these categories, changes in the contribution policy assumption are not expected to have a significant impact on the overall contribution amounts.

Contributions for Plans over 80% AFTAP

Contribution targets

For plans that have reached an AFTAP funded status of at least 80%, the contribution policy assumption is set as shown below:

SE Figure 9. Current SE Contribution Policy Assumption
For Plans with AFTAP More Than 80%

Funded Status	% of plan sponsors using each approach	
	MRC[2]	Discretionary Targets[3]
80+% AFTAP and <100%[1] in all of last 3 years	1-VRP%	VRP% applied to the greater of UVBL and MAXP3
100%[1] in any of last 3 years	0%	100% applied to the greater of UVBL, MAXP3, TNC
Floor contributions	Floor contributions are set equal to the minimum required contributions reflecting "maximum allowable credit balance"; no contributions in excess of the floor are assumed for plans over 125% funded (Standard VBL basis).	

[1] The 100% Funded Status level is calculated as the estimated current market funded status using the Standard Premium Funding Target (Standard VBL) and market value of assets.
[2] The MRC is the statutory minimum required cash contribution after 90% of available funding credit balances are applied.
[3] The Variable Rate Premium Percent (VRP%), Unfunded Vested Benefit Liability (UVBL), Maximum Funded Status in Prior Three Years (MAXP3), and Target Normal Cost (TNC) contribution strategies are defined further below and in Appendix 1. FY 2024 Contribution Policy Assumption. These amounts are not less than the floor minimum required contribution.

For plans above 80%, the UVBL strategy is to reduce and eliminate the PBGC variable rate premium by funding up to 5% of the vested benefit liability in each year (with higher contribution rates for less well funded plans as shown below in SE Figure 11.B.). The MAXP3 strategy is to regain a higher prior funded ratio obtained in the past 3 years by funding up to 30% of the deficit in each year. Under the TNC strategy, plans target to maintain their current vested benefit liability funded status by funding the increase in plan liability each year attributable to the cost of benefits earned during the year.

A percentage of the plans that did not achieve a 100% Funded Status level in any of the last three years are assumed to contribute only the MRC. The percentage of plans electing the MRC as the funding target is noted in the assumption table as "1-VRP%". The percentage of plans expected to fund toward the UVBL and MAXP3 targets is based on the "VRP%". Contributions for plans that were at least 100% in any of the prior three years are not assumed to be driven by the MRC.

VRP% assumption

The VRP% is the percentage of plan sponsors electing to fund to reduce or eliminate the unfunded vested benefits. The VRP% varies to reflect that a plan sponsor's incentive to eliminate or reduce the VRP increases as the VRP rate increases. If the VRP rate is $30 per $1,000 of unfunded vested benefit liability, then 50% of plans are assumed to target UVBL funding and 50% MRC. If the VRP rate is $100 per $1,000 of unfunded vested benefit liability, then 100% are assumed to target UVBL funding and 0% MRC. The VRP% is based on linear interpolation for rates in between.

The VRP was $52 per $1,000 of unfunded vested benefit liability in 2024, resulting in a VRP% of 65.7% (meaning that in general we would expect 65.7% of plans in this category to elect to fund to reduce the unfunded vested benefit liabilities and 34.3% would elect to fund only the MRC). However, some plans are subject to the per participant premium cap. These plans are assumed to be less incented to contribute higher amounts since additional contributions may not reduce the required VRP. For these plans, the VRP% is calculated based on the plan's "effective VRP rate" (equal to the capped premium amount divided by the unfunded vested benefit). For this reason, the average assumed "VRP%" election rate is lower and was observed at 57% for 2024 for the test population.

Plans funding in excess of the minimum required contribution (VRP% observed)

We observed that the average number of plans funding in excess of the minimum required contribution for the 2019 through 2023 plan years (i.e., where cash contributions plus applied funding credit balances were in excess of the statutory minimum required contribution) were as follows:

SE Figure 10. Average Number of Plans Electing to Contribute in Excess of the Minimum Required Contribution (2019-2023)

AFTAP Range	0-70%	70-75%	75-80%	80-90%	90-100%	100-110%	110-120%	120-130%	130-140%	140-150%	150% +
Average % funding in excess of MRC (VRP%)	31%	19%	28%	38%	49%	45%	46%	43%	39%	39%	36%

In SE Figure 10, we have highlighted the relevant data since we are now focusing on plans with an AFTAP of 80% or more but where the estimated market funded status is less than 100%. We note that the table above reflects contributions by AFTAP range (not market funded status) but the results are expected to be representative of the subject group. These are the plans for which the VRP% assumption applies. The average proportion of plans funding in excess of the minimum required contribution for this group was 47%, whereas the current VRP% assumption assumes a higher proportion of plans may fund in excess of the MRC (approximately 57% for 2024).

Thus, despite the assumptions of 1) if the VRP rate is $30 per $1,000 of unfunded vested benefit liability, then 50% of plans are assumed to target UVBL funding and 50% MRC and 2) if the VRP rate is $100 per $1,000 of unfunded vested benefit liability, then 100% are assumed to target UVBL funding and 0% MRC, the observed numbers incented to contribute in excess of

the MRC may be less than assumed (though we note that the minimum required contribution floor may be larger than the UVBL or MAXP3 contribution). Consideration may be given to reducing the modeling parameters. For example, anchoring the election rate to 40% at the $30 per $1,000 of unfunded vested benefit and pulling back from 100% at $100 per $1,000 to 95%, a slightly lower level to reflect that all plans may not be positioned to fully fund. This may align expectations a bit closer with the experience. We have shown modeling sensitivity to this parameter below in the Future Strategies for Contribution Policy Assumption section of this report.

UVBL funding target

The UVBL funding target strategy assumes the following contribution amounts:

SE Figure 11.A. Current SE Contribution Policy Assumption Parameters for UVBL Contribution Strategy

Standard VBL Funded %:	< 60%	60-80%	80-85%	85-90%	90-95%	95-100%
Percentage of UVBL	10%	15%	25%	33%	50%	100%
Equivalent number of years to eliminate UVBL	10 years	7 years	4 years	3 years	2 years	1 year

The objective of the UVBL funding target is to reduce or eliminate the UVBL used to calculate the PBGC variable rate premium, so contributions are calculated as a percentage of the unfunded vested benefit liability using the plan's selected PBGC variable rate premium filing liability, Standard Premium Funding Target or Alternative Premium Funding Target. The Standard VBL Funded % is used to determine the applicable percentage (i.e., the contribution percentage is based on the estimated current market funded status calculated using the Standard VBL and then applied to the plan's actual unfunded vested benefit premium filing liability).

An equivalent expression for the UVBL contribution amount is to express the contribution as a percent of the vested premium filing liability. For example, a plan that is 85% funded has 15% of its vested premium liability unfunded and will contribute 33% of the unfunded amount or 4.95% of its vested premium liability (i.e., 33% x 15% x VBL). A plan that is just under 90% would have approximately 10% in unfunded vested benefit liability and will fund 33% of that amount or 3.30% of the VBL. Thus, a target contribution range of 3.30% to 4.95% of vested benefit liability is assumed for plans 85% to 90% funded as shown in the table below.

SE Figure 11.B. Current SE Contribution Policy Assumption Parameters for UVBL Contribution Strategy (Expressed as Equivalent Increase in Funded Status)

Standard VBL Funded %:	< 60%	60-80%	80-85%	85-90%	90-95%	95-100%
Percentage	10%	15%	25%	33%	50%	100%
Equivalent Increase in Funded Status	4.00% - 10.00%	3.00% - 6.00%	3.75% - 5.00%	3.30% - 4.95%	2.50% - 5.00%	0.00% - 5.00%

In SE Figure 12 below are the observed aggregate contributions expressed as a percentage of the aggregate premium filing liability in each year. Data is grouped by each plan's Standard VBL Funded %.

SE Figure 12. Annual Contributions as a Percentage of Vested Benefit Premium Filing Liability

	Standard VBL Funded %					
Plan Year Contributions	< 60%	60-80%	80-85%	85-90%	90-95%	95-100%
2020	8%	4%	3%	2%	3%	5%
2021	5%	3%	3%	2%	3%	4%
2022	4%	3%	2%	4%	3%	3%
2023	5%	5%	7%	3%	5%	2%

SE Figure 12 included only those plans that contributed more than the minimum required contribution amount for the plan year and for which the AFTAP was greater than 80%. For this purpose, the contributions for a given plan year are expressed as a percentage of the subsequent year's premium funding target. For example, contributions for the 2023 plan year will be used to reduce the unfunded vested benefit liability for the 2024 premium filing.

Further, we also observed plan sponsors are continuing to contribute in sufficient amounts to eliminate the VRP as shown in SE Figure 13 below. SE Figure 13 includes only those plans that contributed more than the minimum required contribution amount for the plan year and for which the AFTAP was greater than 80%. These are the plan for which the UVBL contribution strategy is assumed to apply.

SE Figure 13. Impact of Contributions in Excess of the Minimum Required Contribution on the Variable Rate Premium for Plans with AFTAP Over 80%

	$0 VRP	$0 VRP	Reduced VRP	Excess conts
Year	w/o excess	due to excess	VRP>0	Still at cap
2019	34%	22%	31%	14%
2020	32%	17%	30%	22%
2021	30%	18%	28%	24%
2022	24%	21%	27%	28%
2023	51%	16%	25%	8%
Average	33%	19%	28%	20%

For this group, approximately 19% of plans eliminated the variable rate premium as a result of the excess contributions with another 28% reducing the premium. Excess contributions were not required for 33% of plans who achieve a $0 VRP even without the excess contributions.

A plan sponsor may choose to fund the pension plan or alternatively to use available cash elsewhere. The February 2021 memorandum describes the "return" on any contribution to include the immediate reduction in the variable rate premium. The total return on pension contributions versus the cost of capital informs a plan sponsor's decision making for funding the

plan. For example for 2024, if a plan reduces its unfunded vested benefit as a result of a $100,000 contribution, the variable rate premium is reduced by $5,200 or 5.20%. If the variable rate premium was limited by the variable rate premium cap, the return attributable to a reduction in the variable rate premium would be lower (or zero if the premium amount remained unchanged). Due to the added return (via a reduction in the variable rate premium), a contribution funding policy that seeks to reduce or eliminate the VRP continues to represent a compelling funding strategy.

For those plans that have an 80+% AFTAP but are less than 100% funded on a market basis and that elect to contribute in excess of the minimum required contribution, the contribution is based on the greater of the UVBL contribution or the MAXP3 contribution. For this group the primary driver of contributions is the UVBL and we observed that eliminating the MAXP3 as a target contribution strategy does little to change the overall expected contributions (the MAXP3 amount is discussed further below). Overall, for this group, for those who elect to contribute in excess of the minimum required contribution the actual contribution amounts appear to fall within the range of expected amounts.

Target normal cost (TNC) funding target

The TNC funding strategy assumes contribution amounts are tied to pension accounting service cost. By funding the increase in plan liability attributable to the cost of benefits earned during the year, the target is to maintain the current funded status.

In the February 2021 memorandum, the TNC funding target provided for a “multiplier” to the plan’s service cost with the multiplier decreasing as the funded status increased. For FY 2023 and FY 2024, the multiplier was 1.0 for all funded status levels. Based on discussions with the PBGC, the multipliers were also a parameter available for interest rate adjustments to approximate the accounting service cost.

For this purpose, the normal cost is intended to represent the annual increase in liabilities due to the accrual of benefits, measured on a market basis and without expenses. The Standard Premium Funding Target filing method is used to estimate the market based TNC.

For plans where the TNC was the expected contribution amount, SE Figure 14 shows how the actual contributions compared to the expected amounts.

SE Figure 14. Comparison of Actual Contributions to the TNC Expected Contributions For Plans Expected to Contribute the TNC

	Count	Expected Contributions ($M)	Actual Contributions ($M)	A/E
2019	1,456	29,113	31,523	108%
2020	1,567	28,474	26,011	91%
2021	1,314	24,808	12,756	51%
2022	723	10,234	9,477	93%
2023	930	11,066	6,329	57%
Total	5,990	103,695	86,096	83%

In the table above and in PRAD’s annual back-testing, the Schedule SB Funding Target normal cost was used in lieu of the market based TNC. In general, this would be expected to understate the expected contribution amounts (i.e., the normal cost would be higher under market interest

rates when the Standard VBL interest segment rates are lower than the funding target segment rates used for reported liabilities on the Schedule SB.) Thus, the A/E ratios may be lower than shown above.

The normal cost A/E ratio has fluctuated from 51% to 108% for the test population over 2019 through 2023 versus the assumed rate of 100%. We would suggest that the TNC multiplier should continue to be monitored but the current assumption aligns with the observed range.

MaxP3 funding target

Under the MAXP3 strategy, if the Standard VBL funded ratio drops (i.e., estimated market funded status declines), the plan sponsor is assumed to contribute up to 30% of the deficit relative to the highest vested benefit liability funded ratio in the last three years. The MAXP3 funding strategy assumes contributions at the following levels:

SE Figure 15. Current SE Contribution Policy Assumption Parameters for MAXP3 Contribution Strategy

Standard VBL Funded %	< 110%	110-115%	115%-125%	125%+
% of Drop (% of the vested benefit liability deficit relative to the vested benefit liability needed to attain the highest funded ratio in the last three years)	30%	25%	20%	0%

Using the February 2021 memorandum example, a plan that is currently 111% but had achieved a prior funded status of 120% in the past 3 years, is said to experience a deficit of 9% of vested benefit liability relative to the highest funded ratio during the prior 3 years. Using SE Figure 15 above and the plan's current Standard VBL Funded % of 111%, the contribution is expected to be 25% of the 9% vested benefit deficit, or 2.25% of the vested benefit liability.

The rationale for the MaxP3 funding strategy is that plan sponsors may have their own funding objective benchmarks (other than or in addition to meeting minimum funding requirements and eliminating the variable rate premium). Therefore, some plan sponsors may choose to continue to fund in excess of the MRC contribution strategy in order to meet these objectives. Such possible funding targets are discussed further in the Contribution Framework and Future Considerations section below.

In our analysis, we considered an alternative target for the MAXP3 measure. We also observed that even when a plan is over 100% funded, a plan sponsor may elect to continue to contribute in excess of the minimum required contribution. We agree with the premise that the funding targets may vary from plan sponsor to plan sponsor. As an alternative to the MAXP3 contribution strategy, we considered whether the dollar amounts in a year may correlate more closely with the actual amounts contributed during the prior year(s). We found a positive correlation as shown in SE Figure 16 below.

SE Figure 16. Correlation between Current Plan Year Contributions And Prior Years' Contributions

Year	1 Year Prior	2 Years Prior	3 Years Prior
2022	0.691	0.643	0.690
2023	0.660	0.632	0.590

Though a positive correlation exists for the amounts-based contribution assumption and for some years produced a better fit, as noted earlier plan sponsors may exhibit different behaviors when in the same financial position as another plan. Thus, for example, a plan sponsor may elect not to over-react to a one-year drop in funded status due to unfavorable asset returns or interest rates and continue to contribute in amounts similar to prior years. In this case an amounts-based assumption may make sense. Another sponsor may elect to fund in larger amounts in response to a drop or when business conditions allow in which case, assuming higher contribution levels will persist in a subsequent year may not be reasonable. In the latter situation, an amounts-based contribution may overstate future contributions due to the incorporation of the "one-time" large contribution.

Thus, there might be a preference to maintain the MAXP3 strategy over an amounts-based measure when contributions are no longer driven by minimum required amounts, by contributions necessary to avoid benefit restrictions, or by amounts to avoid or eliminate the variable rate premium.

Overall, contributions for plans that are more than 100% funded were less than expected in recent years. There are two levers at play for the amount of contributions for plans over 100% funded. First is the number of plans that contribute in excess of the minimum required contribution. Currently the policy assumes plans less than 125% funded will target to contribute the greater of the MRC, UVBL, MAXP3 or TNC targets (with those 125% funded will contribute the statutory minimum required contribution only). We observed that 55% of plans are not contributing more than the minimum required contribution. Introducing a parameter that enables a portion of the plans that are over 100% (but less than 125%) to contribute only the MRC may align expectations more closely with experience.

Second, is the amount of contributions for those plans that are contributing in excess of the minimum. The MAXP3 funding strategy may be the most complex of the assumed strategies since each plan will have its own funding target (based on their own prior three years' observed funded status levels) and further, the strategy sets an assumption as to how fast the plan will fund up to the prior level. A three-year lookback period appears to be a reasonable period to set the plan's funding status target since it targets recent contribution behavior but allows for a smoothing period so that it does not overreact to one-year anomalies. However, consideration could be given to the period over which contributions are assumed to be made in response to a drop in funded status. For example, lowering the percentage of the drop expected to be funded in the year is a parameter that would reduce overall expected contributions as it lengthens the time period for funding the drop.

We isolated the plans that were assumed to contribute the MAXP3 from PRAD's back-testing datasets over the last five years. The results are shown in the table below:

SE Figure 17. Comparison of Actual Contributions to the MAXP3 Expected Contributions For Plans Expected to Contribute the MAXP3

	Count	Expected Contributions ($M)	Actual Contributions ($M)	A/E
2019	628	4,237	730	17%
2020	938	8,048	1,260	16%
2021	959	9,650	981	10%
2022	581	12,764	1,251	10%
2023	147	3,050	1,088	36%
Total	3,253	37,749	5,311	14%

Based on the observed experience, it does appear appropriate to lower the expected contribution amounts for this population.

In the Future Strategies for Contribution Policy Assumption section below, we include the results of additional back-testing to assess the sensitivity to adjusting these model parameters.

Plans Over 125%

The current contribution policy assumption assumes no contributions in excess of the statutory minimum required contribution for plans that are over 125% funded. We looked at the data for the prior four years to determine the point at which plan sponsors elected to stop contributions. In SE Figure 18 below, we identified the average funded status at which contributions stopped in each year. Specifically, we are showing the average funded status for plans that are over 100%, where the current plan year contribution was zero, and where a prior year contribution was made.

SE Figure 18. Average Funded Status of Plans that Plan Sponsors Elected to Stop Contributions

Plan Year	Funded Status
2020	119%
2021	124%
2022	121%
2023	127%

Based on this data, the 125% assumed funded status threshold appears to align well with a threshold where plan sponsors decide to take a funding holiday. It does not necessarily mean that every plan sponsor will cease funding at the 125% funded status.

Contribution Adjustments for Plans Projected to Undergo a Distress Termination

For plans projected to undergo a distress termination, contributions during the three years prior to termination are set to zero under the contribution policy assumption. In general, the premise is to note that contributions in the years immediately prior to a distress termination may have been less than expected and may be less than minimum required amounts.

Based on our discussions with PBGC, by zeroing out the three years prior to termination, the stated intent is to mitigate the impact of any assumed excess contributions so that overall expected contributions in this period align with actual contributions and are not overstated.

We reviewed the contribution history for the five years prior to termination for those plans that became trusteed plans in the period 2021 through 2023. For this group of plans, we reviewed those plans with 100 or more participants as a proxy for future distress terminations modeled in PIMS. For each plan, we gathered Form 5500, Schedule SB contribution amounts for the five-year period prior to termination. A summary of our findings is outlined below in SE Figure 19.

SE Figure 19. Contributions Amounts for Five Years Prior to Termination for Trusteed Plans 2021-2023
(Plans with more than 100 participants)

	MRC (after 90% of CB) (Expected)	Cash Contributions (Actual)	Adjusted MRC ($0 for 3 yrs before YOT)	Adjusted MRC ($0 for 2 yrs before YOT)	Actual Cash/ Exp MRC
YOT minus 1 year	35,750,437	21,669,211	-	-	61%
YOT minus 2 years	44,164,301	24,168,716	-	-	55%
YOT minus 3 years	39,756,296	24,860,509	-	39,756,296	63%
YOT minus 4 years	37,622,817	27,221,418	37,622,817	37,622,817	72%
YOT minus 5 years	27,307,069	19,993,873	27,307,069	27,307,069	73%
YOT-1 year through YOT-5 years	184,600,919	117,913,727	64,929,886	104,686,182	64%

There were approximately 35 plans in this subgroup. For each plan we summarized the statutory minimum required contribution, the available funding credit balance, the portion of the credit balance applied, and the amount of cash contributions for the five filing years prior to the year of termination.

Actual cash contributions were $117.9M for the five-year period. The total minimum required contribution after applying 90% of the available funding credit balances and removing the 3 years of contributions prior to termination were $64.9M. This brings the expected contributions lower than the observed contributions. We noted that eliminating just two years of contributions prior to the year of termination resulted in expected contributions of $104.7M which aligned a bit better with the observed experience.

We also observed that the total cash contribution amounts were less than the target MRC amounts in each of the five years prior to the year of termination. Total contributions for this period were approximately 64% of the MRC target. As before, the MRC target reflects the statutory minimum required contribution amount after reflecting 90% of the available funding credit balances.

We concluded that the elimination of three years may continue to be a reasonable assumption considering that the data sampling is small and more conservatism may be desired. In addition, for some plans, the model may have predicted contributions in excess of the MRC (based on a plan's funded status). Thus, clearing an additional year may be appropriate.

As an alternative approach, since annual contributions were approximately 64% of the MRC, contribution amounts may be considered at this or similar levels for the five-year period prior to the year of termination if relatively easy to incorporate.

Funding credit balance management

First, though plans are contributing more than the minimum required contribution, we observed that they are not consistently using such amounts to add to the prefunding balance (PFB). An election to increase the PFB by the amount contributions exceed the minimum required contribution would create a "rainy day fund" that can be used to satisfy the minimum required contribution in a subsequent plan year.

Using the back-testing data files, for plans with an AFTAP of 80% or more, we observed that the following amounts of excess contributions were added to the prefunding balance in each year:

SE Figure 20. Amount Added to Prefunding Balance
as a Percentage of Eligible Excess
(Plans with AFTAP Over 80% Included in PRAD's SE Back-testing Datasets)

Plan Year	% of Excess Contributions Added to Credit Balance
2019	42%
2020	65%
2021	57%
2022	40%
2023	38%
2019-2023	51%

Currently, the PIMS system assumes 100% of the available excess contributions will be added to the prefunding balance. However, the data shows that consistently lesser amounts are added.

We offer a few observations on why plan sponsors may not elect to increase the prefunding balance:

- Though funding balances create a rainy-day fund that can be used to pay a future minimum required contribution, certain funded status measures require that assets first be reduced by the funding credit balance. For example, AFTAP thresholds must be met to avoid benefit restrictions and in certain cases, to calculate the AFTAP, assets are first reduced by the funding balances. Thus, in order to maintain the AFTAP, there is a check to prohibit sponsors from generating runaway credit balances.

- We also note that there are two types of funding credit balances, carryover balances and prefunding balances. Carryover balances represent credit balances that emerged before the Pension Protection Act of 2006 and in certain calculations, they receive preferential treatment over the prefunding balances (for example, in determining the 80% threshold for whether a funding balance can be used to satisfy the minimum). However, when a funding balance is used, the carryover balance must be used first before the prefunding balance. Thus, plan sponsors may not wish to add to the prefunding balance only to have it result in a subsequent reduction of the more favorable carryover balance.

- Due to the monitoring that may be required for a plan's funded status and funding credit balance application, plan sponsors may simply opt to avoid or limit its active management.

Second, the current contribution policy assumption includes a provision that when the minimum required contribution is the target contribution strategy, such amount will be calculated by reducing the statutory minimum required contribution by 90% of available funding credit balances. For this purpose, no distinction has been made to differentiate between an available carryover balance or available prefunding balance. Once the total amount has been determined, we expect that it would first apply to any remaining carryover balance and once that balance is exhausted, remaining amounts would be taken from the prefunding balance.

For plans with an available funding credit balance, SE Figure 21 below shows the portion of the credit balance used when a minimum required contribution was required (i.e., when the minimum required contribution was greater than zero). The results are shown by plan year based on the AFTAP funded status for that year. The percentage used is reflected as the amount used over the total available credit balance. The total available credit balance may be higher than the minimum required contribution.

SE Figure 21. Percentage of Funding Credit Balance Used to Satisfy the Minimum Required Contribution in Each Plan Year

AFTAP	2019	2020	2021	2022	2023
80-90%	33%	26%	28%	28%	26%
90-100%	50%	36%	30%	26%	26%
100-110%	16%	15%	12%	14%	13%
110-120%	9%	9%	10%	7%	8%
120-130%	9%	7%	6%	6%	6%
130-140%	9%	4%	7%	7%	8%
140-150%	2%	3%	2%	2%	3%
150%+	1%	1%	4%	4%	1%

We have also prepared a second table with respect to the funding credit balance. In the table below, we are showing the percentage of the minimum required contribution met by the funding credit balance in each year. This is the ratio of the applied credit balance to the plan's minimum required contribution.

SE Figure 22. Percentage of Minimum Required Contribution Satisfied by the Funding Credit Balance in Each Plan Year

AFTAP	2019	2020	2021	2022	2023
80-90%	42%	65%	77%	74%	70%
90-100%	60%	63%	32%	73%	42%
100-110%	64%	81%	82%	58%	75%
110-120%	80%	70%	88%	73%	77%
120-130%	73%	89%	89%	84%	69%
130-140%	96%	70%	92%	90%	79%
140-150%	29%	60%	98%	83%	57%
150%+	18%	9%	89%	83%	31%

Based on the recent data, it appears that lower levels of funding credit balances are applied than assumed in the contribution assumption policy.

Earlier we noted that where "MRC" is noted as a contribution strategy in the contribution policy assumption, it is defined as the statutory minimum required contribution reduced by 90% of the available credit balance (carryover balance plus prefunding balance). The February 2021 memorandum provided that the lesser of 90% of the available credit balance or 90% of the minimum required contribution (prior to applying any available credit balance) would be funded by the credit balance. Depending on how the credit balance is used in the model, the credit balance assumption may need to be updated to better align with observed experience.

Suggested considerations:

1. Clarify the assumed portion of the funding credit balance that is applied to the MRC and align with experience data (if updates are needed).
2. Lower the percentage of the excess contributions added to the prefunding balance from 100% to align more closely with the 51% observed.

Future Strategies for Contribution Policy Assumption

Contribution Targets

We believe the contribution framework as outlined above and in Appendix 1. FY 2024 Contribution Policy Assumption, incorporates the key drivers for pension funding contributions for single employer plans.

To supplement these considerations, we have outlined potential funding objectives and targets below:

SE Figure 23. Potential SE Contribution Targets

Targets	Description
Avoid benefit restrictions	Achieve 60% AFTAP to allow continued benefit accruals
	Achieve 80% AFTAP to allow the payment of lump sums
	Achieve 80% AFTAP to allow an amendment to take affect
	Achieve 90% AFTAP to allow a presumed AFTAP greater than 80%
	Achieve 110% funded status to allow the payment of lump sums to Top 25 high paid (for smaller plans where the lump sum amount may exceed 1% of liability)
Reduce or eliminate PBGC Variable Rate	Achieve 80% AFTAP to avoid at-risk classification (generally increases minimum required contributions and VRP)
Premium (VRP)	Reduce filing UVB in order to reduce variable rate premium
	Reduce filing UVB to zero in order to eliminate variable rate premium
Other elective/discretionary considerations	Achieve or maintain 100% - 110% funded status on accounting market basis
	Achieve or maintain 100% - 110% funded status on plan-termination basis
	Continue to fund current year's accrual (in order to maintain funded status)
	Maintain or improve funded status to support de-risking investment strategies
	Maintain or improve funded status to support partial settlement options
	Maintain or improve funded status over multi-year period using measures without smoothing permitted under funding relief
	Maintain 401(h) account for retiree medical benefits
	Maintain or improve funded status back to higher level achieved in a prior year (e.g., MAXP3)
Floor	Minimum required contribution
Cap	Maximize tax deduction opportunity

Though these considerations have been in operation over recent years and are not new, we believe they continue to be relevant factors influencing current contribution behaviors. Not all are explicitly addressed in the current policy; however, the general premises are addressed since plans are assumed to continue to fund toward 100% funded status on a market basis and to continue to fund toward higher levels consistent with past experience.

We also note the following with respect to the contribution funding strategies:

- The "other elective/discretionary" contributions in SE Figure 21 generally focus on long term plan strategy and risk mitigation. Plans may seek funding levels in excess of 100% to provide a cushion to guard against adverse market change (e.g., to provide a funding cushion in the event investment returns are worse than expected or liabilities increase due to downward interest rate movement). This may be a precursor for plan sponsors with a near term strategy toward settling pension liabilities through pension risk transfers (settling a portion of the plan liability) or through plan termination (settling all of the plan's obligations).
- Closed or frozen plans may continue to monitor their asset allocation with an eye toward termination or settlement and seek capital preservation asset allocation strategies with targeted asset allocation changes as higher funding targets are achieved. Thus, increasing the overall funded status may align with their overall risk mitigation strategies.
- Not all strategies will fit the outline, and individual objectives may not be apparent as we observed plans continuing to contribute in large amounts even though well-funded. That said, we would expect to see the maximum tax-deductible contribution to continue to act as a cap in these situations as plan sponsors protect against the accumulation of trapped surplus. The contribution policy assumption also provides the 125% funded status threshold above which point no contributions in excess of the minimum required amounts are assumed. This also provides a guard against overestimating contributions in the SE PIMS modeling.
- Funding in excess of 100% (for example to 110% or higher) is not explicitly assumed under the current assumption policy unless the plan has reached the higher funded status in any of the last three years. Then, once a plan's observed funded status exceeds 100% (either as observed in current filings or based on projected market simulations that result in a funded status greater than 100%), the achieved higher targets are incorporated in future funding via the MAXP3 contribution strategy.

Back-testing Sensitivities

Based on our analysis and summary observations, below we have outlined and modeled sensitivity adjustments to the SE contribution policy assumptions. Further exploration may be needed to set the target levels. Over the near term these assumptions can be monitored and if adjusted contribution policy assumption changes continue to work well, they may be considered for a future implementation in the PIMS modeling. Some of these considerations are straightforward and may easily be updated using the system parameters. Others may require additional assessment from the PRAD team in order to set and implement.

The specific sensitivities we modeled are as follows:

- For plans using the MAXP3 contribution target an adjusted contribution amount was modeled as follows in order to model lower discretionary contributions:

SE Figure 24. Back-testing SE Contribution Policy Assumptions Sensitivity Parameters for MAXP3 Method

Standard VBL Funded %	< 110%	110-115%	115%-125%	125%+
% of Drop* (Current)	30%	25%	20%	0%
% of Drop* (Alternative modeled for sensitivity)	20%	15%	10%	0%

*As defined above in SE Figure 15.

The results of the sensitivity back-testing are shown below:

SE Figure 25. Back-testing SE Contribution Policy Assumptions Sensitivity to MAXP3 Method

Year	Funded Level	Actual Contributions	Current Cont Policy Estimate	Alt Cont Policy Estimate	Current Difference (%)	Alt Policy Difference (%)
2023	<100% last 3 years	6,945	10,413	10,409	50%	50%
	>100% in last 3 years	13,893	18,905	17,919	36%	29%
2022	<100% last 3 years	6,714	8,365	8,350	25%	24%
	>100% in last 3 years	17,703	34,280	30,433	94%	72%
2021	<100% last 3 years	6,199	11,611	11,605	87%	87%
	>100% in last 3 years	15,820	30,496	27,164	93%	72%

- For plans over 100% funded, we introduced a parameter to allow a percentage of plans to contribute only the MRC. For purposes of this illustration, we set the target at 25%, i.e., we weighted each plan's expected contribution, assuming 25% of the MRC and 75% of the higher discretionary amounts outlined in SE Figure 9 for plans with funded ratios of 100% or more in any of last 3 years. More analysis may be needed to identify the specific parameter level (which may be coordinated with MAXP3 contribution period as discussed above). The results of the sensitivity back-testing are shown below.

SE Figure 26. Back-testing SE Contribution Policy Assumptions Sensitivity to MRC% for Plans >100% Funded

Year	Funded Level	Actual Contributions	Current Cont Policy Estimate	Alt Cont Policy Estimate	Current Difference (%)	Alt Policy Difference (%)
2023	<100% last 3 years	6,945	10,413	10,413	50%	50%
	>100% in last 3 years	13,893	18,905	14,477	36%	4%
2022	<100% last 3 years	6,714	8,365	8,365	25%	25%
	>100% in last 3 years	17,703	34,280	25,863	94%	46%
2021	<100% last 3 years	6,199	11,611	11,611	87%	87%
	>100% in last 3 years	15,820	30,496	22,998	93%	45%

- For plans using the MaxP3 target, the MAXP3 contribution amount was modeled by setting the contribution target as the prior three-year *average* dollar amount of contribution. The results of the sensitivity back-testing are shown below.

SE Figure 27. Back-testing SE Contribution Policy Assumptions
Sensitivity to Average of Prior 3 Years' Contributions in place of MAXP3

Year	Funded Level	Actual Contributions	Current Cont Policy Estimate	Alt Cont Policy Estimate	Current Difference (%)	Alt Policy Difference (%)
2023	<100% each of last 3 years	6,945	10,413	10,991	50%	58%
	>100% within last 3 years	13,893	18,905	20,536	36%	48%
2022	<100% each of last 3 years	6,714	8,365	9,040	25%	35%
	>100% within last 3 years	17,703	34,280	33,125	94%	87%
2021	<100% each of last 3 years	6,199	11,611	12,054	87%	94%
	>100% within last 3 years	15,820	30,496	35,200	93%	123%

- For plans using the VRP% an adjusted contribution level was modeled as follows:

SE Figure 28. Back-testing SE Contribution Policy Assumptions
Sensitivity Parameters for VRP%

PBGC Premium Rate Level	Current	Alternative
$30	50%	40%
$100	100%	95%

The results of the sensitivity back-testing are shown below:

SE Figure 29. Back-testing SE Contribution Policy Assumptions
Sensitivity to VRP%: 40% at $30, 95% at $100

Year	Funded Level	Actual Contributions	Current Cont Policy Estimate	Alt Cont Policy Estimate	Current Difference (%)	Alt Policy Difference (%)
2023	<100% each of last 3 years	6,945	10,413	9,129	50%	31%
	>100% within last 3 years	13,893	18,905	18,905	36%	36%
2022	<100% each of last 3 years	6,714	8,365	7,021	25%	5%
	>100% within last 3 years	17,703	34,280	34,280	94%	94%
2021	<100% each of last 3 years	6,199	11,611	9,783	87%	58%
	>100% within last 3 years	15,820	30,496	30,496	93%	93%

In addition, though not modeled, PBGC may also consider:

(1) Clarify the assumed portion of the funding credit balance that is applied to the MRC and align with experience data (if updates are needed).
(2) Lower the percentage of the excess contributions added to the prefunding balance from 100% to align more closely with the 51% observed.

Assessment of Stress and Sensitivity Tests (SE)

The Fiscal Year 2024 Projections Report includes three primary stress/sensitivity analyses for the Single Employer Pension Insurance Modeling System (SE-PIMS):

1. Sensitivity of FY 2034 single-employer net financial position to changes in SE model's discount rate
2. Sensitivity of FY 2034 mean net financial position to plan de-risking activity
3. Extreme stress test scenarios, including market downturns and bankruptcies

In addition, the projections report includes a supplementary analysis of plan underfunding under minimum-contribution behavior, which directly addresses employer contribution behavior. Overall, the tests primarily evaluate macroeconomic drivers of PBGC exposure (interest rates, investment performance, bankruptcies, and plan sponsor risk behavior), with less direct testing of contribution policy assumptions.

Assessment of individual tests

Discount Rate Sensitivity

The sensitivity of the FY 2034 single-employer net financial position to the discount rate is measured by shifting the discount rate used to calculate PBGC liability values up and down by 50 basis points. Only the discount rate for calculating liabilities is changed with all other assumptions and variables held constant. This test is appropriate for understanding balance-sheet volatility and provides a standard actuarial valuation sensitivity. Although useful, sensitivity to the discount rate is only indirectly related to contribution behavior.

Sensitivity to Plan De-Risking Activity

The projections report includes evaluating the sensitivity of the FY 2034 single-employer mean net financial position to plan de-risking activity including increased retiree bulk annuity purchases and increased voluntary plan terminations. These activities affect timing and probability of plan termination claims, changes in premium revenue patterns and changes in participant counts. Testing the sensitivity of the net financial position to plan de-risking activity captures important behavioral responses by plan sponsors and real-world trends toward liability transfer transactions. However, while this test captures the impact on the net financial position of some sponsor behavior it does not directly measure the impact of contribution behavior.

Single-Employer Stress Test Scenario

The projections report includes an extreme stress scenario designed to resemble the early-2000s claim environment. Key assumptions include:

- 35.2% equity market decline
- 20% reduction in plan assets
- 40% annual bankruptcy probability for B+ or lower-rated sponsors
- Approximately $32 billion in claims over six years

Under this extreme stress scenario claims increase substantially and PBGC net financial position declines but remains positive under all trials.

Because the single employer contribution assumption is sensitive to changes in the modeled employer AFTAP, vested benefit liability and previous funded levels, it follows that SE-PIMS modeling would capture assumed changes in employer contribution behavior under this extreme stress scenario. For example, if under a baseline scenario a plan's funded level were projected to remain over 80% and contributions were assumed to be based on a combination of

eliminating the variable rate premium and reaching a previous higher funded level, under the extreme stress scenario such a plan's funded level may drop below 80% and contribution behavior would be assumed to shift toward restoring the 80% funded threshold. Changes in the level of employer contributions are not directly measured or reported in the projections report under this stress test scenario. It might be worthwhile to review how the contribution assumption behaves under such a stress scenario, whether contribution levels remain reasonable under extreme economic conditions or if a modification to the contribution assumption might impact the stress-test outcome.

Plan Underfunding

The level of single-employer plan funding is projected stochastically over a 10-year period under both baseline assumptions (including the current employer contribution assumption) and under the assumption that employers contribute only the minimum required amount. Compared to the baseline projections, the mean and median projected underfunding over the projection period more than double under the assumption that employers contribute only the minimum required amount, and the range of outcomes grows significantly, even while all other baseline assumptions remain unchanged. This analysis highlights the importance of discretionary contributions to system funding and directly addresses contribution policy behavior. Building on this analysis, additional contribution stress testing scenario that directly ties plan underfunding to PBGC financial projections could be considered. Because the SE-PIMS model relies on assumed sponsor contribution patterns directly stress testing employer contribution behavior will provide a more robust risk assessment.

Conclusions and Considerations

The stress and sensitivity testing framework for the Single-Employer model is generally robust for macroeconomic risk, particularly through the extreme stress scenario combining market losses and bankruptcies. We note that under the current contribution policy employer contribution levels are highly sensitive to the assumed portion of plans contributing the minimum required contribution versus the portion assumed to make discretionary contributions. By testing the sensitivity of plan underfunding to the assumption that all plans contribute only the minimum required amount the projections report does disclose sensitivity to perhaps the most impactful component of the contribution policy. However, the framework does not explicitly stress employer contribution behavior and its impact on PBGC financials, despite contributions being a key determinant of:

- plan funding levels
- claim probability
- premium income.

Additional direct stress testing of employer contributions, where sponsors contribute the minimum required amount over the projection period could be considered to further evaluate the impact of reduced discretionary funding. This test already appears in the Underfunding Analysis section but could be expanded to include the impact on PBGC financial projections.

Other considerations could include testing declining contributions during recession, similar to bankruptcy stress test but directly measuring the impact of a drop in funding over 3-5 years. For example, testing could couple poor market returns with lower discretionary contributions. This may already be addressed through bankruptcy testing if that testing adequately generates worse outcomes.

ME Contributions Review

ME Introduction

Multiemployer pension plans have faced significant financial pressure over the past two decades due to a combination of declining active populations, industry contraction in certain sectors, and market disruptions. The financial crisis of 2008 accelerated funding challenges for many plans, as asset losses coincided with a declining contribution base leading to an increase in the number of plans entering critical funding statuses and facing increased risk of insolvency.

In response to these challenges, policymakers enacted several legislative measures intended to stabilize the multiemployer system. The Multiemployer Pension Reform Act of 2014 (MPRA) introduced tools allowing deeply troubled plans to suspend benefits under certain conditions to avoid insolvency. More recently, the American Rescue Plan Act of 2021 (ARP) established the Special Financial Assistance (SFA) program, providing substantial federal funding to eligible plans to enable them to pay benefits through at least 2051. These developments have significantly improved the outlook of the multiemployer system and influenced the modeling approaches used in the PIMS Projections Reports.

In the ME-PIMS model, assumptions related to employer contributions play an important role because they directly influence projected plan funding levels and the likelihood of future insolvencies. Even relatively small changes in contribution assumptions can materially affect projections. In the model, total employer contributions are projected as the sum of two components: ongoing employer contributions and withdrawal liability payments (WDL). Ongoing contributions are generally projected based on the number of active participants and projected per capita contributions (PCC), both of which depend on underlying assumptions such as active population decline and contribution rate growth. Withdrawal liability payments are projected using a separate set of assumptions related to employer withdrawal behavior and payment patterns.

To support our review, PBGC provided documentation, analyses, and reference files used for the ME-PIMS model. These materials provided assumptions and rationale used to develop the contribution projections in the ME-PIMS model. A brief description of each document relied on is provided below:

- *ME Contributions Memo:* This memo from 2023 provides a detailed description of the contribution assumptions adopted for the FY2020 Projections Report. While certain parameters have changed since the memo, this memo is the basis for the current contribution assumptions.
    - *Exhibits:* We were provided the supporting exhibit spreadsheets referenced in the ME Contributions Memo.
    - *2009-2018 Contribution Rates:* We were provided with a supporting analysis file used in setting the contribution rate growth assumption.
- *PBGC Assumption Changes:* This document, prepared by PBGC for our review, demonstrates how the assumptions related to ME contributions have changed for each projections report from FY2020 to FY2023 (no changes in FY2024 Report).

- *ME FY2023 Model:* This file serves as the ME-PIMS model that was used for the FY2023 Projections Report.
- *Annual ME data files:* These files represent the adjustments made to contributions for withdrawal liability payments that are used as the base year data in the projections.

In addition to the model documentation provided by PBGC, our analysis relied on several other publicly available sources of information. These included:

- *PIMS Projections Reports (FY2022 – FY2024):* These reports document the health of the ME program along with the assumptions used to project financial status of the program.
- *Prior PIMS Reviews:* Two prior PIMS Peer Reviews reference the ME contribution assumptions including the Cheiron report *MAP-21 Peer Review FY2019* and the Advanced Analytical Consulting Group, Inc. report, *Multiemployer Active Participants.*
- *Form 5500 Datasets:* Publicly available datasets that include historical Form 5500 and attachments data on ME plans.
- *PBGC Pension Insurance Data Tables:* Summary tables that demonstrate ME plan universe metrics.
- *PRAD ME experts:* We met throughout the engagement with PRAD team members to ask questions and relied on their expertise in explaining the assumptions and methods.

Our review focused on the assumptions that impact projected contributions. We examined the active population decline, contribution rate growth, and withdrawal liability payment assumptions, as well as the treatment of mass withdrawal events. These assumptions collectively determine how the model projects ongoing employer contributions and withdrawal liability payments over time. Our assessment evaluated the reasonableness of these assumptions based on PBGC's documented rationale, historical experience observed in available data sources, and additional analyses performed as part of this review. We also considered how the assumptions performed when applied to historical data through back-testing and sensitivity testing of key parameters.

ME Contribution Assumptions Review

Active Population Decline

Description

Below we document our understanding of the current assumption, as stated in the FY2024 Projections Report, used for the mean net decrease in the active population per year. It is our understanding that the assumed mean rate of decline is based on the plan's risk zone status. In the model these rates are allowed to vary from year to year around the expected level using a lognormal framework.

ME Figure 1. Current Model Assumption for Mean Net Decrease in population per year

Description	Decline Assumption
Neither Endangered nor Critical (Green)	1.0%
Endangered Plans (Yellow)	2.5%
Critical plans (Red) that do not receive SFA	3.0%
Critical and Declining (C&D) Plans	5.1%
Critical plans that do receive SFA	2.0% through 2031 and 1% thereafter

The above assumption dates back to the 2020 Projections Report. Prior to this report the mean net decrease in the active population per year across all simulated scenarios was 1.3%/year for all zones.

Rationale

In the FY2024 Projection Report, PBGC provides rationale for the active decline assumption as:

These assumptions were developed based on a 2021 study of Form 5500 data spanning from 2010 through 2019 as well as assumptions used on SFA applications.

PBGC further elaborated in the PBGC Assumption Changes document provided to our team:

This assumption was updated in 2021 Projections Report to reflect analysis from the AACG peer review from March 2019 and Cheiron peer review from November 2020.https://www.pbgc.gov/sites/default/files/me-active-participants.pdf Because of the distorting impact of the COVID-19 pandemic, this assumption has not been analyzed and updated since the change to the 2021 Projections Report.

In November 2020, Cheiron completed a review of the recoded ME-PIMS model and validated the enhancements being introduced into the model. The enhancements relevant to active population decline included modeling year to year active population changes with a uniform distribution and having the random draws across scenario/year but staying consistent across plans.

Advanced Analytical Consulting Group (AACG) performed a peer review on how the active participants are modeled in ME-PIMS in March 2021. AACG studied active participant behavior from 2009 to 2018 and concluded that the prior assumption used for active population was oversimplified and could be updated without adding too much complexity to the model. Their results showed that factors such as industry and risk status appeared to have significant impacts on a plan's active population decline. As a result of the study PBGC updated the assumption to incorporate different population decline assumptions by risk status as shown above. PBGC directly used the results shown in Figure 8 of the AACG report that showed the average annual participant-weighted geometric changes in active participation by risk status.

Commentary

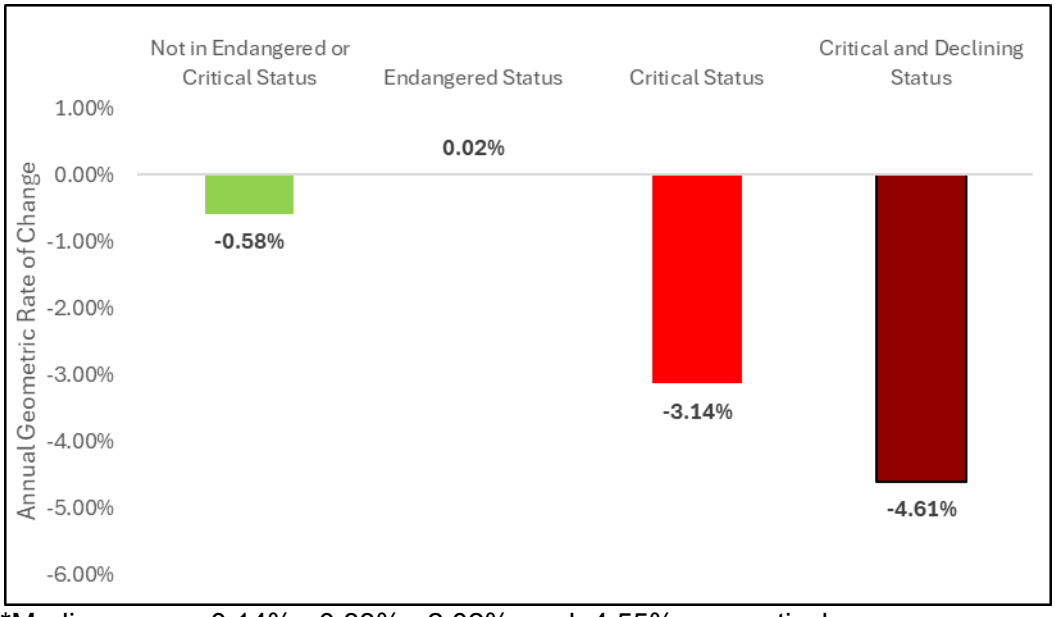
It makes intuitive sense for PBGC to tie assumptions for active population decline to a plan's risk status as outlined in the AACG study because plans in different risk zones may face markedly

different workforce dynamics as theorized below.

- Well-funded green zone plans may generally be characterized by relatively stable active populations, reflecting a balance between new entrants and exits. As a result, these plans are projected to experience only small declines in active participants.
- Endangered and Critical plans may face greater attrition pressures, reflecting factors such as employer exits, plan closures, or declining bargaining leverage, and are projected to experience higher annual declines.
- Critical and Declining plans, may have shrinking workforces and limited ability to attract or retain contributing employers, could be projected to see the steepest declines.

For any actuarial assumption that is based on historical or experience data, it is important to revalidate that the assumption remains reasonable over time. To validate the continued use of the active decline percentages, we studied active population movement from 2019 to 2023 using Form 5500 Schedule MB Data. ME Figure 2 below shows the average geometric changes in active participants from 2019 to 2023 and shows close alignment to the current assumption parameters. We also studied percentile behavior and made note of the medians for each zone. To reduce anomalous observations, plans with year-over-year changes in active participants greater than 20% were excluded from the analysis. Changes of this magnitude are often driven by one-time events, such as plan mergers, partitions, data corrections, or other structural changes rather than underlying workforce trends.

ME Figure 2. Average Annual Participant-Weighted Geometric Changes in Active Participation (2019-2023)*



*Medians were -0.14%, -0.33%, -2.02%, and -4.55%, respectively.

Due to the potential impact of the COVID-19 Pandemic during our study period, next we extended our study to include data back to 2009. This resulted in fewer plans for each risk status since they had to be the same status in 2009 and 2023 to be included in our analysis. These results, shown below in ME Figure 3, are consistent with our results for 2019 to 2023 and consistent with the current assumptions set for active population decline. Median values were generally lower in both analyses and may be a better indicator of the central tendency of plan experience.

ME Figure 3. Participant-Weighted Geometric Changes in Active Participation (2009-2023)

Status	# of plans	Annual Geometric Rate of Change	Median
N	342	-1.96%	-1.01%
E	7	-2.57%	-2.74%
C	62	-3.51%	-2.67%

In addition to reviewing the active population by risk zone status, we also analyzed active population trends grouped by industry. Multiemployer plans in different industries can face very different dynamics: some sectors have experienced significant workforce disruptions, employer exits, or shifts in collective bargaining while others have remained relatively stable. Examining trends at the industry level provides additional context to help determine whether projected active population declines align with sector specific realities.

ME Figure 4. Average Annual Participant-Weighted Geometric Changes in Active Participation by Industry

	Plan Year 2023:		Plan Year					
Industry	Plans	Actives	2020	2021	2022	2023	2019-2023	2009-2023
Construction	494	1,113,715	0.93%	-2.96%	-0.40%	0.36%	-0.38%	-0.87%
Retail	33	295,991	-3.65%	-4.67%	-3.49%	-2.03%	-3.36%	-2.83%
Transportation	74	417,290	-1.49%	-2.85%	-1.04%	-0.42%	-1.30%	-2.98%
Other/Unknown	230	909,014	-1.00%	-4.49%	-1.72%	-0.58%	-1.76%	-2.85%
All Sectors	831	2,736,010	0.00%	-3.44%	-0.94%	-0.06%	-0.96%	-1.65%

While it appears that industry contributes significantly to active population behavior, it should be noted that it appears risk status has more disparity between groupings signifying it to be a stronger indicator of active population decline. While layering industry into the current assumption could improve projections, it should be noted that it would add further complexity to the model and may not have significant impact on the assumption since we expect a strong correlation between industry and risk zone status. The interaction between industry and zone status was not evaluated in this analysis; however, it could be explored further to assess whether one may be influencing the other.

Overall PBGC's structure and rationale for the active population decline assumption appears reasonable. However, PBGC had been relying on older data to support the current assumption. Our current assessment shows that more recent data continues to align with the current assumption. It is important for PBGC to perform periodic reviews on the parameters to justify their continued use. We equate this type of review to performing periodic experience studies that pension plans typically perform every 3-5 years to justify their assumptions are reasonable in the long term while aligning with actual experience.

PBGC should consider performing annual back-testing on the assumption and perform sensitivity testing on the risk status parameters to see how certain tweaks to each parameter impact the back-testing results over time in order to consider how future expectations may

change based on emerging experience. We performed back testing back to 2020 and discuss the results further in ME Back-testing Results.

Contribution Rate

Description and Rationale

Below we summarize our understanding of the current assumption, as stated in the FY2024 Projections Report, used for annual estimated per capita contribution growth rates in the ME-PIMS model. In addition, we document the rationale provided by PBGC across each zone status.

ME Figure 5. Current Model Assumption and Rationale for Per Capita Contribution Rate Increases

Risk Status	Assumption	Rationale
Green	Contributions increase toward a funding target based on normal cost and amortization of unfunded liabilities, with increases phased in gradually and subject to a 5% cap.	*Reflects professional judgment about the general funding objective for healthier plans to incorporate into collective bargaining cycles*
Endangered	Contributions increase to reflect implementation of a funding improvement plan designed to improve funding status over time, with annual increase limited by a 8% cap and applied for a defined period.	*Utilizes function to estimate a Funding Improvement Plan but cap the annual rate increase at a sustainable level. Professional judgment applied so migration paths between different zones during the projection period don't result in large jumps in projected rate increases on a year-to-year basis.*
Critical	Contributions increase to reflect a rehabilitation plan intended to address funding deficiencies and improve funded status, with annual increases limited by a 8% cap.	*Utilizes function to estimate a Rehabilitation Plan but caps the annual rate increase at a sustainable level. Professional judgment applied so migration paths between different zones during the projection period don't result in large jumps in projected rate increases on a year-to-year basis.*
Critical and Declining (excluding SFA)	Assumes a flat 2.5% per year increase.	*These plans have generally exhausted all reasonable measures and have little capacity for additional future rate increases. Because of the SFA Program, there are expected to be few C+D plans in the early years of the projection.*
SFA	Contributions are assumed to remain level through 2051 reflecting statutory relief, after which standard zone-based assumptions apply.	*Reflects professional judgment about level rates for plans that receive SFA based on calculations that don't reflect rate increases, after years in which plans had very steep increases to extend plan solvency.*
Cap	Contribution levels are subject to an overall cap relative to historical levels, after which growth is limited to inflation or wage growth. The cap includes a multiple depending on zone status.	*Reflects practical constraints on employer contribution increases under CBAs and serves as modeling safeguard to prevent unrealistic or highly volatile contribution projections in stochastic simulations.*

Based on the ME Contributions memo and the FY2024 Projection Report, it is our understanding that the PCC Rate increase assumption parameters were set based on an analysis of historical Form 5500 Schedule MB data from 2009 to 2018, as well as professional judgment related to the cumulative level of contribution rate increases that appear to be sustainable for plans.

Commentary

Similar to the active population decline assumption it is appropriate for the per capita contribution rate assumption to depend on the plan's risk status given that plans in different zones face fundamentally different financial and operational realities:

- Green zone plans are generally well-funded and have flexibility in contribution decisions. Gradual increases toward a funding target provide stable, predictable contribution growth consistent with well-funded plans, avoiding abrupt adjustments.
- Endangered plans (subject to Funding Improvement Plans under MPPAA) face a statutory requirement to adopt a plan designed to improve the funded ratio by at least 33% over 10 years. PBGC models this by applying contribution rate growth at 8% per year for up to 12 years. While the model does not explicitly solve for the exact target ratio, using the 8% cap serves as a practical proxy, reflecting both the statutory goal and expected constraints on what plans can reasonably implement.
- Critical Plans (subject to Rehabilitation Plans under MPPAA and MPRA) must, by law, adopt measures to eliminate funding deficiencies and reach at least 80% funded over 10 years. In PIMS, these plans are similarly modeled with contribution rate increases at 8% per year for up to 12 years. Similar to Endangered Plans, this method balances statutory requirements with the reality that large increases may not be feasible in practice.
- Critical and Declining Plans are modeled with a flat 2.5% contribution growth rate recognizing their inability to use contribution rate increases as a means towards increasing funding.
- SFA plans are modeled to assume no increase in contribution rates which makes intuitive sense because their calculations in the SFA applications do not include contribution rate increases.

Additionally, the long-term caps on contribution multiples relative to the 2019 baseline appears to be a modeling control, preventing unrealistic assumptions of runaway contribution growth.

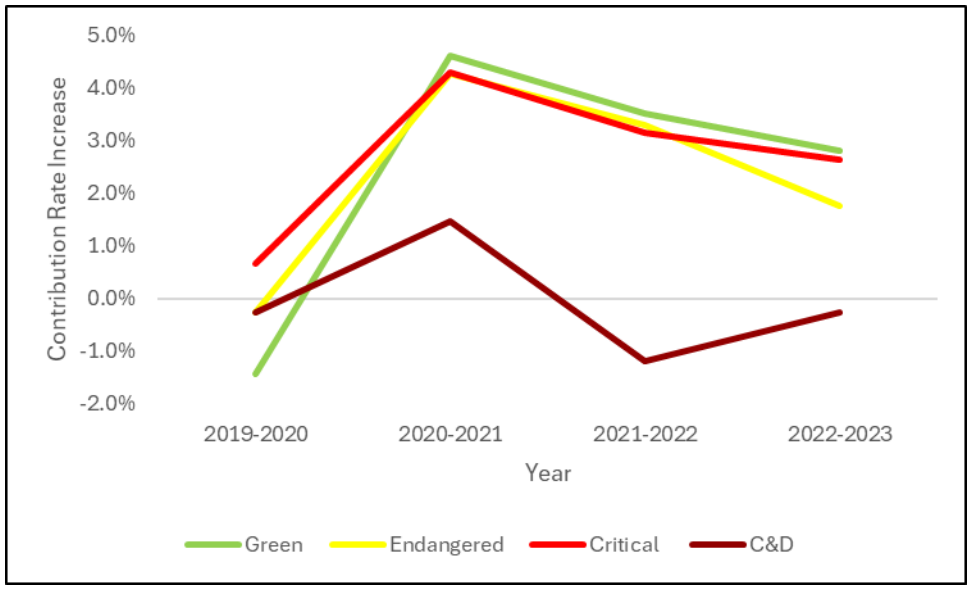
We began our analysis of the assumption by comparing the results of Exhibit 2 from the ME Contributions Memo to updated data from 2019 to 2023. For our analysis we pulled risk zone status, active counts, contribution amounts, and withdrawal liability payments from Form 5500 Schedule MBs. We then calculated per capita contribution rates by dividing contributions by actives (averaged over two reporting years). We also excluded SFA plans from our analysis as of the year they received SFA disbursements. ME Figure 6 summarizes our analysis. Each row represents the cumulative annual average contribution rate for plans within that zone status at the end of each measurement period. In other words, each rows can be described as the average compound annual rate of change in per capita contributions for plans within the given zone status over the specified period. In both our analysis and the prior PBGC analysis, we excluded year over year contribution rate changes greater than 20% or less than -20%. This helps prevent distortion of results from extreme values that may not arise from normal per-capita contribution increase, but from factors such as plan mergers or partitions, large withdrawal liability lump-sum payments, or other atypical events. While some plans could have experienced large percentage increases/decreases including these extreme cases could obscure the typical behavior the assumptions are intended to capture.

ME Figure 6. Comparison of Cumulative Annual Average Per Capita Contribution Rate Increases from 2009-2018 to 2019-2023

	Cumulative Annual Average 2009 – 2018			Cumulative Annual Average 2019 - 2023		
Status	# of plans	Plan weighted	Participant weighted	# of plans	Plan weighted	Participant weighted
N	786	6.1%	6.2%	833	3.0%	3.1%
E	120	8.4%	7.7%	34	4.2%	8.1%
C	167	8.4%	8.9%	167	3.8%	4.7%
D	112	7.9%	9.7%	32	1.7%	1.5%
All	1,185	6.8%	7.0%	1,066	3.1%	3.5%

This preliminary analysis showed a stark contrast between results for the 2009 to 2018 and 2019 to 2023 periods. Based on our analysis it appears COVID-19 may have had a strong impact on contribution rate increases. This analysis, as shown in ME Figure 7 below, demonstrates that contribution rate growth was lower for 2019-2020 but then increased sharply from 2020-2021 and then has leveled out since.

ME Figure 7. Per Capita Contribution Rate Increases by Year and Risk Status



We extended our analysis to include data from 2009 to 2023 which is summarized below in ME Figure 8. This appears to smooth the COVID impact and returns results closer to the experience seen from 2009 to 2018. It should be noted that the prior analysis did not back out withdrawal liability payments from contributions to isolate ongoing contribution rate increases; however, this did not have a material impact after our testing (though we note that for all 2019 to 2023 results summarized above, our analysis backs out withdrawal liability payments). For consistency, the results shown for 2009 to 2023 below in ME Figure 8 do not back out withdrawal liability payments.

ME Figure 8. Cumulative Annual Average Per Capita Contribution Rate Increases from 2009-2023

	Cumulative Annual Average 2009 – 2023		
	# of plans	Plan weighted	Participant weighted
N	349	5.5%	4.9%
E	7	6.6%	7.1%
C	98	7.9%	6.7%
	454		
All	1,012	5.9%	5.4%

To extend our analysis, below in ME Figure 9 we show the results on a percentile basis.

ME Figure 9. Distribution of Results for Cumulative Annual Average Per Capita Contribution Rate Increases from 2009-2023

	Cumulative Annual Average 2009 – 2023			
	25th Percentile	50th Percentile	75th Percentile	85th Percentile
N	3.3%	**5.4%**	7.4%	9.2%
E	6.1%	**7.3%**	9.3%	9.6%
C	5.4%	**7.4%**	11.1%	13.1%
All	3.8%	**5.9%**	8.0%	9.4%

The overall results from 2009 to 2023 show some consistency across green (N), endangered (E), and critical (C) risk zone status to the current assumption caps.

Next, we analyzed contribution rate increases for plans that moved from one status to another during the review period. This analysis can be used to support the use of caps to limit large jumps in rate increases on a year-to-year basis. When changes in status do happen, as shown in ME Figure 10 below, it appears plans are limited in using contribution rates as a means for returning to a better status.

ME Figure 10. Comparison of Cumulative Annual Average Per Capita Contribution Rate Increases from 2009-2018 to 2019-2023 for plans that changed risk status

	Cumulative Annual Average 2009 – 2018			Cumulative Annual Average 2019 - 2023		
	# of plans	Plan weighted	Participant weighted	# of plans	Plan weighted	Participant weighted
N -> E	13	9.6%	10.3%	4	3.8%	3.2%
N -> C	19	8.4%	10.2%	12	4.6%	7.0%
N -> D	12	7.2%	9.0%	1	1.0%	1.0%
E -> N	194	6.5%	6.8%	73	3.0%	2.8%
E -> C	25	7.5%	8.5%	6	8.6%	9.4%
E -> D				2	6.5%	8.9%
C -> N	133	6.2%	7.6%	26	4.0%	1.9%
C -> E	41	9.0%	8.3%	6	6.3%	15.2%
C -> D				13	0.8%	1.0%
D -> C				41	3.5%	6.3%
S to any	110	7.1%	6.8%	5	8.8%	4.9%

Overall the support and rationale provided by PBGC for the contribution rate increase assumption appears to be reasonable. Similar to the active population decline assumption, PBGC has been relying on older data to support the current assumption. Our current assessment shows that more recent data continues to align with the current assumption. For any assumption that is supported by data or experience it is important for PBGC to perform periodic reviews on the parameters to justify their continued use even if professional judgment suggests that the 2009 to 2018 analysis is still relevant due to the potential distortion of COVID results.

Our analysis demonstrates that PBGC should monitor emerging experience since contribution increase rates have remained low in recent years. It appears that Critical and Declining plans may be able to contribute higher contribution amounts than what is currently assumed, although we have limited data within that subgroup to support changing the parameter. We recommend that PBGC perform annual back-testing on the assumption parameters for each zone and see how certain tweaks to each parameter impact the back-testing results over time in order to consider how future expectations may change based on emerging experience. We performed back testing back to 2020 and discuss this further in ME Back-testing Results.

Withdrawal Liability Payments

Description

The ME-PIMS model separates withdrawal liability (WDL) into ongoing and emerging components. For plans that receive Special Financial Assistance (SFA), projected WDL payments are drawn from the SFA application. For other plans actual WDL payments reported in Schedule MBs starting with 2021 filings are collected and used in PIMS for all plans that have reported it at the time of the data collection. For plans that have no withdrawal liability payments reported, the model estimates based on an analysis of larger plans where WDL is calculated as a percent of contributions. Each year plans are reviewed for large changes in WDL if they have the following characteristics:

- large plans (>5,000 participants),
- plans with significant changes in key metrics (contributions, market value of assets, actuarial value of assets, total liabilities, current liability normal cost, benefit payments, or total headcounts), and
- critical and declining plans.

For terminated and insolvent plans, payment schedules are received from the plan administrator and discounted for potential non-payment with payments assumed to decline over time at a rate of 2% per year. For all other plans, prior year WDL payments are assumed to decline by 30% in the first year (recognizing lump sum settlements occurrence) and phase out over 15 years. Future withdrawals are modeled and those payments are assumed to phase out over 20 years.

Rationale

PBGC's approach is supported by historical experience, internal studies, and professional judgment. The model reflects the WDL maximum period of obligations, the potential for employer non-payment, and that WDL payments often occur as one time or lump-sum settlements. Separating ongoing and emerging WDL allows the model to capture known WDL contributions as well as estimate future WDL contributions that may arise from future withdrawing employers. The structure also accounts for industry differences and plan size recognizing that larger or more distressed plans typically provide more reliable WDL data.

Commentary

Current WDL Commentary

For plans where WDL payment data is not read in from Schedule MBs, PBGC estimates current WDL as a percentage of employer contributions based on an analysis of larger plans conducted as part of the ME Contributions Memo (Exhibit 1). Because these parameters are based on a prior analysis, we performed a similar analysis using more recent data covering the 2021 to 2024 period. Our analysis, summarized in ME Figure 11, allows us to compare the original assumption parameters to more recent experience and assess whether the assumed WDL percentages remain broadly consistent with observed patterns.

ME Figure 11. Analysis of Large Plans (>5,000 participants)
WDL as a % of Contributions

	Constructions Plans	C and D Plans (excluding Central States)	Other Non-construction Plans
Current Assumption	**0.0%**	**13.0%**	**2.0%**
2021	1.2%	15.7%	6.0%
2022	0.9%	14.5%	3.9%
2023	0.5%	13.0%	1.4%
2024	0.3%	11.3%	0.8%

The results generally show close alignment with the assumed percentages, except for 2021 and 2022 which were impacted by the COVID-19 pandemic. The analysis presented above focuses on larger plans; our back-testing further considers actual WDL across the full universe of plans and may provide additional context for assessing this assumption.

PBGC assumes that approximately 30% of base year WDL payments will result in one-time or lump sum settlements. Using the more detailed Schedule MB attachments now available, we calculated the estimated share of WDL payments represented by lump sum settlements for 2022 through 2024. This yielded approximately 42% for 2022, 14% for 2023, and 31% for 2024. While year-to-year variation is expected, the results suggest that 30% remains a reasonable estimate. PBGC should continue studying this assumption as the lump sum information is now readily available. As more data flows in over the next few years a more comprehensive analysis could be performed to assess if more refinement to the assumption may be warranted, for example, to determine if lump sums are correlated with risk status or industry.

The model then phases ongoing WDL payments to zero over 15 years, which reflects how these obligations play out in practice. Some employers may settle early with lump sums, others pay over several years, and some may default or pay only partially. The 15-year horizon captures this mix while acknowledging that WDL payments naturally decline over time as plans terminate, wind down, or experience attrition.

Emerging WDL Commentary

The model projects emerging WDL using a set of parameters for future employer withdrawals:

- *Base-year ongoing contributions*: serve as the starting point for estimating potential withdrawals
- *Population decline of 1.3% per year*: approximates the gradual reduction in the

contributing workforce that may generate future WDL

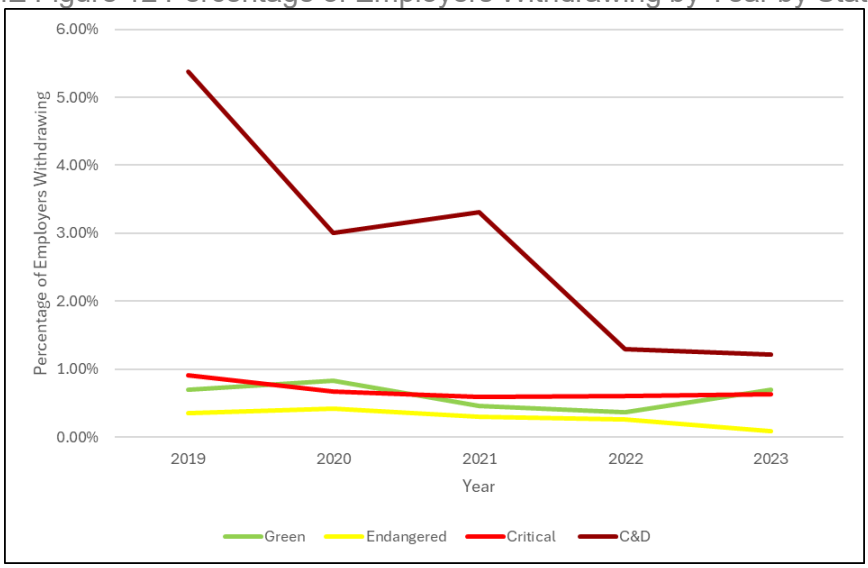
- *30% factor of contribution declines*: represents share of population/contribution decreases attributed specifically to employer withdrawals (rather than changes in active counts or contribution rates)
- *Annual growth factor of 3.5%*: captures expected increases due to wage growth and typical contribution growth.

Each of these parameters is used in projecting future withdrawal liabilities that have not yet occurred and are not fully observable. Base-year contributions provide a consistent starting point across plans, while the population decline and growth factors approximate how contributions may evolve over time. These parameters allow the model to estimate emerging WDL in a uniform and transparent way even though individual plan behavior can vary.

Overall, this approach balances stability, simplicity, and realism. It avoids tying emerging WDL too closely to current-year contribution rate increases or active population decline. Doing so prevents artificially generating WDL for plans with little or no current liability while still capturing the broad magnitude and timing of potential future withdrawals.

There could be correlation between a plan's risk status and the likelihood of an employer withdrawing from the plan. To test this hypothesis, we estimated the withdrawing employer incidence across risk status for the past several years. For simplification we identified withdrawn employers and overall contributing employers in a given year to perform our calculations which means larger plans with a larger number of employers (withdrawing or ongoing) carry more weight. We summarize our analysis below in ME Figure 12, which shows a recent trend that C&D plans appear to have a higher incidence of withdrawing employers in a given year but does not appear as significant across other risk statuses. Similar to our analysis, PBGC could study and assess whether industry may also be a signifier of higher likelihood of withdrawal.

ME Figure 12 Percentage of Employers Withdrawing by Year by Status



Mass Withdrawal

Description

It is our understanding that in the current ME-PIMS model, mass withdrawals are modeled only upon plan insolvency; no plans are assumed to experience mass withdrawal prior to insolvency. The key assumptions for mass withdrawal are:

- *Insolvent plans:* 60% are assumed to undergo mass withdrawal, and 40% are assumed to remain ongoing
- *Initial WDL payment:* Estimated to be 120% of the most recent projected year regular contributions adjusted to remove contribution rate increases made after 2014 for plans in Endangered or Critical Status; 70% of employers are assumed to commence payments in the first year
- *Decay:* WDL payments are assumed to phase out over 20 years
- *Ongoing insolvent plans*: contributions assumed to decline by 10% in the first year and 5% per year thereafter

Rationale

The assumptions for mass withdrawal are based on PBGC's internal studies of terminated and insolvent plans using observed payment patterns for withdrawn employers. The 60/40 split is intended to reflect recent historical experience while the WDL payment parameters reflect typical employer behavior expectations. These simplifying assumptions are necessary because mass withdrawal events are rare, highly plan specific, and not explicitly identified in public datasets, making precise modeling difficult.

Commentary

To evaluate the reasonableness of the mass withdrawal assumptions used in the model, we reviewed recently insolvent and terminated multiemployer plans over the 2020-2024 period. For these plans, we compiled available data on employer contributions, withdrawal liability payments, active participants, and contributing employers using publicly available Form 5500 filings and related datasets. The objective of our review was to determine whether observable plan experience could provide support for the assumption that a portion of insolvent plans undergo mass withdrawal while others remain ongoing.

While this analysis provided some context on plan behavior around insolvency, the available dataset proved too limited to support a meaningful validation of the model assumptions. The number of recent insolvencies during the review period was small, and the plans involved were generally small in terms of employer base, active participants, and contribution levels. As a result, observed changes in contributions or employer counts were often difficult to interpret and did not clearly distinguish between gradual plan wind-down and a true mass withdrawal event.

In addition, identifying mass withdrawal events using publicly available data is inherently challenging. Mass withdrawals are defined under ERISA as occurring when all or substantially all employers withdraw from a plan, but this event is not explicitly reported in Form 5500 filings. As a result, identifying potential mass withdrawals required us to infer from indirect indicators such as declines in contributing employers, contributions, or increases in withdrawal liability payments which can also occur in situations where a plan is gradually declining rather than experiencing a discrete mass withdrawal event.

The recent implementation of the SFA program further complicates the analysis of recent experience. The SFA program has significantly reduced the number of near-term insolvencies among multiemployer plans by providing financial assistance to eligible plans that might otherwise have become insolvent. As a result, both the number of recent insolvency events and the expected number of insolvencies in the near future are limited which further constrains the ability to evaluate mass withdrawal behavior.

Given these limitations, we did not attempt to empirically validate the assumption that 60% of insolvent plans experience a mass withdrawal while the remaining 40% continue as ongoing insolvent plans. Conceptually, the structure of the assumption appears reasonable since in practice, we would expect some insolvent plans may experience rapid employer withdrawals and effectively terminate operations, while others may continue operating with a reduced employer base and declining contributions for an extended period.

The remaining parameters governing contribution and withdrawal liability payment behavior following insolvency also appear directionally reasonable. The structures of the assumption reflect the expectation that withdrawal liability payments initially increase following a mass withdrawal event as employer obligations are assessed but gradually decline over time as employers satisfy their liabilities.

For ongoing plans that continue making contributions, the assumption pattern is consistent with the expectation that plans entering insolvency typically experience continued erosion of their employer base and active participant population, resulting in a gradual decline in ongoing contribution income.

As additional insolvency events occur in the future and more experience becomes available, PBGC may wish to revisit these assumptions and evaluate whether observed plan behavior supports refinement of the model parameters.

ME Back-testing Results

Methodology

In our assumption review discussed above, typically more recent experience was used to assess whether specific model parameters remain reasonable for use in contribution projections. These analyses were generally performed at a more granular level and often relied on summary metrics, such as year-over-year averages, to evaluate the appropriateness of the parameters. By contrast, back-testing reflects a more comprehensive assessment of the overall contribution results.

Back-testing is a critical step in evaluating the reasonableness of model assumptions. It involves comparing expected values to actual historical outcomes to identify potential biases or systematic deviations. While PBGC performs back-testing for the SE-PIMS model, back-testing of the ME-PIMS model has not been previously conducted. Our analysis addresses this gap by constructing expected contributions, withdrawal liability payments, and active participant counts using Form 5500 data and our understanding of the ME-PIMS model assumptions. This simplified approach allows us to assess whether the assumptions are generally consistent with historical experience, even though we are not using the model's own outputs.

Our analysis utilizes Form 5500 data for plan years 2019 through 2024. Because 2024 data is not yet complete, conclusions for that year are preliminary. We compiled a list of unique plans across this time period to track plan-level changes. The inclusion of 2019 data was necessary to establish a baseline for WDL calculations for 2020, which depend on year-over-year changes in plan metrics. For our back-testing, we calculated expected contributions, WDL payments, and active participants for a given year based on the prior year's data and assumptions and then compared these expected values to the actual outcomes observed in the Form 5500 data for that year.

Form 5500 data can be incomplete or inconsistent, so not every plan is represented in every year. Plans were excluded from a given year's back-testing calculations if any information necessary for our calculations was missing. This exclusion is not expected to materially affect results, as our analysis still covers 1,100 plans for the years 2020 through 2023 in each year. For plans that received SFA we treated them as SFA plans only in the year and subsequent years after they actually received disbursements. Plans that have applied for SFA but had not yet received payments were treated according to their zone status.

We implemented our back-testing framework based on our understanding of the assumptions and how the ME-PIMS model calculates contributions. The framework is flexible, allowing inputs to be easily modified so that the impact of individual assumption parameters can be explored. For simplicity, we used beginning-of-year active participant counts from the Form 5500 MB for calculating per-capita contributions. While we are not using the actual model results, our calculations are designed to approximate the logic of the model and produce expected values consistent with its methodology. Minor differences between our approach and the model's calculation may exist, but they are unlikely to materially affect the overall results. This approach provides an evaluation of the assumptions and insight into how well they align with historical plan experience.

Summary

ME Figures 13-15 below present a high-level comparison of expected versus actual values for our back-testing results from 2021 through 2024. For contributions, we focused on ongoing contributions net of WDL. At a high level the results suggest that PBGC's multiemployer assumptions for contributions tend to be slightly conservative in recent years as expected values for ongoing contributions and actives are generally lower than actual amounts. It should be noted that WDL percentage differences are higher but that component is relatively small compared to overall contributions. However, the consistent pattern of underestimating total contributions could present an opportunity for parameter adjustments. It is important to interpret these results carefully in the context of external factors, such as COVID-19, which created significant volatility in contributions and WDL in some years. Overall, the alignment between expected and actual values appears reasonable, providing confidence that the assumptions broadly capture historical plan experience.

ME Figure 13. ME Back-testing Results for Ongoing Contributions for 2021 - 2024

Year	Actual	Expected	% Difference
2024	$25,999,499,256	$25,229,333,787	-2.96%
2023	$33,438,655,345	$32,278,549,305	-3.47%
2022	$32,184,266,166	$30,099,710,076	-6.48%
2021	$30,915,117,810	$29,771,884,458	-3.70%

ME Figure 14. ME Back-testing Results for Active Participants for 2021 - 2024

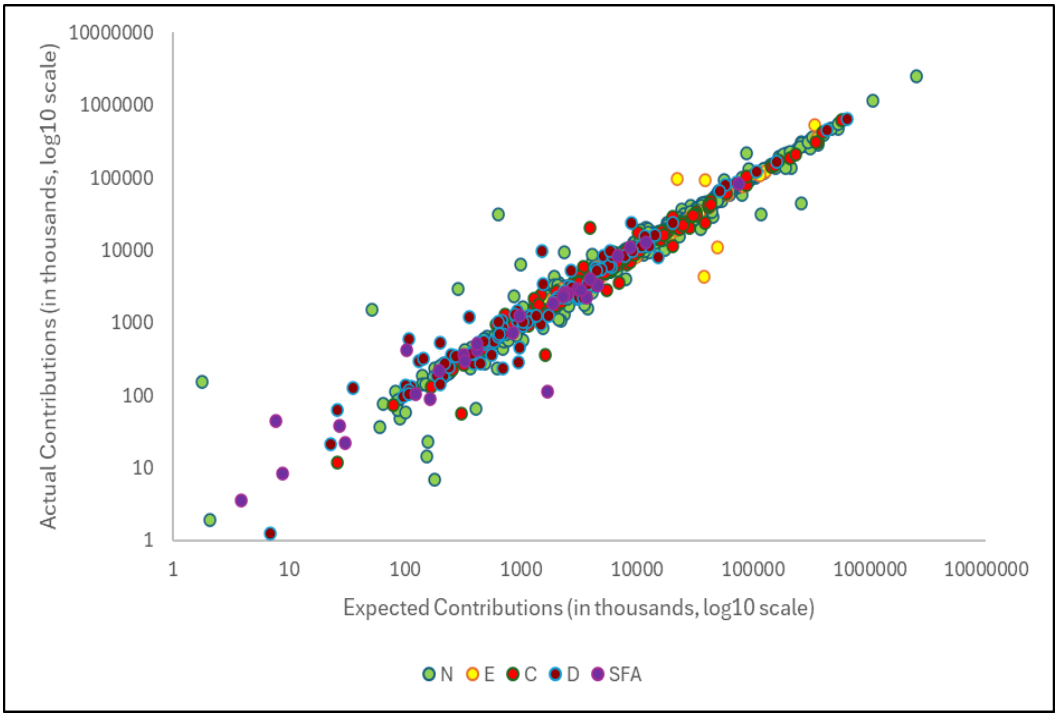
Year	Actual	Expected	% Difference
2024	2,813,701	2,761,650	-1.85%
2023	3,245,909	3,145,086	-3.11%
2022	3,043,518	2,988,587	-1.80%
2021	3,403,435	3,536,105	3.90%

ME Figure 15. ME Back-testing Results for WDL for 2021 - 2024

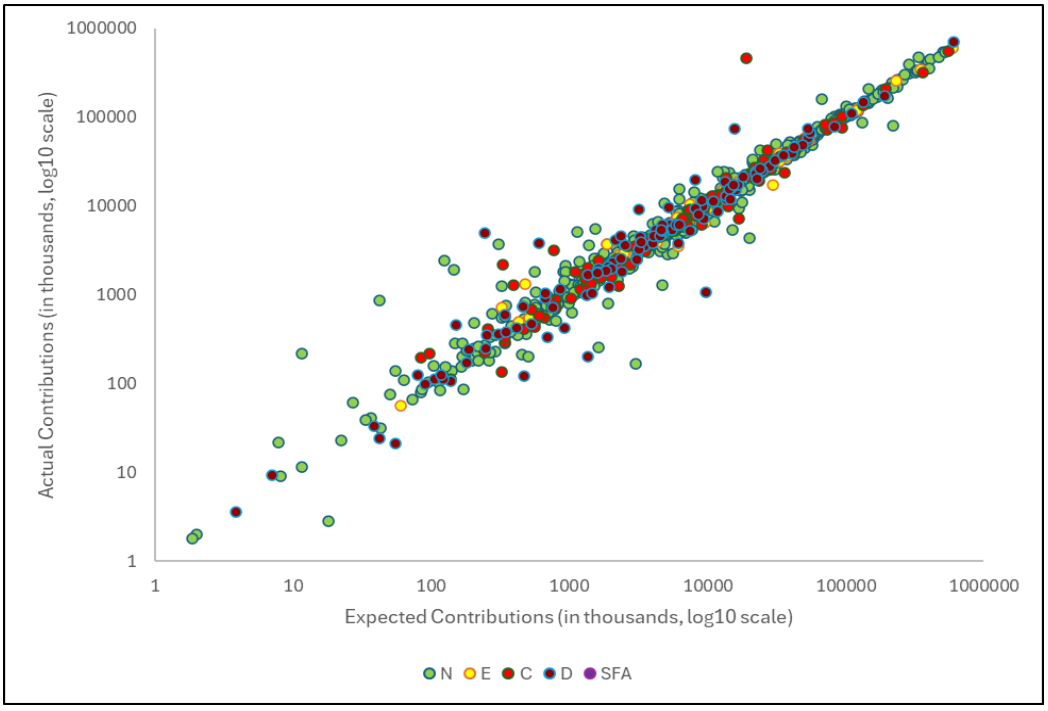
Year	Actual	Expected	% Difference
2024	$578,447,171	$588,523,190	1.74%
2023	$892,772,361	$1,026,513,463	14.98%
2022	$1,217,912,058	$1,376,819,034	13.05%
2021	$1,706,938,920	$1,809,334,246	6.00%

To provide a more granular, plan-level view of the back-testing results, we created scatter plots for 2023 and 2022 comparing expected versus actual contributions **inclusive of withdrawal liability.** Contributions were divided by 1,000 for readability and plotted on a base-10 logarithmic scale, so the axes represent log10(contributions in $1,000s). This scaling allows plans of widely varying sizes to be compared on a relative basis and prevents larger plans from visually dominating the chart. On a log-log plot the imaginary 45 degree line represents perfect alignment between expected and actual values. Most plans cluster around the imaginary 45 degree line confirming that at a granular level the reconstructed expected values align reasonably well with historical outcomes for most plans. More detailed is provided in the Appendix where we document each year's review and investigate results by risk zone status level.

ME Figure 16: Expected Versus Actual Contributions for 2023 grouped by Risk Status



ME Figure 17: Expected Versus Actual Contributions for 2022 grouped by Risk Status



Parameter Testing

The back-testing framework was designed to allow individual assumption parameters to be easily modified. This allows us to observe how sensitive the results are to specific inputs and to evaluate whether modest adjustments could improve alignment between expected and actual outcomes.

The goal of back-testing multiple years was to identify consistent directional patterns in the results that may suggest certain parameters are systematically conservative or aggressive. Where these patterns appeared, we tested alternative parameter values to understand how changes would affect the model's expected results.

For the following parameter studies, each is evaluated independently. This approach allows us to isolate the impact of each parameter and assess how adjustments to individual assumptions influence the model's ability to reproduce observed outcomes.

Active Population Decline

As discussed earlier in this report, the model's active population decline assumptions were originally calibrated using the geometric annual average change in the active participants across zone status from 2009-2018. Our expanded historical analysis through 2023 showed similar patterns overall, although more recent experience suggests somewhat smaller declines across most statuses.

The back-testing results are broadly consistent with this observation. In aggregate, expected active counts were generally lower than actual counts across statuses for the years 2021-2024, indicating that the model may be projecting active population decline slightly faster than what has been observed in recent years. While most differences are relatively small (generally within 5%) the pattern is consistent across multiple years of back-testing. To evaluate the sensitivity of the results we tested a modest reduction in the assumed rate of active population decline across zone statuses as outlined in ME Figure 18 below and our results are summarized in ME Figure 19.

ME Figure 18. Active Population Decline Back-testing Sensitivity Test

Zone Status	Current Assumption	Sensitivity Test
N	-1.0%	-0.5%
E	-2.5%	-1.0%
C	-3.0%	-2.5%
D	-5.1%	-4.6%

ME Figure 19. Active Population Decline Back-testing Sensitivity Test Results

	Actual	Expected (current)	Expected (adjusted)	Current Difference	Adjusted Difference
2024	2,813,701	2,761,650	2,775,922	-1.85%	-1.34%
2023	3,245,909	3,145,086	3,162,519	-3.11%	-2.57%
2022	3,043,518	2,988,587	3,006,176	-1.80%	-1.23%
2021	3,403,435	3,536,105	3,557,594	3.90%	4.53%

Overall reducing the assumed rate of active population decline results in expected values that more closely align with observed experience in the back-testing period. However, given the relatively short time horizon and potential impacts from COVID-19, the results should be interpreted as a sensitivity test rather than a recommendation.

Contribution Rate

As discussed earlier in this report, the model applies a cap on annual contribution rate growth that varies by zone status. The original parameters were informed by historical contribution rate changes. Our expanded review of contribution rate changes using Form 5500 data through 2023 showed somewhat different increases than those observed in the earlier analysis used to set the assumption. To evaluate the sensitivity of the results, we made adjustments to the contribution rate caps, as shown below ME Figure 20.

ME Figure 20. Contribution Rate Increase Back-testing Sensitivity Test

Zone Status	Current Cap Assumption	Sensitivity Test
N	5%	5%
E	8%	7%
C	8%	7%
D	2.5%	4%

ME Figure 21 below summarizes the back-testing results under the sensitivity test. Overall, the change resulted in slightly lower expected contributions than the current back-testing, although the impact was generally small (less than 20 basis points in all years).

ME Figure 21. Contribution Rate Increase Back-testing Sensitivity Test Results

	Actual	Expected (current)	Expected (adjusted)	Current Difference	Adjusted Difference
2024	$25,999,499,256	$25,229,333,787	$25,214,821,639	-2.96%	-3.02%
2023	$33,438,655,345	$32,278,549,305	$32,254,253,713	-3.47%	-3.54%
2022	$32,184,266,166	$30,099,710,076	$30,056,127,046	-6.48%	-6.61%
2021	$30,915,117,810	$29,771,884,458	$29,716,080,830	-3.70%	-3.88%

In addition to the zone-specific contribution rate caps, the model also applies a cap based on a multiple of per capita contributions (PCC) from 2019. This cap limits the maximum growth in PCC used in the projection model. Based on our estimation in our back-testing, approximately 5% of plans in a given year were affected by this cap. To evaluate the sensitivity of the results to this constraint, we performed an additional test where the PCC cap multiple was increased to 50 across all plans, effectively removing the cap for nearly all plans in the analysis. ME Figure 22 shows the resulting adjusted back-testing results. Removing the PCC cap produced a more noticeable impact on expected contribution, indicating that the PCC cap has a more meaningful influence on the model's contribution projections.

ME Figure 22 Contribution Rate Cap Back-testing Sensitivity Test Results

	Actual	Expected (current)	Expected (adjusted)	Current Difference	Adjusted Difference
2024	$25,999,499,256	$25,229,333,787	$25,360,874,220	-2.96%	-2.46%
2023	$33,438,655,345	$32,278,549,305	$32,883,901,593	-3.47%	-1.66%
2022	$32,184,266,166	$30,099,710,076	$30,148,701,874	-6.48%	-6.32%
2021	$30,915,117,810	$29,771,884,458	$29,825,134,151	-3.70%	-3.53%

Withdrawal Liability Payments

As discussed earlier in this report, for plans that do not have their actual WDL payments read in to the model from the Schedule MBs the assumption for WDL as a percentage of contributions is 0% for construction, 2% for non-construction green and yellow plans, and 13% for non-construction critical and critical and declining plans. While our testing of the assumption basis does not support the need to adjust these percentages, we adjusted the percentages to 0%, 1%, and 12% respectively to assess the sensitivity of the assumption.

ME Figure 23. Construction WDL Back-testing Sensitivity Test Results

	Actual	Expected (current)	Expected (adjusted)	Current Difference	Adjusted Difference
2024	$578,447,171	$588,523,190	$560,346,161	1.74%	-3.13%
2023	$892,772,361	$1,026,513,463	$989,390,239	14.98%	10.82%
2022	$1,217,912,058	$1,376,819,034	$1,341,512,149	13.05%	10.15%
2021	$1,706,937,920	$1,809,334,246	$1,759,729,742	6.00%	3.09%

Another key factor in the calculation of ongoing WDL is the 70% factor applied in year 1 to account for lump sum settlements (30%). We used our back-testing to test this factor as well and below we show the results if a 60% factor is used which is to say that more WDL is settled as a lump sum in the initial year. This alteration has a much stronger impact on the results which makes it an important future consideration for PBGC to continue testing the likelihood of lump sum settlements.

ME Figure 24. WDL Lump Sum Settlement Back-testing Sensitivity Test Results

	Actual	Expected (current)	Expected (adjusted)	Current Difference	Adjusted Difference
2024	$578,447,171	$588,523,190	$511,255,825	1.74%	-11.62%
2023	$892,772,361	$1,026,513,463	$888,101,826	14.98%	-0.52%
2022	$1,217,912,058	$1,376,819,034	$1,187,669,160	13.05%	-2.48%
2021	$1,706,937,920	$1,809,334,246	$1,558,680,347	6.00%	-8.69%

Future Considerations

Overall, our review indicates that the ME contribution assumptions appear reasonable, are appropriately structured, and perform well when evaluated against recent historical experience. The back-testing results demonstrate that the framework produces outcomes that are directionally consistent with observed plan behavior, with a modest degree of conservatism across key components, including ongoing contributions and active participant counts. No individual assumption was identified as requiring immediate adjustment, and the current approach appears suitable for projection purposes.

Given the inherent volatility in multiemployer plan experience and the evolving environment, specifically around the SFA program, the process used to evaluate and update assumptions is critical. Back-testing can serve as a valuable tool to assess emerging experience, identify patterns or anomalies, and evaluate whether model refinements to assumption parameters may be needed.

We suggest that PBGC considers performing regular back-testing analyses, supported by structured review discussions to interpret results and assess whether observed deviations are persistent or driven by temporary factors. Where patterns emerge over time, targeted sensitivity testing can be used to evaluate the impact of potential parameter adjustments. In addition, clear documentation of the annual review process, including the rationale for maintain or modifying assumptions would further strengthen the governance and transparency of the modeling framework.

Overall the current assumptions provide a sound basis for projecting contributions, and with continued monitoring and structured review, PBGC will be well positioned to refine these assumptions as additional experience becomes available.

Assessment of Stress and Sensitivity Tests (ME)

As part of our review of the ME-PIMS contribution assumptions we reviewed the Fiscal Year 2024 Projections Report for any sensitivity or stress testing specific to the projection of contributions. Our review notes that the ME-PIMS sensitivity testing primarily includes:

1. Average assumed CBUs Reduced by 1.0% annually
2. Sensitivity of FY 2034 mean net financial position to discount rate changes (+- 50 basis points)

In addition, the projections report includes supplementary information on events that occurred after the measurement data around SFA eligibility and their potential impact on the projections.

Assessment of individual tests

CBUs Sensitivity

As learned during the 2008 financial crisis, economic events/downturns pose a significant risk to the multiemployer program. PBGC tests the model's sensitivity to potential decreasing work levels by adjusting the average annual CBUs by 1.0% annually. Because employer contributions are largely driven by the number of CBUs, this sensitivity test captures the potential effect of a more rapid decline in the contribution base. With respect to contributions,

this is most likely the most significant sensitivity test that PBGC can conduct.

Discount Rate Sensitivity

The sensitivity of the FY 2034 multiemployer net financial position to the discount rate is measured by shifting the discount rate used to calculate PBGC liability values up and down by 50 basis points. Only the discount rate for calculating present value of financial assistance is changed with all other assumptions and variables held constant. This test is appropriate for understanding volatility and provides a standard actuarial valuation sensitivity. Although useful, sensitivity to the discount rate is only indirectly related to contribution behavior.

Conclusion

Overall the sensitivity testing included in the projection report addresses the most impactful assumption to the model with respect to contributions. If capacity and time allows, PBGC could extend their sensitivity test to include other driving factors of contributions such as contribution rate growth and withdrawal liability payments. Additional sensitivity testing focused on these components could provide further insight into the potential range of contribution outcomes.

Future Considerations

- PBGC could perform parameter-based sensitivity testing on contribution rate growth and caps.
- Back-testing informed sensitivity testing as conducted above in our report
- Scenario/shock testing to certain industries due to emerging technologies such as Artificial Intelligence.
- Sensitivity testing around SFA assumptions

ASOP Review

The purpose of this review is to assess whether the data, assumptions, methods, and reporting associated with the modeling of employer contributions for both SE-PIMS and ME-PIMS appear to satisfy relevant Actuarial Standards of Practice (ASOPs). Specifically, this evaluation considers whether the practices described in the Projections Report appear consistent with ASOP No. 23 (Data Quality), ASOP No. 41 (Actuarial Communications), ASOP No. 51 (Assessment and Disclosure of Risk Associated with Measuring Pension Obligations), and ASOP No. 56 (Modeling).

ASOP No. 23 – Data Quality

ASOP No. 23 provides guidance on the selection, review, and use of data in actuarial analyses. The standard requires actuaries to evaluate whether data are appropriate for the intended purpose, review data for reasonableness and consistency where practicable, and disclose reliance on data provided by external sources.

The Projections Report indicates that the databases for both models are constructed primarily from publicly available Form 5500 filings, including several schedules that contain plan financial information, actuarial liabilities, and contribution data. Additional information is incorporated from plan sponsor financial databases, SFA applications, and other economic and PBGC sources.

The report states that PBGC reviews economic inputs, regulatory parameters, sponsor financial information, and plan data for missing or inconsistent values before incorporating them into the model. The actuarial opinion also states that the actuaries reviewed the source information for reasonableness for purposes of the evaluation and relied on the preparers of the original filings for the accuracy of the underlying data. Such reliance statements are consistent with the disclosure provisions of ASOP No. 23. Additionally, the data appears to be sufficient for the stated purpose of the Projections Report (p.3, PBGC FY 2024 Projections Report): "...to provide an actuarial evaluation of the future financial status of PBGC's Multiemployer and Single-Employer Programs."

These practices appear to be consistent with ASOP No. 23. The report clearly identifies the principal data sources and acknowledges reliance on external reporting entities. The documentation suggests that data are reviewed for reasonableness and completeness prior to use in the model, and appears to be sufficient for the purpose of the report.

ASOP No. 41 – Actuarial Communications

ASOP No. 41 establishes standards for actuarial communications, including requirements that actuarial reports clearly describe methods, assumptions, data sources, and limitations. The standard also requires that communications include sufficient detail for an intended user to understand the results and their underlying basis.

The Projections Report provides a description of the SE-PIMS and ME-PIMS modeling framework and discusses key assumptions affecting projection results, including sponsor contribution behavior. The report identifies the principal data sources used in the model and includes an actuarial opinion stating that the assumptions and methods are reasonable for the purposes of the analysis.

These elements appear consistent with the communication requirements of ASOP No. 41. The report explains the modeling approach and discloses major limitations and sources of uncertainty.

Nevertheless, the documentation of the contribution assumptions for both models could be expanded. In particular, summarizing the analysis used to develop these assumptions would further support the rationale for the selected assumptions at each measurement date. This might include a discussion of the periodic review of these assumptions within the Projections Report to further improve transparency and help readers better understand the basis for the modeled contribution patterns. In addition, comprehensive internal documentation that memorializes assumption reviews, considerations discussed, and final decisions (whether assumptions are changed or sustained) may prove invaluable for future reference.

ASOP No. 51 – Assessment and Disclosure of Risk

ASOP No. 51 provides guidance on identifying and communicating risks associated with measuring pension obligations. The standard emphasizes the importance of disclosing significant sources of uncertainty that may materially affect results.

The Projections Report acknowledges that projections of pension funding and PBGC exposure are subject to significant uncertainty. Economic conditions, sponsor financial health, and sponsor contribution behavior all affect projected outcomes. The report notes that sponsor decision-making is difficult to predict and may change in response to economic or regulatory developments.

This qualitative discussion of uncertainty is consistent with the principles of ASOP No. 51. However, the report provides limited quantitative analysis illustrating the impact of alternative sponsor contribution behaviors on projection results. For example, the report does not appear to include sensitivity analyses illustrating the PBGC's potential financial impact of sponsors contributing only minimum required amounts or, conversely, making higher discretionary contributions. Similarly for the ME-PIMS model the report does not appear to include sensitivity analyses around some key assumptions underlying contribution behavior for multiemployer plans including contribution rate increases or withdrawal liability payments. Providing additional sensitivity analysis related to contribution assumptions would improve the disclosure of risk associated with the projections.

ASOP No. 56 – Modeling

ASOP No. 56 provides guidance on the development, use, and documentation of actuarial models. The standard emphasizes that models should be appropriate for their intended purpose, that key assumptions and methods should be reasonable, and that model limitations should be disclosed.

SE-PIMS and ME-PIMS are stochastic simulation models designed to project the financial condition of defined benefit pension plans and the PBGC insurance program under a range of economic and sponsor outcomes. The model simulates economic scenarios, sponsor financial conditions, and bankruptcy risk to produce a distribution of possible future results.
For SE-PIMS, within this framework, employer contributions are determined through behavioral rules intended to approximate sponsor responses to funding requirements and financial incentives. These rules reflect statutory minimum funding requirements as well as incentives related to funding thresholds and PBGC premiums. Contribution behavior varies based on the plan's simulated funding status, with sponsors assumed to contribute either minimum required amounts or additional contributions intended to improve funding levels.

The report also acknowledges that sponsor behavior is inherently uncertain and that simplified assumptions are required. This disclosure of model limitations is consistent with ASOP No. 56. Additionally, the use of simplified behavioral rules to approximate contribution decisions appears

to be appropriate for the intended purpose, as it would not be feasible to model each sponsor's decision process individually. Again the model as described in the report appears to be appropriate for its intended purpose and consistent with ASOP No. 56.

However, the documentation of the empirical basis for the contribution assumptions is limited in the report. The contribution behavior assumptions are stated to be derived from internal PBGC analysis summarized in a separate memorandums (the Contribution Policy Assumption Memos), but the report itself provides relatively little information regarding how those assumptions were developed or validated. The report also provides limited discussion of model validation procedures or comparisons between modeled contributions and historical contribution patterns.

Additional disclosure regarding model calibration, validation, and testing would strengthen the documentation of the modeling process and provide greater transparency regarding the basis for the contribution assumptions.

Conclusion and Considerations

Based on this review, the modeling of employer contributions within SE-PIMS and ME-PIMS, as described in the FY 2024 Projections Report, appears consistent with applicable Actuarial Standards of Practice. The report identifies the primary data sources used in the model, describes the behavioral framework used to project sponsor contributions, acknowledges key sources of uncertainty, and provides an actuarial opinion regarding the reasonableness of the assumptions and methods used.

The modeling approach, using structured behavioral rules within a stochastic simulation framework, supports system-level policy analysis designed to evaluate the financial condition of the PBGC insurance program.

A few enhancements could further strengthen the documentation and transparency of the analysis. In particular:

- The report could provide additional discussion of the empirical analysis used to develop the contribution assumptions.
- Additional documentation of model calibration and validation procedures would strengthen the support for the modeled contribution patterns.
- Additional sensitivity analyses would improve the disclosure of uncertainty associated with the projections.
- Expanded description of data validation procedures would further document compliance with ASOP No. 23.

Addressing these areas would enhance the clarity and transparency of the projections and further strengthen alignment with actuarial standards.

Actuarial Certification Letter

Pension Benefit Guaranty Corporation
Board of Directors
445 12th Street SW
Washington, DC 20024
April 30, 2026

This report presents the results of Athena Actuarial Consulting's ("Athena") targeted peer review of the assumptions and methods used by the PIMS models to project pension plan contributions. Our independent review satisfies the annual peer review requirement under Section 40233(a) of MAP-21. The contribution assumptions reviewed in our report were based on the FY 2024 PBGC Projections Report.

All data, reports, and model descriptions used as the basis of this review were from public information or were provided by the Policy, Research, and Analysis Department at PBGC. Athena has analyzed the data and other information provided for reasonableness and has no reason to believe the information provided was not suitable for the purpose of the analysis.

For purposes of this analysis, Athena used Excel models provided by PBGC for single employer plans. In addition, Athena developed Excel models for the multiemployer plans. These models were developed to calculate the expected contributions and to compare them to the actual historical contributions. There were no known limitations or weaknesses in these models and we believe they were suitable for this analysis.

The undersigned with actuarial credentials collectively meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. This report was prepared exclusively for PBGC's Board of Directors for the purposes described herein and satisfies the annual peer review requirement under Section 40233(a) of MAP-21. This report is not intended for the benefit of any other party and may not be relied upon by any third party for any purpose. Athena accepts no responsibility or liability with respect to any party other than mentioned above.

To the best of our knowledge, no real or perceived conflict of interest exists between PBGC and Athena which would impair the objectivity of the work detailed in this report.

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List of Abbreviations/Acronyms

Abbreviation	Definition
AFTAP	Adjusted Funded Target Attainment Percentage
ARP	American Rescue Plan Act of 2021
ASOP	Actuarial Standards of Practice
A/E	Actual to Expected Ratio
C	Critical Plan
CBU	Contribution Base Unit
D	Critical and Declining Plan
E	Endangered Plan
FY	Fiscal Year
MAXP3	Highest market funded status achieved in any of the past three years
ME	Multiemployer
MPRA	Multiemployer Pension Reform Act of 2014
MRC	Minimum Required Contribution
N	Neither Endangered or Critical Plan
PBGC	Pension Benefit Guaranty Corporation
PCC	Per Capita Contribution
PFB	Pre-funding Balance
PIMS	Pension Insurance Modeling System
PRAD	Policy, Research, and Analysis Department
SE	Single employer
SFA	Special Financial Assistance
T-PIMS	Transformational Pension Insurance Modeling System
TNC	Target Normal Cost
UVB	Unfunded Vested Benefit
UVBL	Unfunded Vested Benefit Liability
VBL	Vested Benefit Liability
VRP	Variable Rate Premium
WDL	Withdrawal Liability

Appendix

FY 2024 SE Contribution Policy Assumption

Funded Level	Percent of plan sponsors using each approach[3]				
	AFTAP	MRC[2]	UVBL	MAXP3	TNC
0% - 70% AFTAP and <100%[1] in all of last 3 yrs		100%			
70% - 75% AFTAP and <100%[1] in all of last 3 yrs	50%	50%			
75% - 80% AFTAP and <100%[1] in all of last 3 yrs	100%	0%			
80+% AFTAP and and <100%[1] in all of last 3 yrs		1-VRP%	VRP%* Max (UVBL, MAXP3)		
100%+[1] in any of last 3 yrs		0%	100% * Max (UVBL, MAXP3, TNC)		
Floor contribution	Floor contributions are set equal to the minimum required contributions reflecting "maximum allowable credit balance"; no contributions in excess of the floor are assumed for plans over 125% funded (Standard VBL basis).				
Distress termination claims	Zero contributions for the three years prior to termination				

The specific approach to calculating the contribution related to each behavior is described below.

1. AFTAP - Fund to reach an AFTAP of 80% in one year.
   1.1. Measured as of the beginning of the plan year (e.g., 2023 plan year contributions will be estimated to be made as of 1/1/2023) in the amount needed to increase the AFTAP to 80% as of 1/1/2023)
   1.2. The AFTAP contribution is the excess of 80% Total Funding Target (i.e., Form 5500, Sch SB, Item 3D3) over the Actuarial Value of Assets (AVA, Form 5500, Sch SB, Item 2B) where the AVA is reduced by both the Carryover Balance (COB, SB Item 13A) and the Prefunding Balance (PFB, SB Item 13B).
   1.3. Only those contributions attributable to plan years prior to 2023 will actually impact the 2023 AFTAP. Contributions made in 2024 for the 2023 plan year will improve the 2024 AFTAP.
2. MRC - Fund MRC using 90% of available funding credit balance.
   2.1. Measured as of the beginning of the plan year (e.g., 2023 plan year contributions will be estimated to be made as of 1/1/2023)

2.2. Minimum Required Contribution (Form 5500, Sch SB, Item 34, before credit balances) reduced by 90% of the sum of the Carryover Balance (COB, SB Item 13A) and Prefunding Balance (PFB, SB Item 13B).
2.3. The Sample Calculation, Appendix A, February 2021 SE Contribution Policy Assumption memo (page 11), further limited the credit balance offset to 90% of the MRC (MRC before credit balances). The contribution assumption for the PBGC Projections Report FY 2024 does not explicitly disclose this additional limitation.

3. UVBL - Fund the percentage of UVBL from the table below.

VBL Funded %:	< 60%	60-80%	80-85%	85-90%	90-95%	95-100%
Percentage	10%	15%	25%	33%	50%	100%

3.1. Target is to reduce or eliminate the UVBL so contributions are calculated as a percentage of the unfunded vested benefits using the elected PBGC variable rate premium filing liability, Standard Premium Funding Target or Alternative Premium Funding Target.
3.2. The Standard VBL Funded % is used to determine the applicable percentage (i.e., the contribution percentage is based on the current market funded status).
3.3. The applicable percentage is then applied to the plan's actual filing liability (standard or alternative).
3.4. Contributions are assumed to be made at the beginning of the plan year so the calculated UVBL contribution is adjusted with interest (i.e., 2024 contributions are adjusted with interest for one year to 2023 using the plan's effective VRP filing interest rate).
3.5. Should the VRP rate exceed $60, then the UVBL contribution rates shown in the table above will be increased as described in the February 2021 SE Contribution Policy Assumption memo.
3.6. For back testing, the Standard VBL Funded % is calculated by first adjusting the reported filing assets by backing out the receivable contribution amounts made after the end of the plan year (i.e., made in 2024 for the 2023 plan year). This is done to estimate what the funded status would have been prior to funding. The Standard VBL Funded % is then the ratio of the adjusted assets to the Standard VBL.
3.7. Similarly, the UVBL, to which the applicable percentage is applied, is calculated as the reported premium liability less the adjusted assets (same adjustment to assets for receivable contributions as noted above).
3.8. In the back testing file for the 2024 Projections report, the reported premium liabilities were used in lieu of the Standard method VBL for purpose of determining the applicable percentage.

4. VRP Factor - VRP%
4.1. The VRP% is the percentage of plan sponsors electing to fund to reduce or eliminate the unfunded vested benefits.
4.2. The VRP% varies to reflect that a plan sponsor's incentive to eliminate or reduce the VRP increases as the VRP rate increases.
4.3. If VRP rate is $30 per $1,000 UVBL, then 50% of plans will target UVBL funding and 50% MRC.
4.4. If VRP rate is $100 per $1,000 UVBL, then 100% will target UVBL funding and 0% MRC.
4.5. Linear interpolation is used to determine the VRP% at other VRP rate levels.
4.6. When the premium is limited to the cap, the VRP rate will be based on the plan's

"effective VRP rate" (equal to the premium amount divided by the unfunded vested benefit).

4.7. For back testing, the unfunded vested benefit liability is calculated by first adjusting the reported filing assets by backing out the receivable contribution amounts made after the end of the plan year (i.e., 2024 VRP filing assets are adjusted by contributions made in 2024 for the 2023 plan year). This is done to estimate the unfunded vested benefits prior to the current year's contribution.

5. MAXP3 - Fund toward the highest funded ratio in the prior three years based on the table below.

Standard VBL Funded %:	< 110%	110%-115%	115%-125%	125%+
% of Drop	30%	25%	20%	0%

5.1. The MAXP3 measure is an estimate of the contribution needed to improve the funded status of the plan on a market basis.

5.2. The target is the highest market funded status achieved in any of the past three years. For this purpose, the market liability is estimated using the Standard VBL.

5.3. Contribution amounts are adjusted to the beginning of the plan year (i.e., 2024 contributions are estimated using the 2024 premium filing market estimates and adjusted with interest for one year back to 2023).

5.4. The highest funded ratio in the past three years is the maximum of the funded percent for the prior year, two years prior, and three years prior on a market basis (i.e., for 2024 using the VRP measures from the 2023, 2022, and 2021 filings). For these prior years, the filing assets are used as reported (no adjustments). The plan liability uses the Standard VBL.

5.5. The highest funded ratio will not be less than the current market funded ratio (i.e., 2024 measure). The current market funded ratio uses the Standard VBL and asset values prior to the current year (i.e., 2024) contributions.

5.6. For back testing, the current market funded ratio is calculated by first adjusting the reported filing assets (2024 VRP filing assets) by backing out the receivable contribution amounts made after the end of the plan year (i.e., made in 2024 for the 2023 plan year). This is done to calculate the plan's funded status prior to the current year's contributions. The plan liability uses the Standard VBL. The adjusted assets are used to calculate the current funded ratio as well as to calculate the current unfunded liability.

5.7. In the back testing file for the 2024 Projections Report, current assets were not adjusted for the receivable contributions (i.e., both the VBL Funded % and the amount of unfunded liability were calculated using the 2024 reported assets without adjustment for receivables.)

5.8. Further, we noted that the example on page 12 of the February 2021 memorandum did not apply the VRP% to the MAXP3 contributions.

6. TNC - Fund the multiple of the target normal cost from the table below.

VBL Funded %:	All
Multiplier	1.0

6.1. For this purpose, the normal cost is intended to represent the annual increase in liabilities due to the accrual of benefits, measured on a market basis and without expenses. The Standard filing method is used to estimate the market based TNC.

6.2. In prior years, the target normal cost was adjusted by multipliers as shown below:

February 2021 SE Contribution Policy Assumption memo:

Standard VBL Funded %	<105%	105-110%	110-115%	115-120%	120-130%	130% +
Multiplier	1.5	1.4	1.3	1.2	1.1	1.0

2022 Projections Report

Standard VBL Funded %	<120%	120-150%	150% +
Multiplier	1.0	0.5	0.0

6.3. In back testing for the 2024 Projections Report, a multiplier was used consistent with the 2022 table.

6.4. Back-testing uses the PPA FT as a proxy for the Standard method normal cost.

7. Funding credit balance - For the floor contribution, the PBGC Projections Report FY 2024 documents that this is the minimum required contribution reflecting “maximum allowable credit balance”.

7.1. For back-testing, the minimum floor is calculated in the same manner as the MRC and applies 90% of the available funding credit balance.

8. No contributions in excess of the contribution floor are assumed for plans over 125% funded.

Back-testing Contributions Additional Support

The tables below show additional detail related to our back-testing of ongoing contributions and break out the results by year and risk zone status.

2023 -> 2024	# plans	Actual Contributions	Expected Contributions	$ Difference	% Difference
N	532	$21,460,515,208	$20,415,516,380	-$1,044,998,828	-4.87%
E	16	$701,023,132	$720,879,560	$19,856,428	2.83%
C	62	$2,462,602,830	$2,731,968,346	$269,365,516	10.94%
D	62	$703,419,487	$673,663,597	-$29,755,890	-4.23%
SFA	41	$671,938,599	$687,305,905	$15,367,306	2.29%
Total	713	$25,999,499,256	$25,229,333,787	-$770,165,469	-2.96%

2022 -> 2023	# plans	Actual Contributions	Expected Contributions	$ Difference	% Difference
N	819	$26,118,837,671	$25,198,736,769	-$920,100,902	-3.52%
E	47	$1,977,313,314	$1,729,965,531	-$247,347,783	-12.51%
C	127	$3,742,911,818	$3,782,697,449	$39,785,631	1.06%
D	94	$1,485,079,248	$1,451,858,855	-$33,220,393	-2.24%
SFA	31	$114,513,294	$115,290,702	$777,408	0.68%
Total	1118	$33,438,655,345	$32,278,549,305	-$1,160,106,040	-3.47%

2021 -> 2022	# plans	Actual Contributions	Expected Contributions	$ Difference	% Difference
N	801	$23,281,311,258	$21,810,388,344	-$1,470,922,914	-6.32%
E	69	$3,256,693,751	$3,292,212,776	$35,519,025	1.09%
C	134	$4,126,360,663	$3,689,145,984	-$437,214,679	-10.60%
D	112	$1,519,900,494	$1,307,962,972	-$211,937,522	-13.94%
Total	1116	$32,184,266,166	$30,099,710,076	-$2,084,556,090	-6.48%

2020 -> 2021	# plans	Actual Contributions	Expected Contributions	$ Difference	% Difference
N	769	$21,408,739,289	$20,137,325,254	-$1,271,414,035	-5.94%
E	97	$3,974,946,223	$4,030,635,928	$55,689,705	1.40%
C	160	$4,208,495,873	$4,349,274,721	$140,778,848	3.35%
D	111	$1,322,936,425	$1,254,648,555	-$68,287,870	-5.16%
Total	1137	$30,915,117,810	$29,771,884,458	-$1,143,233,352	-3.70%

Back-testing Actives Additional Support

The tables below show additional detail related to our back-testing of active population counts and break out the results by year and risk zone status.

2023 -> 2024	# plans	Actual Actives	Expected Actives	Difference	% Difference
N	532	2,211,068	2,167,756	-43,312	-1.96%
E	16	58,816	57,828	-988	-1.68%
C	62	360,454	349,144	-11,310	-3.14%
D	62	127,172	120,471	-6,701	-5.27%
SFA	41	56,191	66,451	10,260	18.26%
Total	713	2,813,701	2,761,650	-52,051	-1.85%

2022 -> 2023	# plans	Actual Actives	Expected Actives	Difference	% Difference
N	819	2,453,803	2,380,276	-73,527	-3.00%
E	47	154,333	146,923	-7,410	-4.80%
C	127	467,685	457,688	-9,997	-2.14%
D	94	160,204	150,235	-9,969	-6.22%
SFA	31	9,884	9,965	81	0.82%
Total	1118	3,245,909	3,145,086	-100,823	-3.11%

2021 -> 2022	# plans	Actual Actives	Expected Actives	Difference	% Difference
N	801	2,177,237	2,133,381	-43,856	-2.01%
E	69	236,523	233,518	-3,005	-1.27%
C	134	468,295	467,299	-996	-0.21%
D	112	161,463	154,388	-7,075	-4.38%
Total	1116	3,043,518	2,988,587	-54,931	-1.80%