FY 2018 PBGC

PROJECTIONS REPORT

SUMMARY

The Pension Benefit Guaranty Corporation (PBGC) insures pension participants against loss of some or all of their pension benefit when a private sector pension plan fails. PBGC operates two separate insurance programs, one for Single-Employer and one for Multiemployer defined benefit pension plans. The amount of benefits guaranteed, the point at which the guarantees apply, and the funding sources are quite different between the two programs. This report provides long-term financial projections for both programs.

This year's projections for PBGC's Multiemployer Program continue to show a very high likelihood of insolvency during FY 2025, and that insolvency is a near certainty by the end of FY 2026. Compared to last year's projections, the potential risk that insolvency occurs during FY 2024 is lower.

The Multiemployer Program continues to report deficits (i.e., negative net positions[1]) much larger than those historically seen in the Single-Employer Program. Multiemployer Program deficits are expected to grow over time.

New results for PBGC's Single-Employer Program show the program is likely, but not assured, to remain out of deficit over the next decade. As noted in PBGC's FY 2018 Annual Report, increasing interest factors and premium collections[2] led to the program emerging from deficit for FY 2018 within the range shown in the prior Projections Report, but faster than the prior mean projection.

MULTIEMPLOYER PLANS About 125 of the 1,400 multiemployer plans that PBGC insures are in critical and declining status[3] and have declared that they will be unable to raise contributions sufficiently to avoid insolvency over the next 20 years. These plans generally have demographic profiles that differentiate them from other multiemployer pension plans, with a far larger ratio of inactive to active participants than seen in other multiemployer plans.

Under the Multiemployer Pension Reform Act of 2014 (MPRA), critical and declining status plans may take steps to improve long-term solvency by permanently reducing benefits[4], including those already in pay status, via permanent benefit suspensions.[5] Some of these plans also have the ability to apply for financial assistance from PBGC to support plan partitions (undertaken in conjunction with permanent benefit suspensions) or plan mergers. Results in this report are based on assumptions regarding the likelihood that additional plans will apply for benefit suspensions and partitions in the future.

However, the model shows many plans are projected to remain on a path towards insolvency, leading to increasing levels of claims for financial assistance from the Multiemployer Program. The report shows that these increased claims for financial assistance make the insolvency of PBGC's Multiemployer Program highly

---

[1] Deficit and negative net position are used in this report to mean the excess of the present value of the liabilities for future payments under the guarantee program over the program assets. "Insolvent," "Deficit" and "Claims" are further defined and discussed in the section "Financial Obligations."

[2] PBGC FY 2018 Annual Report, p. 36.

[3] Based on Form 5500 information and the Critical and Declining Notices filed as of December 2018.

[4] While MPRA potentially allows temporary benefit suspensions and requires that suspensions cease if the plan no longer needs them in order to remain solvent, suspensions are generally anticipated to be permanent reductions in benefit amounts in applications for suspensions received to date.

[5] As of June, 2019, 26 troubled plans had made an application for suspension or partition, of which 13 applications were approved for suspension (including three with partition).

likely to occur during FY 2025. The insolvency projections do not vary significantly even under assumptions that future suspensions and partitions are not reflected.

The report looks forward 10 years from the FY 2018 Annual Report and projects a range of deficits for the Multiemployer Program. On average, the (mean) present value of the projected FY 2028 deficit is $66.2 billion. In nominal terms, the average (mean) projected value of the deficit grows to $90.0 billion for FY 2028. Both estimates are in line with the projected FY 2027 deficits from PBGC's FY 2017 Projections Report.

The results in the report are based on assumptions and PBGC's Pension Insurance Modeling System (PIMS). Updates are routinely made to the assumptions and to the programming of the modeling system. This year, the multiemployer projections reflect significant changes to the assumptions regarding future contribution behavior by plans in different zone statuses. The multiemployer modeling system was entirely recoded to improve functionality, including improved calibration to plan reported values and the modeling of all plans rather than just a sample. Discussion of the multiemployer simulations begins on Page 6; the changes in the model and assumptions are detailed beginning on Page 20.

SINGLE-EMPLOYER PLANS

Simulations of the Single-Employer Program show that improvements in the program's net position remain likely during the next ten years. However, considerable risks to the program remain. These risks include high levels of underfunding in plans that could reasonably present a claim; underfunding in these plans is an order of magnitude larger than observed in the last period when the program was not in deficit. This means that the system is vulnerable to any unexpected downturn in the economy.

This year's report shows a mean projected present value net position of $26.7 billion for FY 2028 in the Single-Employer Program, an increase of $6.6 billion from the prior report. Expressed in nominal terms, the mean projected net position in FY 2028 would be $36.7 billion. There is significant variation around this mean outcome. The overall trend is consistent with that seen in the past several reports but reflects the program's earlier emergence from deficit.

This year's report incorporates various improvements to the Single-Employer Program model, most of which are refinements to improve performance, accuracy, and efficiency. It also reflects PBGC's new investment policy, which calls for increasing the allocation to long-term fixed income investments as the program's funding status improves.[6] The Single-Employer Program results are detailed beginning on Page 22.

---

[6] https://www.pbgc.gov/sites/default/files/april-2019-ips-pbgc.pdf.

TABLE OF CONTENTS

TABLE OF FIGURES

FREQUENTLY USED ABBREVIATIONS

ERISA	Employee Retirement Income Security Act of 1974, as amended
ERM	Critical status plans that have determined they have "Exhausted all Reasonable Measures"
FY	Fiscal Year
ME	Multiemployer
MP-2016	Mortality Projection − 2016 Mortality Improvement Scale
MPRA	Multiemployer Pension Reform Act of 2014
PBGC	Pension Benefit Guaranty Corporation
PIMS	Pension Insurance Modeling System
PPA	Pension Protection Act of 2006, as amended
PV	Present Value
RP-2014	Retirement Plans − 2014 Mortality Table
SE	Single-Employer

ABOUT THIS REPORT

This report contains estimates and projections for both PBGC's Multiemployer Program and Single-Employer Program. Projections start with the values presented in PBGC's most recent FY 2018 Annual Report and then forecasts for the following decade and beyond, based on current economic conditions and current law.[7] PBGC uses two stochastic modeling systems to make the projections: the Multiemployer Pension Insurance Modeling System (ME-PIMS) and the Single-Employer Pension Insurance Modeling System (SE-PIMS). Each relies on running many simulations to derive a range of possible future outcomes. The report uses averages and ranges to summarize the simulations.

The purpose of the report is to provide an actuarial evaluation of the expected operation and status of PBGC's Multiemployer Program and Single-Employer Program over the near term. It does so by illustrating the projected solvency (adequacy of assets and income to meet current cash needs) and balance sheet net position (assets minus liabilities) for the two programs over time under a variety of simulated future conditions. The standard for actuarial evaluations is that the estimates be reasonable and based on the use of reasonable methods and assumptions. In the professional opinions of the signers, this report meets those standards.

The values shown are estimates, not predictions. They reflect a reasonable range of values that might result based on the assumptions and behavioral relationships that underlie the models. The values are highly dependent on the stochastic projections of many highly variable factors such as future interest rates, future equity returns and future decisions by plan sponsors. **The actual results that ultimately occur in future years can, and likely will, vary materially from the mean projections in this report.**

Wide Range of Possible Outcomes

To illustrate the uncertainty inherent in projecting even the near future, this report shows a wide range of possible outcomes associated with a given set of assumptions. These include mean (average) values and "high," median and "low" values projected for key outcomes for FY 2019–2028. To demonstrate potential variation, the "high" value is set at the 85th percentile (i.e., 85 percent of the outcomes are lower), the median value at the 50th percentile and the "low" value at the 15th percentile.

While the "high" to "low" range represents the bulk of projected outcomes, almost a third of projected results lie above the "high" or below the "low" range. Over a 10-year period it is likely that results will fall outside the "high" to "low" range several times. Because these "tail" results are also important, the report also presents discussions of the full distributions of projected financial positions for both programs.

Financial Obligations

The report presents two types of financial obligation measures: (1) liabilities (and assets) stated on both a present value and nominal basis and (2) year-by-year cash flows. PBGC's liabilities reflect the discounted present value of the retirement benefits PBGC pays for the ***lifetime*** of participants and their beneficiaries; these retirement benefits are generally guaranteed benefits with adjustments as set forth in the Employee Retirement Income Security Act of 1974 (ERISA) and regulations. "Claims" are newly recorded (lifetime) liabilities less any associated assets and recoveries; they are generally recorded on PBGC's books when the payment of guarantee amounts is "probable." The amount that PBGC "books" is the present value of benefits payable to participants and their beneficiaries for

---

[7] This report generally uses data and assumptions as of September 30, 2018 (the end of FY 2018).

their lifetimes plus associated expenses that PBGC would pay under the rules governing the guarantee program, less the present value of any assets or other recoveries. Discussions of PBGC's deficit, net position, financial position and net financial position all reflect the discounted present value of lifetime total liabilities in excess of total assets as of a certain date. PIMS generally models anticipated amounts shown as liabilities or assets on PBGC's books at future points in time along alternate economic paths; it does not model amounts that are disclosed in footnotes to PBGC's financial statements but not booked, such as amounts that represent "reasonably possible" contingencies.[8]

The report also looks at **_year-by-year_** cash flows. Discussions of plan or PBGC insolvency focus primarily on the sufficiency of assets, investment returns, contributions or premiums, and other income (e.g. withdrawal liability payments) to meet benefit payments and expenses for a particular year; i.e., the report uses the term "insolvent" to mean lacking the funds to pay current benefits and expenses for a year. In contrast, "net position" refers to the difference between the present value of liabilities for a lifetime of payments and the assets, not to year-by-year cash flow amounts.

About the PIMS Models

The PIMS models are the best available tools for this analysis; but, like most models, they are subject to limitations. The models are continually revised in light of changing law, plan sponsor behavior and PBGC's understanding and interpretation of that behavior.

The SE-PIMS model was updated to incorporate PBGC's current investment policy for the Single-Employer Program. Other changes to the SE-PIMS model include enhancing the capability to model mortality improvement and benefits provided by cash balance plans.

The ME-PIMS model has been entirely recoded to make it more flexible and powerful. Changes include the ability to model the full multiemployer universe of plans, rather than relying on a sample of plans, additional capability for calibration to plan-reported normal cost values, and the ability to model reduced benefit accruals upon plans projected endangered status. The assumptions regarding contribution growth rates for plans have also been revised. The increased level of flexibility in coding alternative Multiemployer Program rules allows PBGC to better respond to congressional and other stakeholder questions as the insolvency of the program approaches.

While both ME-PIMS and SE-PIMS can simulate demographic and economic factors at least 20 years into the future, they do not model all longer-term sources of uncertainty affecting the pension system.[9]

Estimated Multiemployer Program deficits and financial assistance shown in this report assume that PBGC will provide benefits in accordance with the current level of guarantees rather than reducing guarantee levels to those affordable by premiums.[10] This evaluation assumes no changes to the current law after September 30, 2018, for both multiemployer plans and single-employer plans.

---

[8] Reasonably possible contingencies are discussed in Note 9 of PBGC's Annual Report. As of the end of FY 2018, they were $175 billion for the Single-Employer Program and $9 billion for the Multiemployer Program. Figure 10 of this report displays historical values for the Single-Employer Program.

[9] For more information on PIMS, including links to user publications and peer review papers, see the PIMS web page http://www.pbgc.gov/about/projections-report/pension-insurance-modeling-system.html.

[10] This enables the measurement of the size of the promised benefits from the PBGC program and the resources PBGC has to meet those payments. Under current law [ERISA §4022A(f)(2)(C)], if premiums and PBGC Multiemployer Program assets are insufficient

MULTIEMPLOYER PROGRAM

MULTIEMPLOYER PROGRAM OVERVIEW

The current multiemployer system, covering approximately 10.6 million participants in about 1,400 plans, remains under severe stress. Multiemployer plans are collectively bargained plans maintained by one or more labor unions and multiple companies that are generally in the same industry or members of a trade association.

By law, PBGC's Multiemployer Program operates differently than its Single-Employer Program. The insured event is plan insolvency (deemed to occur as of the year in which a plan is anticipated to have insufficient funds to pay benefits and expenses). Even after a multiemployer plan becomes insolvent, PBGC does not take over the administration of the insolvent plan but provides financial assistance to cover the plan's guaranteed benefits and its expenses. Technically, this financial help is in the form of loans. However, with one exception over PBGC's history, the loans have not been repaid.

Multiemployer plans' premium rates for PBGC coverage are lower than those for single-employer plans and are based solely on participant count. The amount and structure of the benefit guarantees provided under the programs also differ significantly. By statute, assets of the Multiemployer Program are separate from those of the Single-Employer Program; assets from one program cannot be used to fund obligations of the other program.

The Pension Protection Act of 2006 (PPA) required multiemployer plans to be categorized based on funding status, compliance with minimum funding standards and duration to likely insolvency. This categorization defines a plan's "zone status." The most troubled plans are characterized as critical status plans.[11] Generally,

---

to pay guaranteed benefits, and Congress does not enact premium increases pursuant to a formal PBGC submission of alternative actions, guarantees are reduced to the level affordable by premiums.

[11] "Critical status plans" are defined in ERISA § 305 (b)(2) under a variety of alternative criteria that target plans with severe funding or liquidity issues. Critical status plans must establish a rehabilitation plan detailing how they intend to emerge from critical status

these are plans that are likely unable to meet minimum funding requirements and/or are likely to become insolvent in the near term. The Multiemployer Pension Reform Act of 2014 (MPRA) defined a subcategory of critical status plans which are "critical and declining." These are critical status plans whose actuaries project that plan insolvency will occur within 20 years or less.[12]

Critical and declining status plans typically have very different demographic characteristics than do plans in less troubled zone statuses. Figure 1 compares the percentage of plans that share a zone status across different indicators of the concentration of inactive participants in the plan. This concentration measure is important because contributions generated by active plan participants are a key source to fund unfunded liabilities for inactive participants. The concentration of inactive participants is summarized by the ratio of inactive to active participants. Ratios are grouped in the following categories: less than 1, 1 to 2, 2 to 5, 5 to 10, 10 to 25, and more than 25 inactive participants per active participant.

Figure 1 - Critical and Declining Plans Have More Challenging Demographics
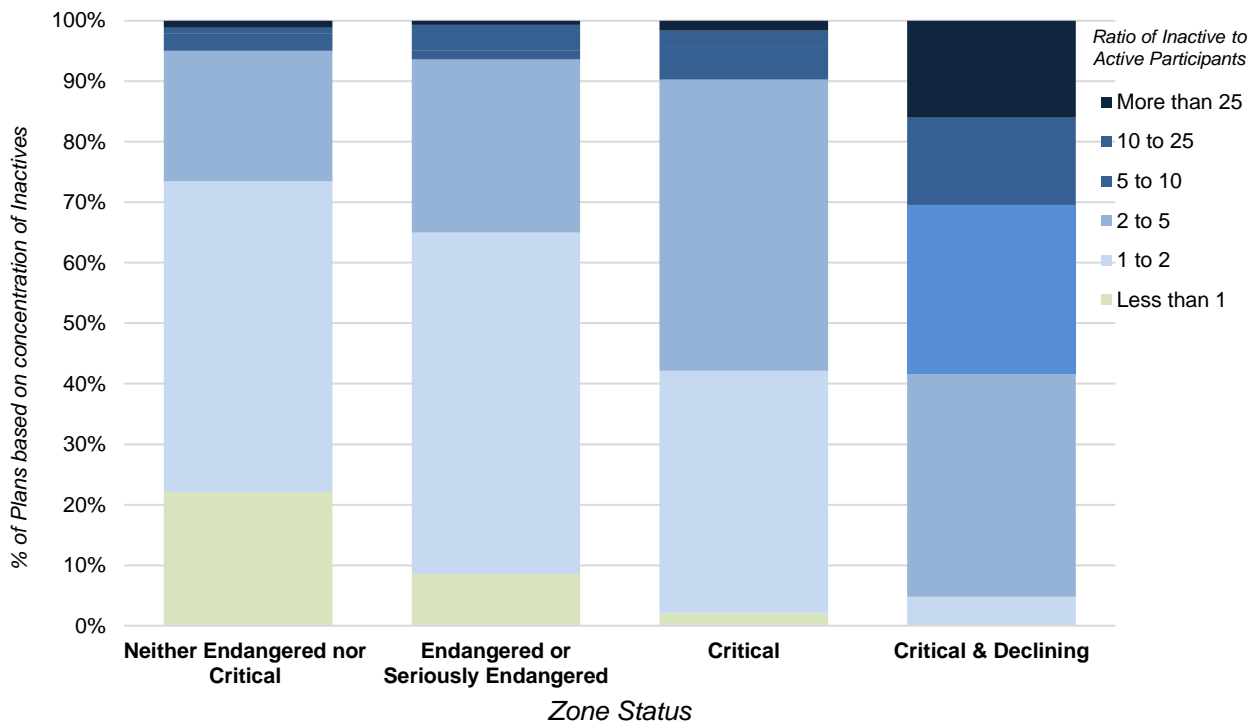
As shown, about half of endangered or seriously endangered plans have a ratio of inactive to active participants of between 1 and 2, compared to less than 5 percent of critical and declining plans. More than half of all critical and declining plans (almost 58 percent) have an inactive to active participant ratio greater

---

(generally within 10-13 years), but if they are not projected to emerge during the rehabilitation period after exhausting all reasonable measures, they must develop an alternative scenario that allows them to emerge at a later time or to otherwise forestall possible insolvency. These critical status plans are referred to as "exhausted all reasonable measures" (ERM) plans.

[12] ERISA §305(b)(6). Under MPRA, plans in critical status must perform either 15- or 20-year projections to determine whether they will become insolvent and thus "critical and declining." Almost all critical status plans satisfy conditions that require a 20-year test.

than 5. The chart is based on information reported by plans on the most recently filed Form 5500 as of January 2019. Generally, this represents information about either the 2016 or 2017 plan year.

Figure 2 examines the percentage distribution of participants in plans that share a zone status across different concentrations of inactive participants in the plan. Again, the concentration of inactive participants is summarized by the ratio of inactive to active participants using ratios of less than 1, 1 to 2, 2 to 5, 5 to 10, 10 to 25, and more than 25 inactive participants per active participant. Figure 2 shows that, weighted by the number of participants, over seventy percent of the participants in the neither endangered nor critical zone are in plans with 1 to 2 inactive participants per active participant. However, most participants in critical and declining plans (over 65 percent) are clustered into plans with five or more inactive participants per active participant.

Figure 2 - Most Participants in Critical and Declining Plans Are in Plans with More Than 5 Inactive Participants for Every Active Participant
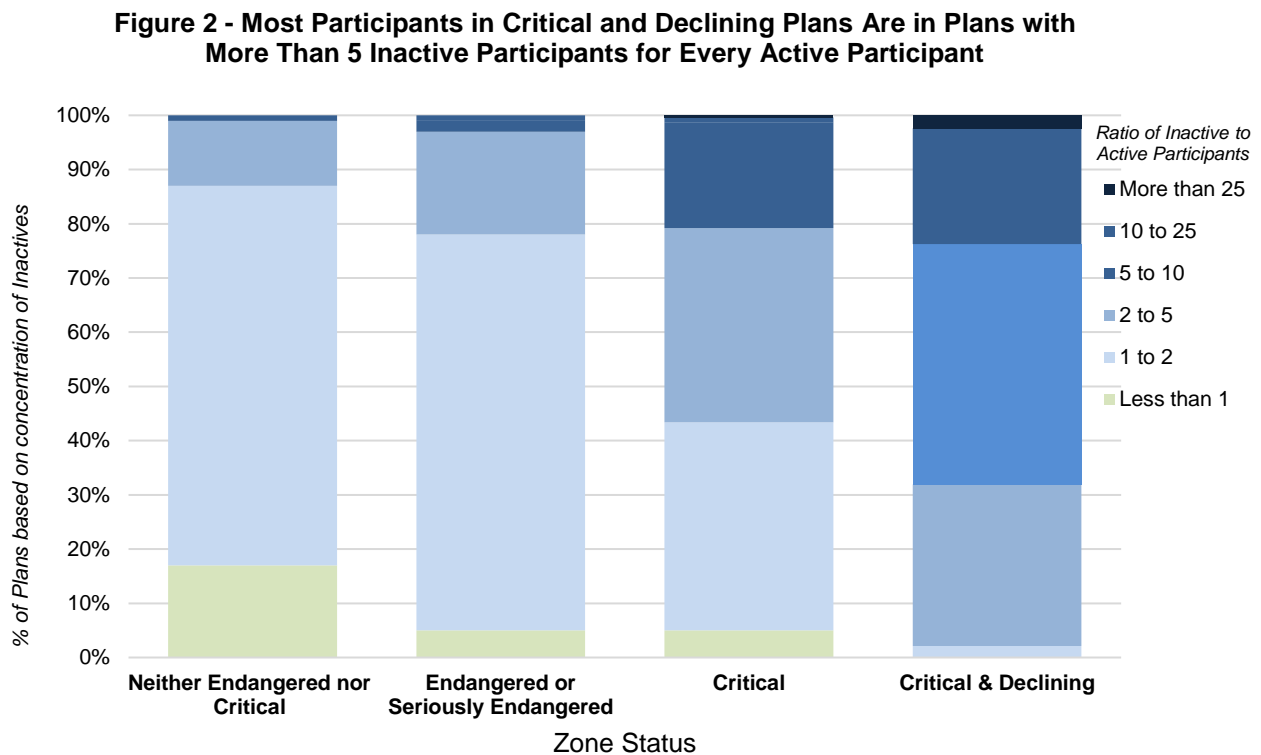
This figure is based on the same dataset as Figure 1. Both figures exclude plans that are terminated or have already become insolvent.

MPRA gives critical and declining plans additional options to address the risk of insolvency, but the use of these options presents difficult choices for plan sponsors and participants. Under MPRA, critical and declining plans may take steps to avoid insolvency by permanently[13] reducing benefit promises to participants via benefit suspensions if they meet certain requirements of the law, including application to and approval by the Department of the Treasury. MPRA also changed PBGC's ability to provide early financial assistance to

---

[13] While MPRA potentially allows temporary benefit suspensions and requires that suspensions cease if the plan no longer needs them in order to remain solvent, suspensions are generally anticipated to be permanent reductions in benefit amounts in applications for suspension received to date.

plans, either by assuming part of the plan's liabilities via a plan partition or by providing facilitated merger assistance. In order to receive partition assistance, the plan must take all reasonable measures to avoid insolvency, including the maximum benefit suspensions, if applicable. Mergers can stabilize or increase the base of contributing employers, combine plans' assets for more efficient investing, and reduce plans' administrative costs. MPRA provides for PBGC to facilitate a merger of plans by providing technical assistance. Critical and declining plans may also apply for financial assistance to facilitate a merger, if necessary, to avoid plan insolvency. A partition or any facilitated merger must reduce PBGC's long-term loss and cannot impair its ability to provide financial assistance to other plans anticipated to need assistance in the future.

As of June 2019, 26 plans had applied for suspension (including five plans that applied for partition), of which 13 plans have been approved for benefit suspension (including three with partitions). As of the end of FY 2018, seven plans had implemented benefit suspensions (including one with partition).

Given the limited number of plans that have been approved, this report continues to use the same future MPRA utilization assumptions as in the FY 2017 Projections Report but defers the assumed average date of commencement of benefit suspensions one additional year.

The estimate of the average projected deficit decreased from a 2027 mean present value deficit of $68.0 billion in last year's projections to this year's projected 2028 mean present value deficit of $66.2 billion, a decrease of $1.8 billion. The section "Reconciling ME-PIMS Results from 2017 to 2018" beginning on Page 19 documents the sources of change in the projected values, including the offsetting impact of changes in the economy and changes in assumptions regarding contribution behavior. In nominal terms, the deficit is projected to grow significantly, rising to a mean projected deficit of $90.0 billion. All stated values assume continued implementation of future suspensions and partitions under MPRA.

The Multiemployer Program is estimated to have a 99 percent likelihood of insolvency in FY 2025 and a 100 percent likelihood in FY 2026. The likelihood of insolvency does not vary greatly with the expected future use of suspension and partitions under MPRA. Compared to the FY 2017 results, the likelihood of FY 2024 insolvency decreased from 26 percent to 4 percent but remains almost unchanged starting FY 2025. This decrease is primarily due to better returns on plan assets than previously expected through the end of FY 2018.

The model runs 500 simulations of the economy and how plans react to changes. While these results are highly variable, none of the simulations show PBGC's program to be solvent or in a positive net position. Instead, absent changes in the law, the model shows PBGC's Multiemployer Program will become insolvent and have a net deficit in 100 percent of the 10-year projection simulations.

WILL PBGC HAVE FUNDS TO PAY MULTIEMPLOYER GUARANTEES?

The Multiemployer Program is running out of money. Participants in insolvent plans face benefit reductions to the level of PBGC guarantees upon plan insolvency. They also face an additional risk that PBGC's multiemployer guarantee fund will run out of money to provide financial assistance, leaving PBGC unable to pay the current level of guarantees.

No scenario shows the Multiemployer Program remaining solvent beyond FY 2026 under current law. The projections continue to show that the program is very likely to become insolvent by the end of FY 2025, absent changes in the law, rising to a near certainty by FY 2026. This is consistent with the FY 2017 projections.

Figure 3 compares the results for the prior (FY 2017) and current (FY 2018) insolvency risk projections, absent changes in the law. In every one of the 500 modeled economic scenarios, PBGC's Multiemployer Program is projected to be insolvent before FY 2027 begins.

Figure 3 - Multiemployer Program Insolvency Before the End of FY 2026
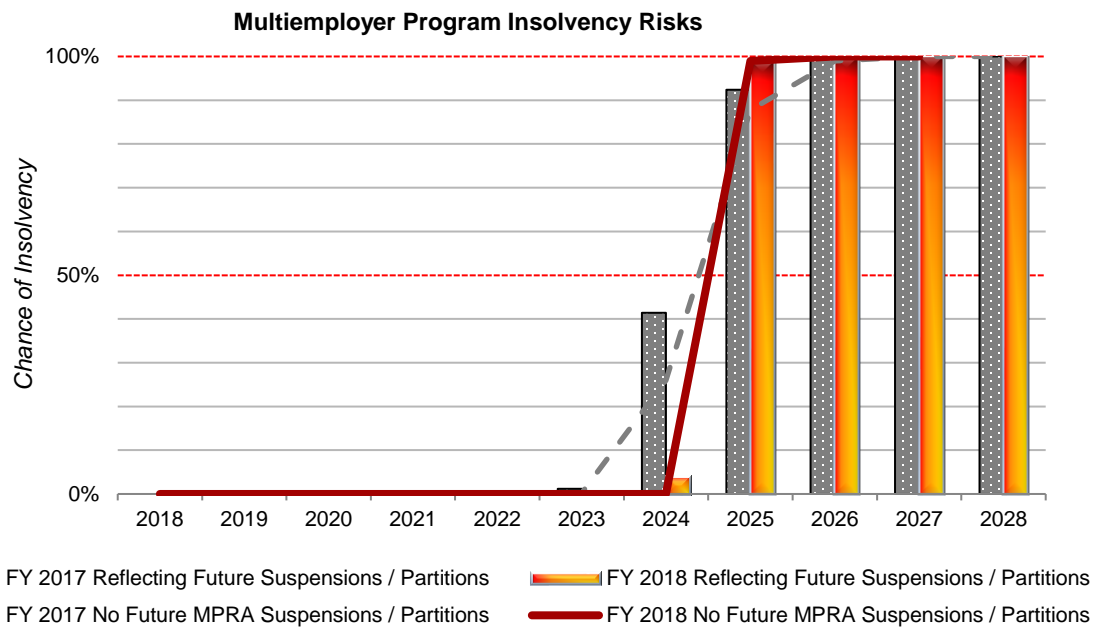
Because PBGC's ability to offer assistance to plans is constrained by the resources of its Multiemployer Program, and because PBGC must certify to Congress that offering partition or merger assistance will not impair its ability to provide assistance to certain other plans, this report reflects an assumption that the number and format of partitions will be limited so as to not significantly accelerate PBGC's insolvency. Thus, the insolvency risk after reflecting future suspensions and partitions is very similar to that shown when reflecting no future suspensions and partitions.

HOW QUICKLY WILL THE MULTIEMPLOYER FUND BE EXHAUSTED?

The model estimates that PBGC's Multiemployer Program risk of insolvency rises very steeply after FY 2024. The FY 2018 projections show similar certainty compared to last year's projections regarding the likely timing of the insolvency of the Multiemployer Program – about 99 percent during FY 2025 and rising to 100 percent for FY 2026. These results are very similar regardless of whether any additional critical and declining status plans engage in benefit suspensions or receive PBGC partition or merger assistance.

An illustration of PBGC's multiemployer fund balance, assuming future benefit suspensions or partitions, provides additional insight into the drivers of multiemployer fund insolvency. Figure 4 compares the assets as of the beginning of the fiscal year to the projected premiums and projected average financial assistance payments for that fiscal year.[14] Assets projected as of the beginning of 2024 are anticipated to cover PBGC's obligations for that year. However, as of the beginning of FY 2025, projected assets are significantly less than the anticipated financial assistance net of anticipated premiums, illustrating the expected insolvency of the Multiemployer Program fund in that year.

Figure 4 - PBGC Multiemployer Fund Projected to Be Drained in FY 2025

PBGC Assets, Average Assistance Payments and Premiums by Fiscal Year
(Projected in Nominal $ Amounts)
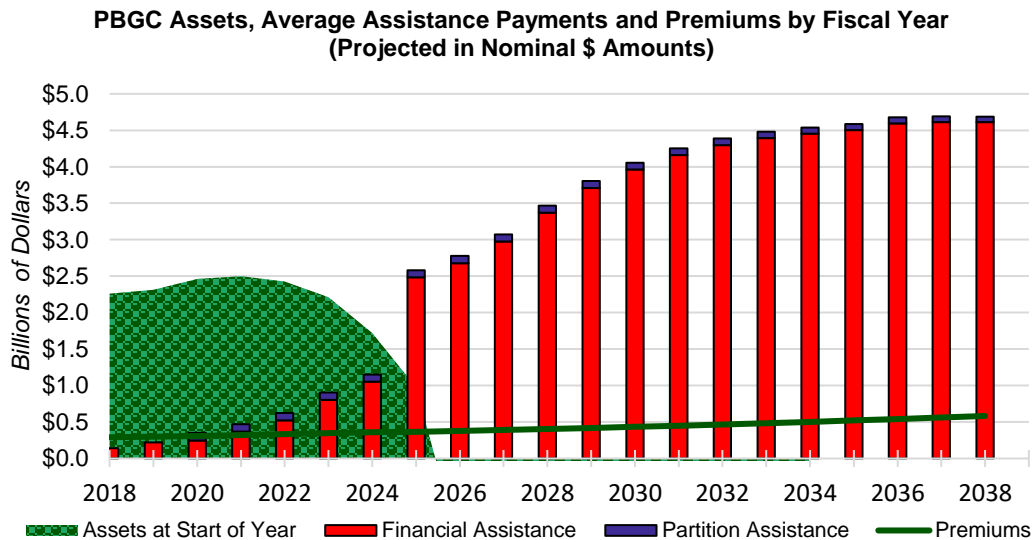
The illustration uses the average of the projected premiums and the financial assistance derived from the simulations, with certain modifications. It shows that average projected financial assistance payments rise dramatically over the next ten years, due to the rising needs of plans that enter insolvency in the 2020's. Annual financial assistance payments rise much more rapidly than premiums in the second decade, when obligations are expected to exceed $3 billion in every year and continue to grow. Thus, under current law, the projections show that any single year of financial assistance in the 2030's is anticipated to exceed the largest level of assets ever projected to have accumulated for the multiemployer fund.

The illustration shown in Figure 4 is similar to that in the FY 2017 Projections Report; however, certain refinements were made to it, given the approaching insolvency of the fund. For most plans the projected financial assistance shown remains the average (mean) level of financial assistance across all of the simulations in each year. Since the average level of financial assistance includes simulations of economic conditions under which plans become insolvent at relatively earlier dates, the average financial assistance level is somewhat larger than the median but is expected to get closer to the median result as insolvency draws closer, until the point at which, shortly before insolvency, they are equal.

---

[14] Assets are shown as of a point in time – the beginning of the fiscal year – and compared with the cash flow generated due to premiums and financial assistance for that following year (less-material items, including investment income and administrative expenses, are not shown).

However, in this year's illustration, for the seven largest plans that are likely to become insolvent prior to FY 2026 the average financial assistance across all simulations has been replaced with a deterministic projection of claims using the median projection. This approach better simulates the pattern of the path of program outlays in the near term as it approaches insolvency. Adding uncertainty to plan asset returns and other outcomes primarily shifts the pattern of near-term insolvencies forward or back in time. Using the average tends to blur the pattern of increases. Using the median result for near term insolvencies leads to a somewhat sharper year-by-year adjustment in both financial assistance and assets but does not change the overall pattern shown in prior reports.

Consistent with recent experience, these plans are also assumed to change their final plan year to pay full benefits for a partial year, and then move to a plan year with benefits paid at the guaranteed level, avoiding any year with benefits paid at intermediate levels between plan levels and guarantee levels. The attribution of financial assistance payments has been refined based on plan years and the estimates of future employer withdrawal liability payments which offset financial assistance.

This year's illustration continues to show the program insolvency to occur in FY 2025.

SUMMARY PROJECTIONS

Projected Net Position

The 10-year projections show the Multiemployer Program's net position improved from last year's projections. This is primarily due to an increase in the discount rates that are used to convert future financial assistance cashflows to a present value offset by changes to assumed contribution behavior; it does not reflect an improvement in the program's anticipated cash flows and solvency.

ME-PIMS projects that the present value of PBGC's 2028 multiemployer obligations will be somewhat lower than last year's projections (a mean present value deficit of $66.2 billion for FY 2028 compared to the previous projection of a mean present value deficit of $68.0 billion for FY 2027, a decrease of $1.8 billion). This projected mean deficit estimate, expressed in present value terms, is about $12.3 billion higher than PBGC's current deficit reported in the most recent Annual Report of $53.9 billion as of the end of FY 2018. The mean deficit is projected to increase even more in nominal terms (expressed in future dollars) to $90.0 billion.

The projected 2028 mean values reflect changes in assumptions including differences in the modeling of suspension and partition. The assumption changes and their impact are discussed in the section "Reconciling ME-PIMS Results from 2017 to 2018" beginning on Page 19.

Figure 5 compares the history of net positions reported by PBGC in its annual reports for the past ten years (the solid line ending in FY 2017) to the present value of a range of projected net positions for the next 10 years (FY 2019 through 2028). The dotted lines show 15th to 85th percentile range and the squares show mean values.

Figure 5 - Projected Present Value of Multiemployer Net Position Declines Over Time

Multiemployer Program Net Position
Historical Experience 2009-2018 and PV 2019-2028 Projections

Legend: Actual (historic dollars) — Projected "High/Low" Range — Projected Mean
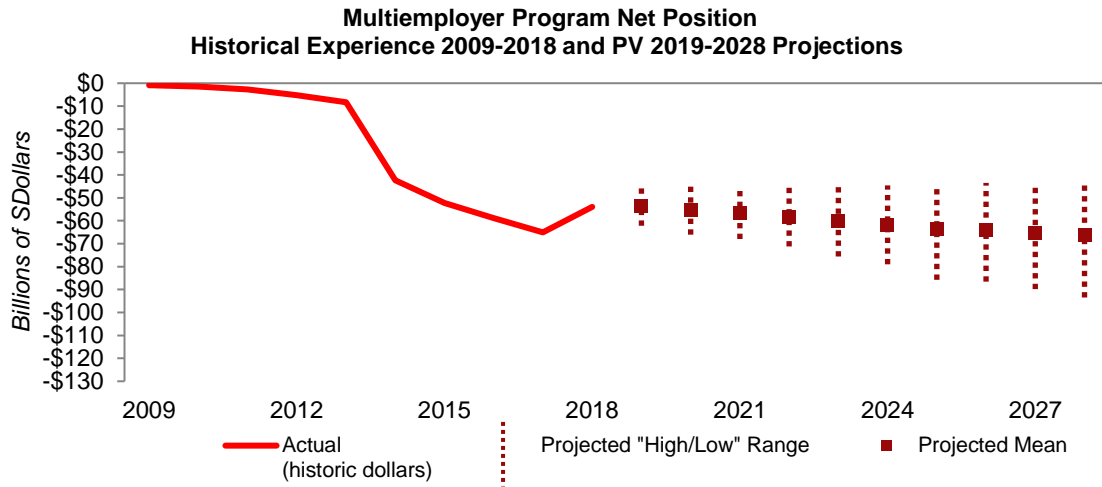
The projections show the present values of PBGC's deficit (i.e., negative net position), assuming PBGC maintains its financial assistance obligations at current guarantee levels, even if assets and premiums are insufficient to provide the guarantees. The resulting deficit is the present value of future financial assistance as of that year, less projected assets, plus any unfunded amounts for prior years carried forward (with interest)[15] in order to continue to provide the current schedule of guarantees and financial assistance in years prior to the projection date.

In Figure 5, the discounted mean future net position is projected to remain somewhat close to the Multiemployer Program's current net position in present value terms.

Figure 6 shows a different presentation of the information in Figure 5, converting the projections of future net position to nominal (future) dollars at each point presented.

Figure 6 - Projected Multiemployer Net Position Continues to Decline in Nominal Dollars

Multiemployer Program Net Position
Historical Experience 2009-2018 and Nominal 2019-2028 Projections

Legend: Actual (historic dollars) — Projected "High/Low" Range — Projected Mean

---
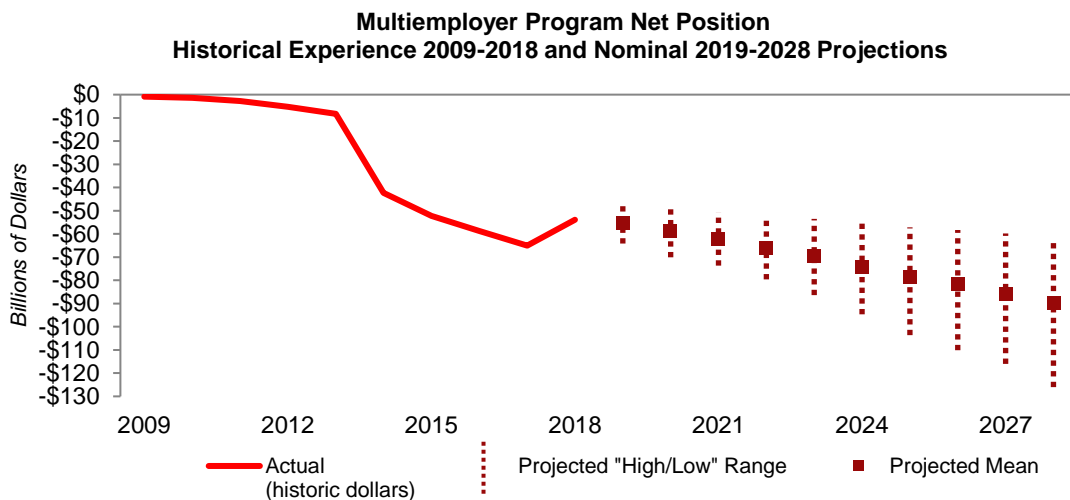
[15] Unfunded amounts carried forward with interest are effectively treated as if PBGC could borrow them. This enables the completion of the present value calculation so that the total liability can be displayed but is not intended to imply that PBGC has borrowing authority.

Sources of Uncertainty: Multiemployer Program

Post-MPRA, there are three major sources of uncertainty in the multiemployer system: (1) Probability of new claims; (2) Variability in the timing and amount of financial assistance payments and (3) Extent to which plans will use suspensions, partitions and facilitated mergers under MPRA. These sources of uncertainty are discussed in detail in the following sections.

Projected Net New Claims

Projected new claims arise primarily, but not solely, from plans that are currently in poor financial condition. Uncertainty as to the probability and timing of future financial assistance payments reflects the volatility of plan investment returns, changes in contributions as the number of current workers covered by the plan varies, and activities undertaken by plans approaching insolvency. This variability in plan earnings, contributions, and benefit accruals makes the date of plan insolvency and the amount of financial assistance uncertain.

The following tables show the mean present value of net new claims and the mean present value of the financial position of PBGC's Multiemployer Program in 2028 (discounted to 2018 present values). Alongside those values, the tables display the "low" and "high" values at the 15th and 85th percentiles. For each of these tables, because higher new claims mean greater financial losses to the PBGC, the order of the columns has been reversed for the second row of projections to highlight the relationship between high new claims and a deterioration of PBGC's financial position. The chart also notes whether the fund is insolvent as of FY 2028 (see Figure 3 for the range of solvency outcomes in other years).

	2018 Present Value (PV) (Dollars in billions at year end)		
	"Low" (15th percentile)	**Mean**	"High" (85th percentile)
PV PBGC ME Net New Claims FY 2019 – 2028	$10	**$28**	$51
	"High" (85th percentile)		"Low" (15th percentile)
PV FY 2028 PBGC ME Financial Position	-$43 Insolvent	-$66[16] Insolvent	-$93 Insolvent

The Net New Claims essentially reflect liabilities recorded when a plan is booked on PBGC's financial statements offset by the value removed from the books in a subsequent year, should a plan's financial condition materially improve.[17] The PV FY 2028 Financial Position measures future obligations as of 2028, including net new claims as well as final adjustments for benefit payments, asset earnings, and projected 2028

---

[16] The mean present value discounted to 2018 is a $66 billion deficit. The mean discounted present value is the average across all simulation paths; discount rates vary among different simulation paths. The mean projected 2028 value is a $90 billion deficit in nominal terms.

[17] This is the present value of net PBGC obligations for plans projected to be booked during the next 10 years, offset by the reversal of liabilities for plans "unbooked" over the 10-year projection period. The liability "unbooked" is the value in the year of removal; it reflects how the liability has evolved over time along a particular economic path and is not the same liability at which the plan was initially booked. Decreases in liability; during the years when a plan remains "booked;" are not captured in the "unbooking" liability.

assumptions, and then discounts to a 2018 present value. The number shown includes as part of the deficit any shortage of funds due to providing financial assistance at the currently guaranteed level even after the multiemployer fund runs out of money.

The median present value of net new claims totaled over the next 10 years is about $20 billion; that is, half of the simulations show a 10-year total of claims above $20 billion and half of the simulations show total claims below that amount. The mean present value of net new claims (that is, the average level of claims) is about $28 billion over the next 10 years. This is approximately the same as last year's projections.

The preceding table shows that the middle 70 percent of outcomes for the present value of the Multiemployer Program's projected financial position has a range of $50 billion, comparable to the FY 2017 range of $54 billion.

The following graphs illustrate the range of projected outcomes for the financial position of PBGC's Multiemployer Program in 10 years. For each value of PBGC's projected net position along the horizontal axis, the height of the line shows the frequency of that net position (out of the 500 simulations).

Vertical lines on the graph below show the present value of PBGC's projected 2028 net position at the 15th and 85th percentiles and the mean and median values of projected net positions. The median result is a deficit with a present value of $60.5 billion in FY 2028. None of the 500 projections shows a positive net position. The most optimistic projection shows a deficit of $16 billion in present value. Many projections show very severe deficits, with the largest projected at a present value of over $200 billion.

Figure 7 - Wide Range of Projected Multiemployer Net Position, But All Are Deficits

PBGC's Potential 2028 PV ME Net Position
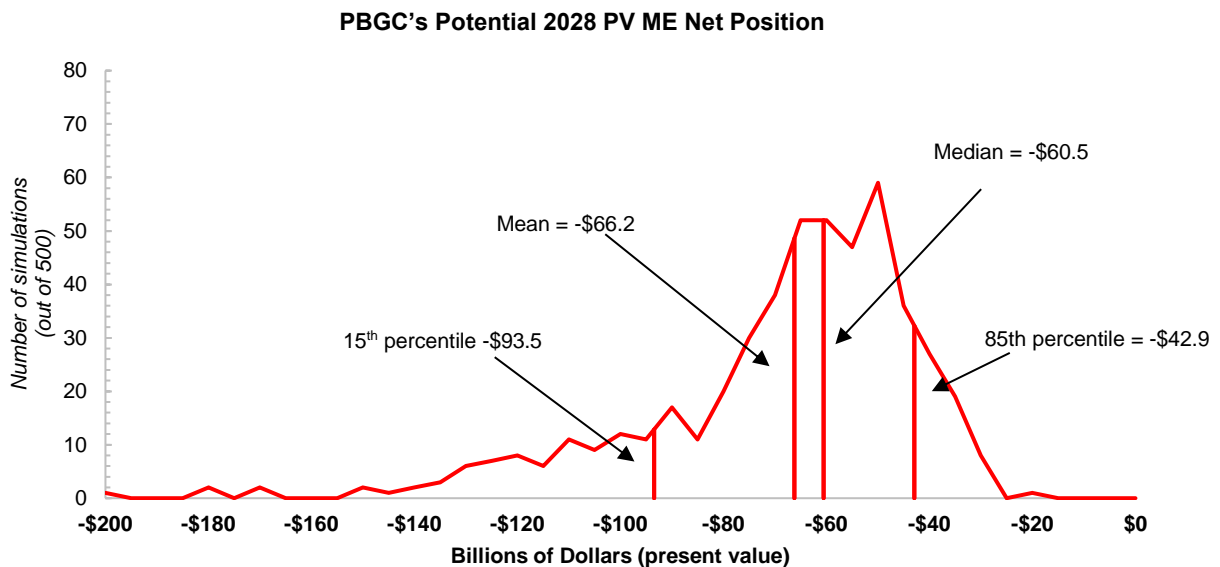
PV Financial Assistance Payments

In addition to new claims, ME-PIMS simulates financial assistance payments from PBGC to insolvent multiemployer plans to pay retiree benefits and plan expenses. PBGC generally provides financial assistance only after a plan becomes insolvent. Thus, financial assistance payments projected over the next 10 years are generally due to previous claims (i.e., plans already booked as losses).

Over the period from FY 2019 to FY 2028, financial assistance payments are projected to exceed the PBGC's resources. Assets in the Multiemployer Program at FY 2018 are about $2.3 billion while the present value of projected premiums over the 10-year period is about $3.3 billion, totaling about $5.6 billion. The table below shows the mean, and "high" and "low" values for the present value of projected financial assistance payments.

	2018 Present Value *(Dollars in billions at year end)*		
	"Low" (15th percentile)	**Mean**	"High" (85th percentile)
PV PBGC ME Financial Assistance Payments FY 2019 – 2028	$11.7	**$14.5**	$17.0
PV Assets Plus Premium FY 2019 – 2028	$5.6	**$5.6**	$5.7

The PV of Financial Assistance Payments for the period FY 2019 to FY 2028 represents the value of near-term cash flows. In contrast, the projected net position reflects money still owed even after providing financial assistance for the next 10 years – it emphasizes the increased demands on PBGC's resources beyond the projected 10-year "financial assistance" payments shown above.

The projected mean, "high," and "low" financial assistance payments are higher than in the FY 2017 projections because the current projections are one year closer to the projected insolvencies of several large troubled plans. With the passage of time, there is now one less year of small financial assistance payments at the beginning of the projections and one more year of very large financial assistance payments at the end of the 10-year projection period.

ASSUMED UTILIZATION OF MPRA SUSPENSION, PARTITION AND FACILITATED MERGER

MPRA gives critical and declining plans additional options to address the risk of insolvency, but the use of these options presents difficult choices for plan sponsors and participants. Under MPRA, some plans facing insolvency within the next 20 years may take additional steps to improve long-term solvency, including permanently reducing benefit promises to participants via benefit suspensions. In order to suspend benefits, plans must be in critical and declining status and submit an application to the Department of the Treasury for approval of the benefit suspensions. The application must meet a number of conditions, including demonstrating that the proposed benefit suspensions will avoid plan insolvency, demonstrating that benefit reductions are equitably distributed among plan participants, and demonstrating that the plan's Trustees have taken all reasonable measures to avoid insolvency, have provided notice to participants describing the

proposed suspensions, and will hold a vote by participants on the proposed reductions, among other conditions.

The ME-PIMS model explicitly estimates a plan census and benefit distribution for each plan in its sample. That information is used to project assets and liabilities and to determine, at each point along each economic path, (1) whether the plan is in critical status, (2) if the plan is projected to become insolvent within the ensuing 20-year period[18] and meets the criteria to be critical and declining status, (3) the amount of benefits protected under MPRA and (4) whether the plan would project long-term solvency, either through benefit suspensions alone, or with partition assistance. For critical and declining status plans, ME-PIMS then applies assumptions as to whether a plan's Board of Trustees will undertake and successfully complete the requirements of benefit suspension.

The degree to which plans and participants will decide to apply for benefit suspensions is still, to some extent, unknown due to limited experience. As of June 2019, 26 plans had applied for benefit suspensions (including five with partitions). As of the end of FY 2018, seven plans have implemented benefit suspensions (including one with partitions). These have been reflected in the FY 2018 results.

The assumptions for these future benefit suspensions reflect two primary factors: whether a plan's Board of Trustees will apply for a suspension that meets the requirements of the MPRA law and, if a plan is not "systemically important," whether participants will vote to override the suspension. For "systemically important"[19] plans, whose applications are approved by Treasury, the law requires that Treasury override any "no" vote, either by accepting the original suspension proposal or by adjusting the proposed suspensions. In the latter case, the Board of Trustees would have the option not to implement the adjusted suspensions.

Changes in the FY 2018 Model of Suspensions and Partitions

For the FY 2018 projections, based on emerging experience, the average date at which future benefit suspensions will first be applicable is assumed to be FY 2020, one year later than incorporated into the set of assumptions. Otherwise, the FY 2018 projections continue the use of the rates of suspension and partition used in the FY 2017 Projections Report. PBGC will continue to review assumptions and methodologies and will incorporate changes as needed to reflect actual experience.

This report continues to assume a zero percent likelihood that the largest critical and declining plan will suspend benefits, a 30 percent likelihood that other plans will apply for suspension alone, and a 10 percent likelihood that other plans will apply for both suspension and partition. PBGC will continue to evaluate the assumptions about future suspensions and partitions as more plans have an opportunity to consider whether to apply.

---

[18] Under MPRA plans in critical status must perform either 15- or 20-year projections to determine whether they will become insolvent and thus "critical and declining." The 20-year test applies if the plan is less than 80 percent funded or has a ratio of inactive to active participants of more than 2 to 1; it is rare for a plan to be in critical status if one of these conditions does not apply.
[19] A plan is "systemically important" if, absent the suspensions, it would be projected to need more than $1,097,000,000 in 2019 ($1 billion (indexed with the National Average Wage Index after 2014)) in financial assistance from PBGC.

VARIABILITY IN PROJECTED FINANCIAL POSITION, MULTIEMPLOYER PROGRAM

Overall, the outcomes in the FY 2018 projections are somewhat better than the distribution shown in last year's projections. The mean, median, and distribution of the FY 2028 net position are less negative than the FY 2027 projections reported last year. The mean discounted present value projected result for FY 2028, assuming future suspensions or partitions, is a $66.2 billion deficit, and the median outcome in FY 2028 (discounted to a 2018 present value) is a $60.5 billion deficit.

Figure 8 - Range of Multiemployer Net Position Outcomes is Similar to Prior Year

Changes From Last Year's Projections

	Projected 2028	Projected 2027
mean	-$66.2	-$68.0
median	-$60.5	-$63.3
std dev	$26.9	$26.2
5%	-$122.6	-$117.2
10%	-$105.5	-$105.9
25%	-$76.7	-$83.4
75%	-$48.2	-$48.5
90%	-$39.7	-$39.9
95%	-$34.8	-$35.0
Probability of positive net position in 2028/2027	0.0%	0.0%
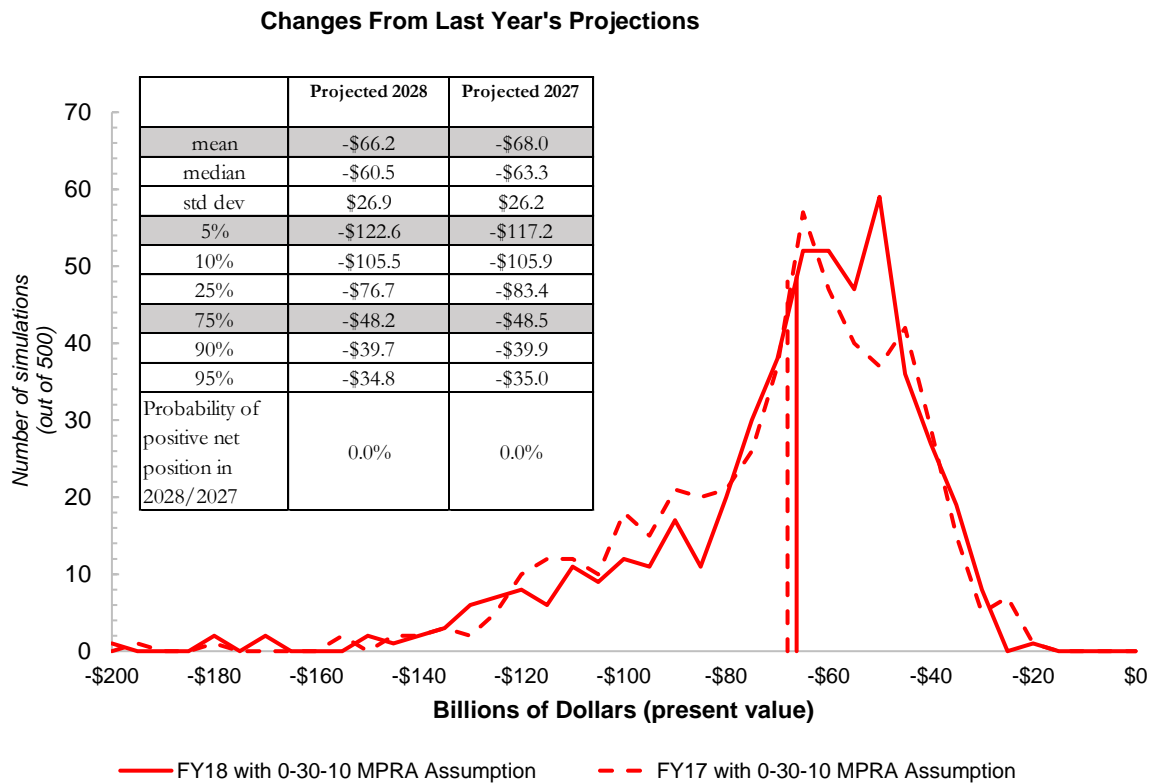
RECONCILING ME-PIMS RESULTS FROM 2017 TO 2018

Figure 9 displays a detailed reconciliation (in dollars, as well as percentages) of the changes from 2017 to 2018. A discussion of each item follows the table. Decreases in the projected deficit amounts are shown as negative numbers in black font on the chart.

The magnitude of the dollar amounts shown in the table change significantly based on the order in which they are calculated, but they would still add up to the final value of $66.2 billion under any order. Because the projected assets are small compared to the liabilities, the percentages displayed would change less significantly, regardless of the order of measurement.

Figure 9 - Reconciliation of Changes in ME-PIMS Results

Reconciliation of Changes in ME-PIMS Results, 2017 to 2018 Results (No Future Suspensions / Partitions under MPRA)			
Description of Change	Value of Change ($ billions)	Net Deficit ($ billions)	% Change
Initial Position for Mean PV of 10-Year Projected Net Deficit from FY 2017 Projections Report		$68.9	
Changes due to Passage of Time from FY 2017 to FY 2018	1.7	70.6	+2.5%
Changes due to New Plan Data	-4.9	65.7	-6.9%
Changes in Economy and Economic Assumptions from FY 2017 to FY 2018	-10.1	55.6	-15.4%
Change due to recoded model	-4.5	51.1	-8.1%
Change in Contribution Assumptions	16.2	67.3	+31.7%
Year 2028 Mean PV of Projected Net Deficit based on 2018 ME-PIMS Model – No Future Suspensions or Partitions		$67.3	
(Reflecting Future Suspensions / Partitions under MPRA)			
Reflecting Suspensions and Partitions	-1.1	66.2	-1.6%
Year 2028 Mean PV of Projected Net Deficit based on 2018 ME-PIMS Model – Reflecting Future Suspensions or Partitions		$66.2	

Expected Change Due to Passage of Time: The FY2017 report projected PBGC's net position in 2027 and presented the results valued in 2017 dollars. To compare with the FY 2018 report, which projects to 2028 with values reported in 2018 dollars, the 2017 projections are rolled forward to project one additional year with one less year of present value discounting. The effect of the roll forward is an increase in the projected net deficit of $1.7 billion.

Data Changes: Changes in the starting data between FY 2017 and FY 2018 include an increase in the number of plans in the sample in ME-PIMS, reflecting new asset allocation for the largest troubled plan, and new plan data provided on Form 5500.[20] Together, these changes result in a decrease of the present value of the deficit by $4.9 billion. This decline is primarily due to better than expected plan asset performance.

Economy and Economic Assumptions: Between FY 2017 and FY 2018, there were changes in the assumptions regarding the underlying economy (e.g., source of imputed asset earnings for the years immediately before the valuation for which actual data are not yet available) upon which all the ME-PIMS projections are based. Reflecting these changes decreases the present value of the projected deficit by $10.1 billion. This is primarily due to projected stronger investment returns and increases in the projected discount rates.

Changes to the Model: This report is based on a recoded model of the multiemployer plans, which is more flexible and reflects the entire data set from the Schedule MB. The effect of this change in the model is a decrease in the mean projected liabilities of $4.1 billion. In addition, this report reflects several modifications to the coding for (1) the incorporation of calibration to normal costs reported by plans, (2) the estimation of withdrawal liability payments, and (3) the methodology for adjusting benefit accruals to a lower rate upon endangered status. The combined effect of all of these changes decreases the mean projected liabilities by $4.5 billion.

Change in Contribution Assumptions: This year's model reflects further refinement of the contribution assumptions. The annual estimated per capita contribution growth rate has been revised as follows:
- Green zone plans – The most recent historical per capita growth rate will phase down over 15 years to the wage growth assumption.
- Yellow zone plans – Implement a funding improvement plan that includes a maximum of 12 percent increase in per capita contribution growth for up to 10 years. Per capita contribution growth is lowered to inflation after 10 years.
- Red zone plans – Implement a rehabilitation plan that includes a maximum of 7 percent increase in per capita contribution growth for up to 15 years (including up to 10 years of increases in yellow zone, if applicable). Per capita growth is lowered to inflation after 15 years.
- Critical and declining zone plans – Annual per capita contribution growth is set equal to the rate of active population decline. This results in constant contribution amounts.

This new change incorporates limits to the per capita contribution rates to a multiple of the 2009 per capita contribution rates (1.5 times for critical and declining status and 3 times for other plans but not less than the current per capita contribution rate). This change increases mean projected liabilities by $16.2 billion. This

---

[20] Information about Form 5500 and its attachments is available at https://www.dol.gov/agencies/ebsa/key-topics/reporting-and-filing/form-5500.

change is based on an analysis of recent 5500 information for a select sample of plans. A more comprehensive analysis is underway and these assumptions will continue to be reviewed. Changes may be made as the additional analysis is completed.

Assumptions Regarding Determination of Suspension and Partition: Based on emerging experience, this report continues with the FY 2017 assumptions but delays the average date they are effective by one year. Reflecting future suspensions and partitions decreases the mean present value of the projected deficit by $1.1 billion but has only a small effect on projected solvency.

SENSITIVITY OF CHANGES TO THE MODEL

Discount Rate

Similar to the FY 2017 Projections Report, PBGC includes tests of the sensitivity to increases and decreases in the PIMS discount rate for valuing PBGC obligations. Using the FY 2018 MPRA suspension and partition election assumptions, discount rates 50 basis points higher than in the base projections would improve the mean present value of the 2028 multiemployer deficit of $66.2 billion by $4.1 billion to $62.1 billion and discount rates 50 basis points lower would worsen the mean present value of the deficit by $4.8 billion to $71 billion. Neither scenario shows any chance of a positive net position in 2028.

Future Wage Index

PBGC's primary assumption on future wage growth is based on the intermediate assumption of the Social Security Administration projection assumptions. As a sensitivity measure, PBGC conducted an alternative modeling simulation using the Social Security Trustees' high-cost assumption, which assumes lower wage growth, for the future wage index. Using this alternate set of economic assumptions and the FY 2018 MPRA suspension and partition election assumptions, the mean present value of the 2028 multiemployer deficit increases by $0.5 billion to $66.7 billion. This scenario still shows no chance of a positive net position in 2028.

SINGLE-EMPLOYER PROGRAM

SINGLE-EMPLOYER PROGRAM OVERVIEW

In FY 2018, PBGC's Single-Employer Program covered about 26 million participants in about 23,000 plans. PBGC's simulations show that continued improvement in the Single-Employer Program's projected net position is likely over the 10-year time horizon.

However, significant inherent risk remains in the Single-Employer Program. Figure 10 graphs the history of underfunding in plans that are classified as reasonably possible to terminate and generate a claim[21] (graphed on the left axis) and compares that to the percentage of that underfunding that resulted in a claim for that year (graphed on the right axis).

---

[21] Each year, in its annual report, PBGC discloses its reasonably possible exposure to loss, based on an evaluation of unfunded vested benefits in plans whose sponsors' credit quality is below investment grade. For details of the selection process and the most recent values see the 2018 PBGC Annual Report, Note 9, beginning on p.95. For historical values see Table S-28 in the 2001 Pension Insurance Data Book and Table S-47 in the 2016 Pension Insurance Data Tables, both available at https://www.pbgc.gov/prac/data-books

Figure 10 - PBGC Single-Employer Exposure to Risk Has Grown, While Recent Claims Remain Low
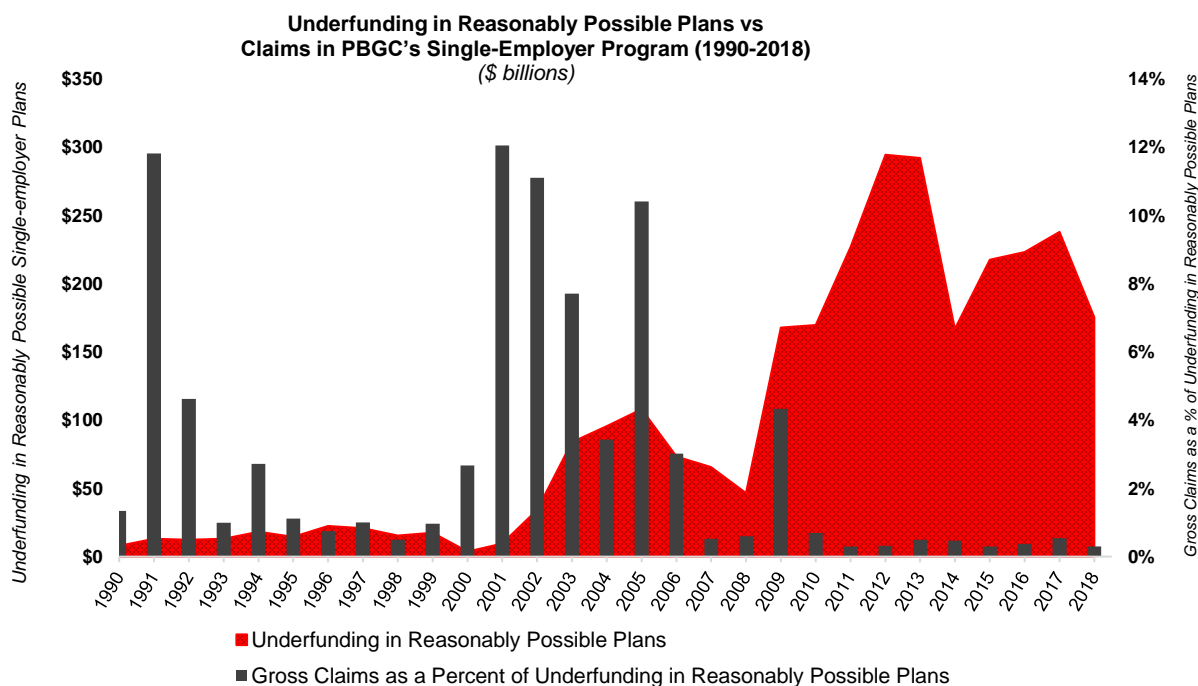
Underfunding in Reasonably Possible Plans vs
Claims in PBGC's Single-Employer Program (1990-2018)
($ billions)

■ Underfunding in Reasonably Possible Plans
■ Gross Claims as a Percent of Underfunding in Reasonably Possible Plans

As noted in PBGC's FY 2018 Annual Report, increasing interest factors and premium collections led to the program emerging from a deficit for FY 2018. The FY 2017 Projections Report showed PBGC's financial position likely to improve in FY 2018, with a likely range of outcomes for FY 2018 that included the actual FY 2018 reported position. The mean projection in the FY 2017 report was for the program to emerge from a deficit in FY 2019 rather than in FY 2018.

PBGC's Single-Employer Program previously came out of deficit during the period 1996 through 2001.[22] As shown in Figure 10, underfunding among plans sponsored by entities with below investment grade credit ratings has increased by an order of magnitude since that period, but the percentage manifesting as claims has, to date, decreased.

The projections continue to show continued improvement in most cases, similar to the pattern reported last year, even after incorporating modeling to reflect changes to the Single-Employer Program's investment policy and refinements to the modeling of insured pensions. Prior Single-Employer Program investment policy modeling had been developed when the program had been reporting substantial deficits. That modeling assumed an abrupt shift in asset allocation to eliminate most investment portfolio risks at any projected point at which the program's funding status is improved to the extent of having assets exceeding 130 percent of liabilities. As the Single-Employer Program's financial position has greatly improved in recent years, PBGC has adopted an investment approach by which investment portfolio risk is gradually reduced as its funding status improves. The investment policy modeling in SE-PIMS is also changed to follow that new policy.

---

[22] See Table S-1, 2016 Pension Insurance Data Tables.

Other changes made to the modeling system include refinements to projections of plan participants' statuses within their plans and improvements to the modeling of benefits in cash balance plans and frozen plans.

The FY 2017 Projections Report projected a mean present value net position of $20.1 billion for FY 2027. The FY 2018 Projections Report shows an improving prospect with a projected FY 2028 mean present value net position of $26.7 billion. The report continues to show a wide range of variability in the potential outcomes for the projected net position. However, as in last year's projections, none of the simulations project that the program will run out of money within the next 10 years.

WILL PBGC HAVE FUNDS TO PAY SINGLE-EMPLOYER GUARANTEES?

As discussed in the section "Financial Obligations" beginning on Page 4, PBGC's financial statements in its Annual Report present liabilities that extend for the lifetime of pension plan participants and their beneficiaries. These liabilities primarily represent obligations for plans that have already terminated plus probable future claims. PBGC's liabilities are then compared to the assets currently held to determine the net position. In general, the Annual Report does not look ahead to see how liabilities and assets will change as new claims arise, new premiums are earned, or asset returns are realized.

The paths simulated in SE-PIMS, by contrast, start with PBGC's existing assets and obligations (liabilities) as of Fiscal Year 2018 and then project:

- Future premium income,
- Future PBGC claims, which increase PBGC's benefit obligations but also include assets recovered from terminated plans and from their sponsors, and
- Future investment income or losses on PBGC assets, based on PBGC's investment policy and asset allocations.

In the 5,000 paths simulated in SE-PIMS, there are none in which PBGC's Single-Employer Program assets are completely exhausted within the 10-year projection period.

SUMMARY PROJECTIONS

Net Position

The FY 2018 Single-Employer Program financial statement assets of $109.9 billion and liabilities of $107.5 billion result in a positive net position of $2.4 billion. The following chart shows PBGC's actual net financial position from fiscal years 2009 to 2018, and the present value of the range of projections for the next 10 years. The mean projected net position for each future year is shown as a large square. The dotted vertical bars for each future year show the range of results between the 15th and 85th percentiles for that future year. Since each year's position affects the following year's position, the uncertainty of PBGC's financial position grows every year through FY 2028, as reflected in the progressively longer vertical bars. This year's mean projected present value net position is $26.7 billion in FY 2028, an increase of $6.6 billion from the comparable numbers in the FY 2017 report. Expressed in nominal terms, the mean projected net position in FY 2028 is $36.7 billion.

**Figure 11 - Single-Employer Program Net Position Projects Continued Improvements
(Present Value Basis)**

Single-Employer Program Net Position
Actual Experience 2009-2018 and PV 2019-2028 Projections
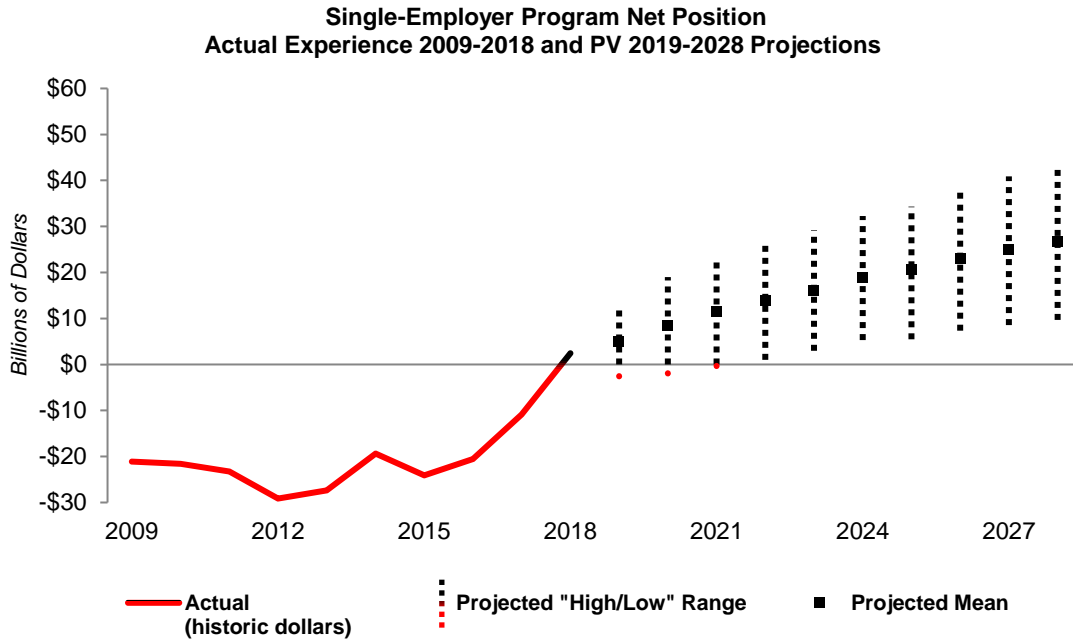
Figure 12 shows a different presentation of the information in Figure 11, converting the projections of future net position to nominal (future) dollars at each point presented. For example, the net position shown in 2026 represents the projected liabilities and assets in 2026 dollars, rather than the present value of those projected liabilities and assets in 2026 discounted to a September 30, 2018 present value.

Figure 12 - Single-Employer Net Position Projects Continued Improvement in Nominal Dollars

Single-Employer Program Net Position
Actual Experience 2009-2018 and Nominal 2019-2028 Projections
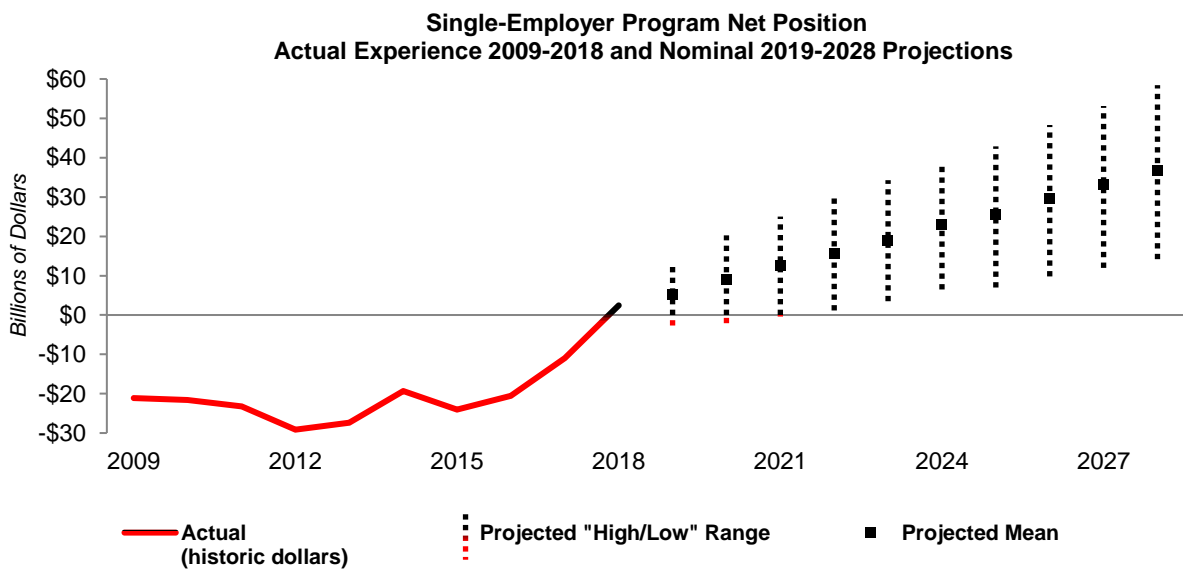
Because PBGC's obligations are paid out over the remaining lifetimes of participants receiving pensions, a deficit means PBGC will have less money than it will need over a period of decades. Without changes, at some point there is a risk that a program in a deficit position will run out of money (i.e., it will have paid out all its assets and still owe benefits). However, a majority of the simulations show that future premiums net of claims may be sufficient to eliminate the deficit over time. Whether or not the deficit is eliminated over time, based on year-over-year cash flow, the program appears highly likely to be able to operate over the near term. Out of 5,000 simulations, none project that PBGC's Single-Employer Program will run out of money within the next 10 years.

The improvements to PBGC's net position over the 10-year period are due to a general trend of improving plan solvency in single-employer plans and projected PBGC premiums exceeding projected claims.

Sources of Uncertainty: Single-Employer Program

The uncertainty in the future of PBGC's Single-Employer Program arises from questions that cannot be answered now regarding which plans will fail, how much PBGC will owe participants as a result of these failures, how much PBGC will still owe participants by FY 2028 (in outstanding benefits that remain beyond the 10-year projection period), what returns PBGC will realize on its assets, and how much PBGC will receive in premiums.

Which Plans Will Fail?

The primary drivers of PBGC's projections are the financial health of the companies that sponsor pension plans and the amount of underfunding in those plans. If many companies with large, underfunded pension plans enter bankruptcy and are permitted to terminate their underfunded plans, new claims are created against PBGC, increasing future PBGC obligations. These new claims will also be reflected in PBGC's projected net position.

How Much Will PBGC Owe Participants?

Benefit payments and new claims. "Benefit payments" for a given year means the amount PBGC is projected to pay to retirees during that year (discounted to a 2018 present value), regardless of when their plans failed. "New claims," on the other hand, represents the total present value of the projected costs to PBGC of plans that fail during the projection period. A new claim is the difference between the present value of all the money PBGC will pay for a plan that is projected to fail and the assets of that plan, including any recovery from plan sponsors. Note that the valuation reflects the benefits payable beyond the 10-year projection period for all failed plans; payments continue until all participants covered by the plan no longer receive benefits.

The present value of projected net new claims (illustrated in the following chart) represents the amount of money PBGC will owe for participants' benefits because their plans fail during the 10-year projection period, less the assets recovered from failed plans and recoveries from the companies that sponsor them. In this chart, as in similar charts above, the solid line represents historical values, while the dotted lines represent the

ranges of outcomes in future years.[23] The outcomes are between the 15th and 85th percentiles. Since PBGC trustees the assets of failed plans, new claims bring in both new assets and new liabilities. Because PBGC would generally not take over a plan that could pay all benefits due, each plan adds liabilities to PBGC that are larger than the assets that PBGC inherits from it.

The projections displayed for net new claims are for each year's results, so patterns in the amount of variability reflect long-term trends rather than cumulative effects.

Figure 13 - Single-Employer Net New Claims

Single-Employer Program Net New Claims,
Actual Experience 2009-2018 and 2019-2028 Projections
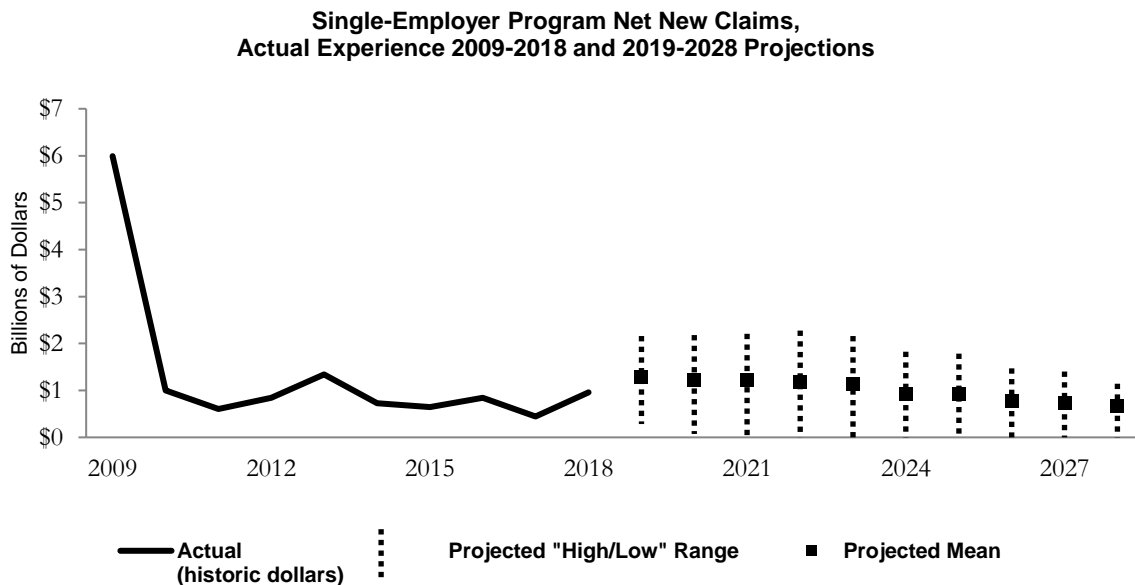
The following table shows a range of projections for present value of the new claims and benefit payments for the next 10 years. The table shows the mean and the "high" and "low" values covering 70 percent of outcomes.[24] The projection of benefit payment amounts are present values of the benefit payments projected to occur over the next 10 years, while the projected new claims amounts are the present values of all new claims that are booked in the next 10 years.

	2018 Present Value (PV) (Dollars in billions at year end)		
	"Low" (15th percentile)	**Mean**	"High" (85th percentile)
PV PBGC SE Benefit Payments FY 2019-28	$62	**$69**	$76
PV PBGC SE Net New Claims FY 2019-28	$2	**$10**	$19

---

[23] The chart does not include claims for plans currently booked by PBGC but not yet terminated ("Probables" plans). Since these plans have not yet terminated, their claims are not included in the historic claims and they are excluded from the projections of future claims (since they are reflected in the balance sheet values that are projected forward in PIMS).

[24] In the tables, "high" and "low" projections for different measurements — such as "Benefit Payments" or "New Claims" — simply order all results through that lens. So, amounts within a single column cannot be combined. Where there are relationships among the values presented, they are noted in the text that accompanies the tables.

More uncertainty exists about future new claims than about future benefit payments. Since benefit payments include continuing payments to people whose plans already have failed, PBGC already knows how much it expects to pay those participants over the next 10 years. Furthermore, while projected benefit payments in this table are only for the 10-year projection period, projected new claims include obligations for benefit payments far into the future. Under the model, the median present value of new claims over the next 10 years is approximately $6.8 billion. The mean present value of claims is higher, about $10.0 billion over the next 10 years. The mean is higher than the median because there is a chance under some simulations that claims could reach very high levels. Comparing to FY 2017, the projected claims are lower primarily due improvements in plan funding and firm financials from the updated data.

How Much Will PBGC Still Owe in Fiscal Year 2028?

Interest rates affect the calculation of present values associated with PBGC's benefit obligations. The Single-Employer Program's obligations are mainly benefit payments to the retirees who depend on PBGC. At any given point in time, PBGC uses interest rates to calculate the expected value of those obligations in the future. Changes in the interest rates can have a substantial effect on the calculations. Variations in the rates used in PBGC's model simulations account for a great deal of the variation in the calculated value associated with the benefits owed. Within the 70 percent of outcomes presented, the Single-Employer Program's present value of projected liabilities in FY 2028 varies by $52 billion (discounted to a 2018 present value), as shown in the following table.

	2018 Present Value (Dollars in billions at year end)		
	"High" (85th percentile)	**Mean**	"Low" (15th percentile)
PV PBGC SE Liabilities in FY 2028	$97	**$69**[25]	$45

What Investment Returns Will PBGC Realize?

In contrast to its role with multiemployer plans, PBGC becomes the statutory trustee of the assets of terminated single-employer plans when they fail. The rate of return on these assets is a significant source of uncertainty for the Single-Employer Program.

As shown in Figure 14, investment income varies a great deal by year. However, the amount of variation does not grow cumulatively, because each year's projection is only for that year's investment income, not the accumulated total of all investment gains and losses. The dotted vertical bars represent the range of outcomes in each year that lie between the 15th and the 85th percentiles. The vertical bars in the chart remain similar in size.

For FY 2019 (the first year of the projections) the projected result ranges from a $14.4 billion gain to a $3 billion loss, expressed as present values discounted to 2018.

---

[25] The mean present value discounted to 2028 is $69 billion. The mean projected 2028 value is $95 billion in nominal terms.

Figure 14 - Single-Employer Program Investment Income

**Single-Employer Program Investment Income,
Actual Experience 2009-2018 and PV 2019-2028 Projections**
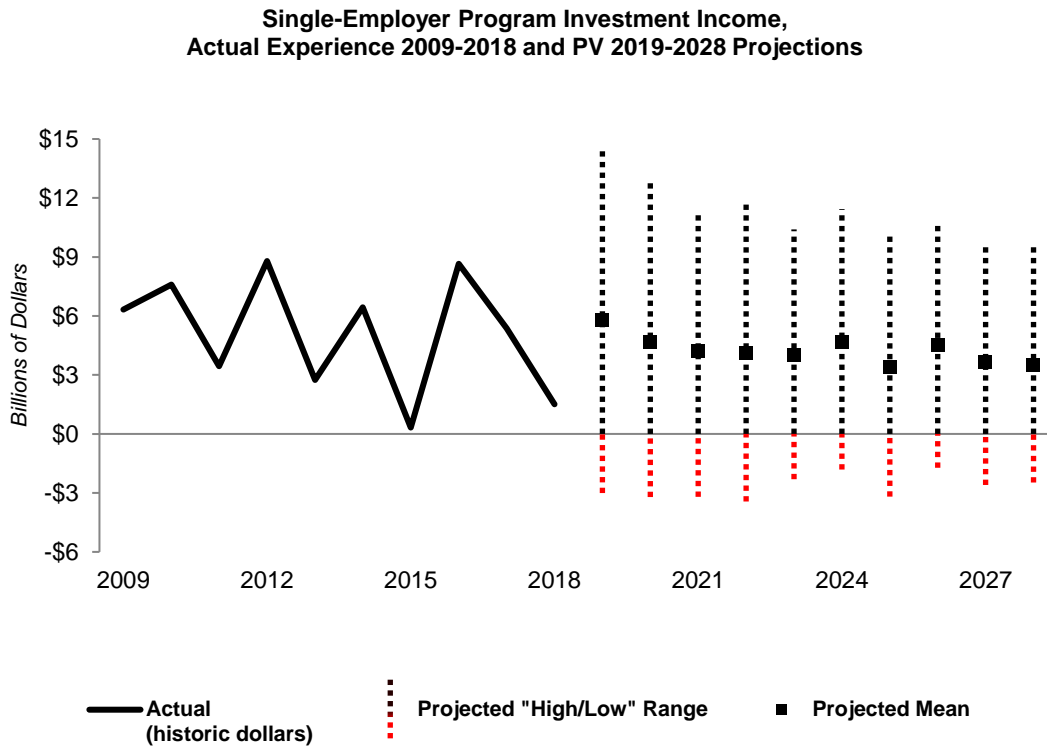
For these projections, the model assumes that PBGC would invest in a mixture of fixed income investments, specifically Treasury and corporate bonds, and in equities, with the allocation based on PBGC's investment policy. That policy calls for gradual increases in the proportion of fixed income investments when there are improvements to the funding status of the Single-Employer Program.

The following table summarizes projections for the total base of assets in the Single-Employer Program by 2028, as well as for the amount PBGC will earn in investment income through FY 2028.

	2018 Present Value (Dollars in billions at year end)		
	"Low" (15th percentile)	**Mean**	"High" (85th percentile)
PV PBGC SE Assets in FY 2028	$73	**$96[26]**	$120
PV PBGC SE Investment Income FY 2019-28	$22	**$42**	$62

Within the results shown in the table (15th percentile to 85th percentile), there is a range of $40 billion projected in the investment returns that PBGC will realize and a $47 billion range in the total amount of PBGC's projected assets.

---

[26] The mean present value discounted to 2018 is $96 billion. The mean projected 2028 value is $131 billion in nominal terms.

New claims also increase assets because, when plans fail, PBGC inherits their assets as well as their future responsibilities. Thus, a plan termination adds to the money PBGC has on hand and adds even more to the amount PBGC owes. In many simulations with rising assets, new claims also increase.

How Much Premium Income Will PBGC Receive?

Plan premiums set by Congress are another factor that can change the program's financial position. The projected amount of premiums that PBGC will receive under current law is shown in the table below:

	2018 Present Value *(Dollars in billions at year end)*		
	"Low" (15th percentile)	**Mean**	"High" (85th percentile)
PV PBGC SE Premiums FY 2019-28	$21	**$28**	$35

The present value of premiums figures shown above are lower than the corresponding values last year. For example, the mean present value of premiums decreased by 24.6 percent, and the 15th and 85th percentiles decreased by 19.7 percent and 28.1 percent respectively. This change is primarily a result of decreasing variable-rate premium income over time. Compared to FY 2017, the model is one year further into that trend and reflects one less year of relatively high variable-rate premiums.

VARIABILITY IN PROJECTED FINANCIAL POSITION, SINGLE-EMPLOYER PROGRAM

SE-PIMS projects PBGC's potential financial position by combining simulated claims (including amounts PBGC recovers from failed plans and their sponsors) with simulated premiums, investment returns and other factors, recognizing PBGC's FY 2018 financial position as the starting point.

The financial position of the Single-Employer Program as of September 30, 2018, was a positive net position of $2.4 billion. In a majority of simulations, the FY 2018 projections show an improvement; the median present value of the projected position in FY 2028 is a $27.3 billion positive net position. The mean present value of the projected position in FY 2028 is a slightly lower $26.7 billion net position. The table below shows the mean position, along with the values at the 15th and 85th percentiles.

	2018 Present Value *(Dollars in billions at year end)*		
	"Low" (15th percentile)	**Mean**	"High" (85th percentile)
PV FY 2028 PBGC SE Financial Position	$10	**$27**[27]	$42

---

[27] The mean present value discounted to 2018 is a $27 billion positive net position. The mean projected FY 2028 value is a $37 billion positive net position in nominal terms.

Figure 15 shows the full range of outcomes that SE-PIMS projects for PBGC's single-employer financial position over the next 10 years. For each value of PBGC's projected net position along the horizontal axis, the height of the line shows how many paths (out of 5,000) have that net position as a result. The higher the curve, the more simulations fall at that point in the distribution. The further to the right any point on the curve is, the better the financial position associated with that point. The further to the right the graph's "hump," the more paths have positive outcomes, and the less spread-out the graph is side-to-side, the more the simulations agree on outcomes.

Figure 15 - PBGC's Potential 2028 SE Financial Position Shows Wide Range of Outcomes

PBGC's Potential 2028 SE Financial Position
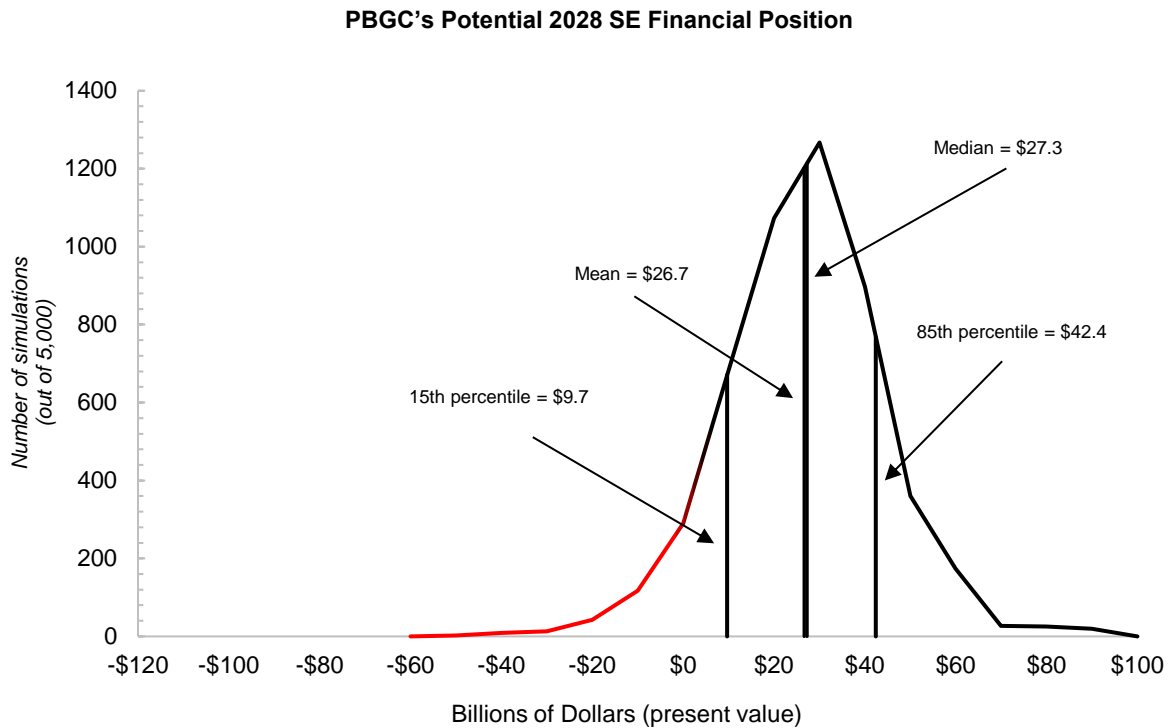
Vertical lines on the graph show the present value of PBGC's projected 2028 net position at the 15th and 85th percentiles, and the mean and median values of projected net positions. The median is a $27.3 billion positive net position in FY 2028, while the mean is a $26.7 billion positive net position.

RECONCILING SE-PIMS RESULTS FROM 2017 TO 2018

Comparison of financial position with last year's results. Figure 16 compares the FY 2017 projections of PBGC's FY 2027 financial position with this year's projections of the FY 2028 financial position. The distribution has moved to the right (the mean and median values have both increased), while the width of the curve has changed only slightly. This means that the average results have improved, but there is little change in the variance around these averages. The mean projected position has improved by about $6.6 billion, from a net position of $20.1 billion to a net position of $26.7 billion. The median projected position has similar improvement.

Figure 16 - SE Financial Position: Comparison to Prior Year Shows Improvement

PBGC's SE Financial Position Compared to Prior Year

	Projected 2028	Projected 2027
Mean	$26.7	$20.1
Median	$27.3	$24.1
Std. Dev.	$17.5	$21.2
5%	-$2.6	-$18.5
10%	$5.6	-$8.2
25%	$15.8	$6.8
75%	$37.5	$35.6
90%	$47.8	$43.2
95%	$54.9	$47.0
Probability of positive net position in 2028 / 2027	93.9%	83.3%

Projected 2028 Mean

Projected 2027 Mean

—— Projected 2028 financial position   – – 2017 projection of 2027 financial position
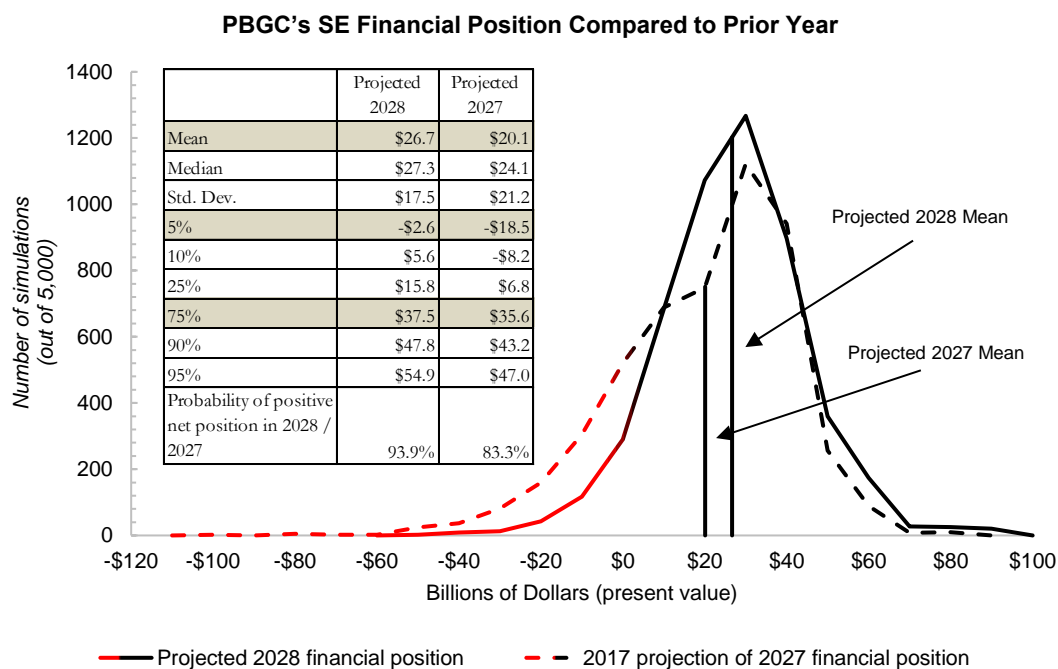
Figure 17 explores the effects of each of the changes in the model and data on the projected FY 2028 net position. It is important to note that the order of the changes affects the values. If the impact of the changes were measured in a different order, it is likely that the values for each of the changes would be different, although the final net position number would remain the same. While the magnitude of changes appears large in relationship to the projected FY 2027 net position, this is largely because the projected net position is a smaller order of magnitude than the liability, and thus relatively small changes in modeled liability appear to have very large effects. These changes are small, however, compared to either projected liabilities or the range of potential net positions.

Figure 17 - Reconciliation of Changes in SE-PIMS Results

Reconciliation of Changes in SE-PIMS Results, 2017 to 2018 Results		
Description of Change	**Value of Change ($ billions)**	**Net Position ($ billions)**
Initial Position for Mean PV of 10-Year Projected Net Position from 2017 Projections Report		$20.1
Changes due to Passage of Time	$2.3	$22.4
Changes to Economy and Economic Assumptions	-$1.0	$21.4
Changes due to Updated Plan, Sponsor and PBGC data	$3.6	$25.0
Changes to the SE Model	$1.7	$26.7
Year 2028 Mean PV of Projected Net Position based on 2018 SE-PIMS Model		$26.7

Changes due to Passage of Time: The FY 2017 report projected the PBGC net position in FY 2027 and presented the results valued in FY 2017 dollars. To compare with the 2018 report, which projects to FY 2028 with values reported in FY 2018 dollars, the FY 2017 projections are rolled forward to project one additional year with one less year of present value discounting. The effect of the roll forward is an increase in the projected net position of $2.3 billion.

Changes to Economy and Economic Assumptions: Market investment returns over the period since the FY 2017 modeling assumptions surpassed the average returns projected for that period with the FY 2017 model. Long-term interest rates also rose over the same period. This combination of events results in higher plan asset values and in lower liability values. These improvements to plan funding levels result in lower projections of claims as well as lower projections of variable-rate premium revenue. The net effect of these changes is a $1 billion decrease in the projected net position.

Updated Plan, Sponsor and PBGC Data: Between the FY 2017 and FY 2018 Annual Reports, PBGC's net position improved by nearly $13.4 billion. This was a larger improvement in the FY 2018 net position than was projected using the prior year's SE-PIMS. Updated data on covered single-employer plans also result in an improved projected net position. Additionally, updated data on the financial status of corporate sponsors of single-employer plans resulted in generally lower modeled bankruptcy rates, leading to a lower projected incidence of future claims. The combined effect of these changes is a net increase in the present value of the projected net position of $3.6 billion.

Changes to the SE Model: The most significant change to the SE model is its incorporation of PBGC's current investment policy for the Single-Employer Program. That investment policy gradually decreases investment risk when PBGC's funding status improves. Prior to the formal adoption of this policy, the model's assumption was a simplified policy that applied an abrupt reduction in investment risk whenever a specified funding percentage was projected to be attained. Other changes to the SE model include refinements to the projections of plan participants' statuses within their plans and improvements to the modeling of benefits in cash balance plans and frozen plans. These changes increase the mean projected net position by $1.7 billion.

In total, the present value of the Single-Employer Program mean projected net position increased from $20.1 billion to a $26.7 billion positive net position.

RECENT SINGLE-EMPLOYER PLAN TRENDS

The projections do not assume that plans are terminated voluntarily by healthy companies, only by companies in distress. However, some healthy companies do close their pension plans by purchasing annuities and undertaking a standard termination. In these cases, PBGC's current obligations are not affected, but those companies cease paying premiums altogether. PBGC will attempt to incorporate the effect of these actions into its model and present them in future reports.

PIMS historically did not model the potential for plans to discharge any significant part of their obligations by purchasing annuities through insurance companies and/or paying lump sums. However, the modeling of lump sum calculations in limited circumstances has recently been implemented (PIMS reflects lump sum

payment of benefits to workers leaving active employment from a cash balance plan that is at least 80 percent funded).

Still, the use of annuity buyouts and lump sums by companies seeking to transfer risk for significant portions of their liabilities is not currently modeled as a continuing or expanding trend in the future. In addition to reducing premium receipts, these transactions might affect future exposure to claims in some circumstances. PBGC continues to gather data on these transactions as part of the premium filing and has performed testing of the sensitivity of the PIMS model to these trends.[28] PBGC intends to continue its investigation of this trend and its implications for the model.

SENSITIVITY OF CHANGES TO THE MODEL'S DISCOUNT RATE

PIMS benefits from comments of readers, other users and a peer review of the model. A previous peer review recommendation was to enhance the disclosure of the sensitivity of results to changes in assumptions and other aspects of the model. PBGC has begun to do this, focusing first on the modeled discount rate. Over time, PBGC plans to expand this analysis to other significant areas of PIMS.

As discussed above, PBGC has added tests of the sensitivity to increases and decreases in the PIMS discount rate for valuing PBGC obligations. If market prices for annuities were based on discount rates 50 basis points higher than in the base projections, the mean present value of the 2028 single-employer net position would improve by $2.8 billion and the likelihood of a positive net position in 2028 would increase from 93.9 percent to 97.1 percent. Discount rates 50 basis points lower would decrease the mean present value of the net position by $3.2 billion and reduce the likelihood of a positive net position in FY 2028 to 89.2 percent.

PBGC also publishes other sensitivity tests of the model on the PIMS page of PBGC's website.[29]

---

[28] See https://www.pbgc.gov/sites/default/files/derisking-sensitivity-economic-downturn-stress-test-fy-2017.pdf
[29] The PIMS page is available at https://www.pbgc.gov/about/projections-report/pension-insurance-modeling-system. Links to sensitivity test memos are included under the column labeled "Information About PIMS".

STATEMENT OF ACTUARIAL OPINION

We, the undersigned, certify that this actuarial evaluation has been prepared in accordance with generally accepted actuarial principles and practices and, subject to the disclaimers herein, to the best of our knowledge, fairly reflects the possible distribution of projected outcomes relative to the operations and status of the Corporation's Single-Employer Program and Multiemployer Program as of September 30, 2018.

In preparing this evaluation, we have relied upon information provided to us regarding plan and participant data, plan sponsor financial information, historic asset yield and bankruptcy information and other matters. We have checked this information for reasonableness as appropriate based on the purpose of the evaluation; the responsibility for the source information obtained from Forms 5500 and elsewhere rests with the preparers of these data.

Subject to the disclaimers herein, in our opinions,

(1) The techniques and methodology used are generally acceptable within the actuarial profession.

(2) The assumptions used are appropriate for the purposes of this report.

(3) The resulting evaluation represents a reasonable estimate of the possible distribution of projected outcomes relative to the operations and status of these programs.

The undersigned are available to discuss the material in this report.

I, Theodore A. Goldman am the Director of PBGC's Policy, Research and Analysis Department (PRAD). I am a Member of the American Academy of Actuaries, a Fellow of the Society of Actuaries and an Enrolled Actuary. I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

I, Jensen Chan am an actuary of PBGC's Policy, Research and Analysis Department (PRAD). I am a Member of the American Academy of Actuaries, a Fellow of the Society of Actuaries and an Enrolled Actuary. I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Theodore A. Goldman 8/02/2019		_Jensen Chan signature_ 8/02/2019	
Theodore A. Goldman	Date	Jensen Chan	Date
Director, Policy, Research and Analysis Department, PBGC		_Actuary, Policy, Research and Analysis Department, PBGC_	
Member, American Academy of Actuaries		_Member, American Academy of Actuaries_	

APPENDICES

OVERVIEW OF PIMS

The analysis contained in this report utilizes ME-PIMS and SE-PIMS. PIMS models are primarily models of pension plans, rather than of plan participants. They use data reported by a sample of pension plans to model the future funding status of the universe of private sector multiemployer and single-employer pension plans. Both models project long-term financial outcomes by running many simulations, each modeling year-by-year changes over 20 years into the future. Each simulation starts with known facts about the economy, the universe of PBGC-insured plans, and PBGC's financial position. The program then introduces random year-by-year changes (within certain bounds) to simulate economic fluctuations, producing 500 simulations for alternate economic paths through time. Within a simulation, each plan's outcomes from one year form the following year's starting point for that plan, and so on. The models recognize that all single-employer plan sponsors have some chance of bankruptcy, that all multiemployer plans have some chance of insolvency, and that these probabilities change over time depending on a variety of factors.

Neither SE-PIMS nor ME-PIMS is a predictive model. Although ME-PIMS reflects anticipated employer behavior in limiting contributions to multiemployer plans, it does not anticipate withdrawal by individual employers. SE-PIMS does not attempt to anticipate companies' more general behavioral responses to changed circumstances, such as, whether or not to continue to sponsor defined benefit plans.

Future Outcomes Are Expressed in Present Value Terms

This report generally expresses future outcomes in present value terms (i.e., discounted back to 2018); unless the numbers are explicitly noted as expressed in nominal terms, values shown should be assumed to be discounted present values. Each simulation's outcomes are discounted based on the 30-year Treasury bond yields projected for that simulation, regardless of whether the underlying simulated cash flows are generated from holdings of equities, corporate bonds, or U.S. Treasury bonds.

In the projections of net position, one important factor is the determination of the amount of money PBGC owes to provide benefits or assistance in today's present values. Changes in interest rates have a large effect on this calculation — the higher the interest rate used to calculate future obligations (liabilities), the lower the present value of the obligations reported. ME-PIMS and SE-PIMS model uncertainty in future changes to these interest rates.

How Projections Compare to Financial Statement Liabilities

The long-term projections, presented here, are different from the exposure reported in PBGC's financial statements. There, PBGC classifies some plans as "probable for financial assistance" (multiemployer) or "probable to terminate" (single-employer) and records them as losses on its financial statements. PBGC describes others as "reasonably possible" losses and discloses the estimated exposure due to these plans in Section VI of the PBGC Financial Statements, "Single-Employer and Multiemployer Program Exposure," but does not book them as losses. These estimates are based on plans that PBGC insures and considers reasonably possible to require financial assistance or to terminate, compared with all the plans that PBGC insures (the universe modeled in ME-PIMS and SE-PIMS).

PIMS treats the financial statement liabilities as initial inputs to the model, estimating how they may vary in the future and adding in the effects of projected new claims, benefit payments and asset returns.

ME-PIMS

ME-PIMS – Overview

Each year in the course of preparing its financial statements, PBGC analyzes insured large (over 35,000 participants) and medium (between 2,500 and 35,000 participants) multiemployer plans to identify those ongoing plans that might become claims against the insurance program. In determining whether a plan should be classified as a probable risk of requiring financial assistance in the future and recorded in PBGC's financial statements as a balance sheet liability, PBGC evaluates whether the plan can be expected to become insolvent within the following 10 years, often taking into account detailed available plan, industry, and employer data. Each plan is determined to either be "booked" as a liability for the financial statements for a given year or not to be included in the accrued liabilities at all.

To project future claims against the Multiemployer Program that are not already booked in the current financial statements, ME-PIMS models a similar process for each plan in each future year for each simulation. In each projection year and for the particular economic path being simulated, ME-PIMS projects a plan's funding status, cash flow, asset base, and growth or decline in the contribution base, to determine whether that plan is projected to become insolvent within a specified time horizon (generally the next 10 years). In each projection year, the plans that are projected as future insolvencies within that time horizon become ME-PIMS liabilities that year for the particular simulated path. Thus, a plan may be "booked" in ME-PIMS in some years and some simulations and not in others.

There is typically a long-time lag between PBGC's booking of a multiemployer plan and the start of PBGC's financial assistance payments. Payments begin only after the plan has depleted its assets. In ME-PIMS' simulation of the Multiemployer Program, a plan can be booked as a probable claim in one year of a

projection, and then, if economic conditions are projected to improve sufficiently, it can become un-booked (in the model) in a later year. Because PBGC's accounting procedures for financial statements reflect considerations not included in the ME-PIMS modeling analysis, and because the financial condition of plans can vary from year to year, the ME-PIMS projections of PBGC's net position may deviate from PBGC's financial statements in subsequent years.

No single underfunding number or range of numbers is sufficient to evaluate PBGC's exposure and expected claims over the next 10 years. Claims are sensitive to changes in interest rates and investment returns, overall economic conditions, contributions, changes in benefits, the performance of some particular industries, and bankruptcies. In the Multiemployer Program, a large number of claims from the actual and projected insolvencies of small and medium-sized plans, and a small number of claims from large plans, have characterized the PBGC's historical claims experience and are likely to affect potential future claims experience as well.

ME-PIMS portrays future underfunding, under current law funding rules, as a function of a variety of economic parameters. The model anticipates that individual plans have various probabilities of positive and negative experience, and that these probabilities can change significantly over time. The model also recognizes the uncertainty in key economic parameters (particularly interest rates and market returns). The model simulates the flows of claims that could develop under hundreds of combinations of economic parameters and extrapolations of plans' respective historical contribution patterns.

ME-PIMS was entirely recoded during 2018 to provide additional flexibility and power in anticipation of requests to model proposed changes in the Multiemployer Program from the Joint Select Committee on Solvency of Multiemployer Pension Plans as well as other parties. The model now calculates values directly for each plan in the universe of multiemployer plans, replacing the prior process of sampling and assigning sample weights so as to extrapolate information to the universe of plans with a new process of modelling future plan cash flows of plans for which only Schedule MB data is available.

ME-PIMS — Data

The model uses data for each plan in the universe of multiemployer plans, including terminated and insolvent plans. Data on plans is primarily derived from the Form 5500, filed annually by each covered plan. Selected numeric entries from Schedules MB, R, and H/I are automatically downloaded from the 5500 FOIA dataset to the PIMS database.

In addition, for a sample of plans, information on plan provisions, demographics of active workers and plan assumptions as to future demographic changes are keyed in by double entry by PBGC's data contractor and reviewed against signed forms and attachments. The sample includes 42 insolvent plans, 27 terminated probable plans, and 279 (including 80 booked plans) ongoing probable plans. Under the recoded model used this year, information from this sample is used to impute data to other plans of similar size, demographics, or industry, as appropriate for the missing data elements. A brief description of the methodology is as follows:

- First all plans in the ME-PIMS database are categorized into major industries.

- Second, the 25th percentile, the 75th percentile and the median of each industry is determined based on the active to inactive ratio.

- For each plan not in the sample, the downloaded data is extended by imputing plan provisions, census and assumptions from the closest match to the 25th, 75th or median active to inactive ratio.

The model contains high-level, electronically downloadable data for each plan and relies on more detailed demographic and assumptions data for plans in the sample which is used to impute similar information for other plans generally in a similar industry. Based on this information, a participant census is simulated for each plan. Data is gathered from the latest Form 5500 filings available as of the preceding spring (generally information for plan years that commenced during 2016 and ended either as of December 31, 2016 or during 2017). The data includes:

- summary statistics on plan demographics,
- plan zone status,
- asset values,
- liabilities,
- actuarial assumptions,
- historical contribution increase rate (over the 7-year period between 2009 and 2016) to assist in modeling plan trends, and
- demographic trends of the ME universe as a whole.

Robust contributing employers' information is not generally available and thus not used in this model—all information is on a plan level.

Data is reviewed for outliers and missing fields. Data on critical and declining zone status receives particular scrutiny; reported data on the Form 5500 is supplemented by information from filed participant notices and other information available to PRAD.

For booked plans PBGC collects additional data beyond the general information available on the Form 5500 and uses it in the model. The additional data is subject to confidential treatment requests under 29 CFR 4901.24.

ME-PIMS — General Methodology

ME-PIMS projects PBGC's potential financial position by combining simulated claims with simulated paths for premiums, expenses, PBGC's investment returns, and changes in PBGC liability; that is, the present value of benefits and expenses payable pursuant to claims recognized by the PBGC. The probability of any particular outcome is estimated by dividing the number of simulations with that outcome by 500, the number of multiemployer simulations.

In each simulation, the model generates 50-year projections for each plan under each of the 500 economic scenarios. As a first step the model generates cash flow benefit payment streams (actives, terminated vesteds, retirees) and normal cost streams from a simulated census. These cash flows are then brought forward each year assuming experience matches the events modeled along each simulated path and that the demographics of future hires mimic the current active distribution. Normal cost cash flow is adjusted for changes in benefit formula (e.g., to a 1 percent of contribution formula or the removal of early retirement subsidies upon critical status), and active population changes.

Because multiemployer liabilities are booked by PBGC several years before a plan becomes insolvent, a plan's financial condition can improve after it is first booked, reducing PBGC's liability for that plan (i.e., the value

of its claim) by delaying its projected date of insolvency and/or reducing the flow of assistance anticipated after insolvency. In some cases, insolvency is delayed beyond the 10-year threshold required for recognition, causing the plan to become "un-booked" and reducing its claim value to zero. Conversely, a plan's condition can deteriorate further following the initial recognition.

ME-PIMS reflects un-bookings as negative claims, which are taken into account in the mean and median claim amounts (i.e., the above amounts represent the value of booked minus un-booked future claims). However, financial improvements during the projection period that are insufficient to cause claims to be un-booked are not reflected in the un-booked ME-PIMS claims values. As a result, the change in net position over the projection period may fall short of the amount that would actually be determined when reflecting the present values of simulated premiums, financial assistance, expenses, and investment returns over that period.

ME-PIMS primarily models the plan's financial status rather than that of the plan's contributing employers.

In the Multiemployer Program, there is little distinction between claims due to insolvency and probable liabilities, unlike the Single-Employer Program. In the Single-Employer Program, a probable liability is generated on PBGC's books when the condition of the sponsoring employer justifies such a classification. In the Multiemployer Program, a probable liability is generated when cash-flow insolvency is projected within 10 years.

To mitigate the modeling and methodological differences between the model used for financial reporting and ME-PIMS, a scale factor is applied, to the extent necessary to match the multiemployer liability reported in PBGC's Annual Report. The scale factor used for the FY 2018 Projections Report is 1.0.

ME-PIMS — Plan Sponsor Behavior

Generally, the model assumes that plans in critical status will increase contributions and make other plan changes. These assumptions differ for critical status plans that have "exhausted all reasonable measures" (ERM). All critical and declining status plans are assumed to be ERM for FY 2018.

The model also reflects potential adoption of suspension of benefits and partition by plan sponsors of critical and declining plans, based on the financial status of each sample plan along each modeled economic path. Plans that are critical and declining along a particular path are assumed to make a one-time decision whether or not to apply for suspensions and partitions based on the assumptions regarding partition and suspension probabilities.

To determine whether a plan will need suspension or partition assistance along a particular economic path, ME-PIMS uses the imputed plan cash flows to calculate benefits at the maximum suspension level (110 percent of PBGC's guarantee, with estimated additional protections for aged and disabled participants). If the suspension reduction is sufficient to achieve long-term solvency, the plan election will be for suspension-only or no changes (depending on a random-number draw). If the suspension is inadequate, the plan is further processed to determine whether an election for suspension plus partition will be modeled.

For a suspension-only candidate plan, the maximum suspensions are adjusted using aggregate cash flows to calculate the benefit levels just high enough to achieve long-term solvency over the 30 years of the projection period. The requirement for longer-term solvency is modeled on a simplified basis by requiring a funding

ratio of at least 20 percent at the end of 30 years. ME-PIMS includes a suspension "re-test". Suspended plans will be re-tested every 5 years to determine if the suspension percentage can be modified. The model will increase the suspension percentage if a plan is projected to be insolvent due to financial deterioration. Should the financial condition of a plan improve, the model will allow a maximum of 50 percent of the change in the suspension percentage to be implemented. In addition, the change is phased-in over four years. For this suspension retesting process, a more conservative asset return of 5 percent is used. These conditions are added to minimize plans going in and out of suspensions during the projections.

For a suspension plus partition candidate plan, the benefits are reduced to the maximum suspension level and the amount of partition assistance required is determined so as to maintain solvency. If the present value of partition assistance required is less than the present value of future assistance by more than a de minimis amount, assuming no partition occurs, the plan is assumed to pass MPRA's expected long-term loss test (see ERISA §4233(b)(3)(A)). Should the plan meet these requirements, it is then modeled as electing between suspension and partition or no changes. Plans projected to receive a partition remain in the partition status throughout the projections.

ME-PIMS does not separately model other forms of financial assistance such as facilitated merger assistance. Since they are subject to similar limits on plans (except the requirement for maximum suspensions), they are modeled as part of the potential partition universe. Given MPRA's impairment tests (see ERISA§4233(b)(4) and §4231(e)(2)(c)), the effect on PBGC outcomes is likely similar whether financial assistance is provided through facilitated merger or partition.

ME-PIMS — Imputing the Inactive Census

ME-PIMS generally operates on the basis of plan data, using aggregate information as reported on the Form 5500; it imputes individual participant census information in order to estimate changes in plan liabilities due to demographic changes over time. The model relies on the PIMS sample plan active participant census (developed from the active age/service scatter attachment to the plan's Form 5500) and extrapolates to the universe of plans based on percentile of active to inactive ratio for several industries. The inactive census is imputed on a basis that varies by age, service, form of benefit (modeling life annuities and joint and survivor annuities), gender, and benefit amount. The imputed inactive census is based on actual inactive data received from several plans. The actual inactive data provides a master template for the assumed distributions by age, service, gender and form of payment to generate each plan's initial inactive census.

ME-PIMS then applies the individual plan's estimated accrual rate to this initial inactive census, which is then further scaled to the Form 5500 in-pay benefits and the starting current liabilities of the plan.

The model also incorporates the ability to input plan specific cash flow information where available.

ME-PIMS — Assumptions

The following variables are stochastically projected:

Interest Rates, Stock Returns, and Related Variables. (e.g., inflation, wage growth, and multiplier increases in flat-dollar plans). These variables are determined by the underlying means, standard deviations and correlation matrix established for the ME-PIMS projections.

- o Stock returns are modeled as independent from one period to the next. To determine a simulated sequence of stock returns, the model randomly draws returns from a distribution that reflects historical experience going back to 1926.

- o Interest rates are modeled as correlated over time. With the model, the Treasury yield for a given period is expected to be equal to the yield for the prior period, plus or minus some random amount.

- o The random draws affecting the bond yields and stock returns are correlated according to an estimate derived from the period 1973 to 2007. Stock returns are more likely to be high when the Treasury yield is falling and vice versa. Credit spreads on investment-grade corporate bonds are modeled to regress toward their historic mean values.

Asset Returns. Plan asset returns are based on an internal study of historic asset returns among large plans. Using the financial rates directly modeled in PIMS (stock market returns, long-term Treasury bond returns and yields), the study estimated mixtures of those rates to best fit the historic returns of plans in the study. PIMS projects annual plan returns using the following weighting based on the average of the estimated rate mixtures: 48 percent stock market returns, 23 percent long-term Treasury bond returns, and 30 percent long-term Treasury bond yield, with a -2.5 basis points additive return adjustment (percentages are rounded). Future plans for PIMS may include modeling of additional asset class returns allowing PIMS to use the investment allocation information trustees now report as part of the annual Form 5500 filings.

Plan Demographics. Starting with the plan's active employee population data from the Form 5500 (grouped by age and service bands), the distribution of active participants for each plan in the future varies according to that plan's actuarial assumptions regarding retirement, disability, and termination of employment. Age and service also vary over time due to hiring assumptions that are determined separately in each scenario of the projections. Hiring patterns vary with stochastic projections; the general assumption is that a plan's historical hiring distribution continues and hiring occurs (or not) to bring the size of the active population up to the size indicated by the continued trend as needed after plan decrements (retirement, termination of employment, disability) take place. ME-PIMS does not currently assume industry-specific employment trends. For all but critical and declining plans, the model incorporates annual variability similar to last year's ME-PIMS assumptions, resulting in a mean net decrease in the active multiemployer population of 1.3 percent per year across all simulated paths. The annual active population decline assumption for critical and declining plans is set to zero percent for programming simplification. Please see the change in contribution assumption for additional detail.

The following non-stochastic assumptions are also used in ME-PIMS projections:

Mortality. The model assumes year by year mortality experience based on the RP-2014 Combined Healthy table, projected to 2032 with MP-2016 improvement scale.

Credit Balances. The credit balance is increased each year by the valuation interest rate and decreased by the amount by which modeled contributions are less than the minimum required.

Per Capita Contribution Rate Increases. ME-PIMS modeling of employer contributions reflects that most employers make contributions at a level above the minimum required. The model incorporates the preliminary result from PRAD's updated analysis on the contributions level. The primary annual per capita contributions increase is based on the historical increase rate observed between 2009 and 2016. This year's model reflects further refinement of the contribution assumptions. Based on preliminary analysis, the annual estimated per capita contribution growth rate was revised as follows;

- o Green zone plans – Historical per capita growth rate phases down to the NAWI (national wage index) over 15 years.
- o Yellow zone plans – Plans implement a funding improvement plan with a maximum of 12 percent increase in per capita contribution growth for up to 10 years. Per capita contribution growth is lowered to inflation after 10 years.
- o Red zone plans – Plans implement a rehabilitation plan with a maximum of 7 percent increase in per capita contribution growth for up to 15 years (including up to 10 years of increases in yellow zone, if applicable). Per capita growth is lowered to inflation after 15 years.
- o Critical and declining status plans – Annual per capita contribution growth is set equal to active population decline. This results in constant contribution amounts.

The per capita contribution rate is further limited to a multiple of the 2009 per capita rate, 1.5 times for critical and declining status plans or ERM plans and 3 times for other plans but not less than the current per capita contribution rate.

Benefit Improvements. For green zone plans with a flat dollar benefit formula, benefit improvements are assumed to be made by amendment and to track changes in wages over time. For green zone plans with a percent of contribution formula, no past service benefit improvements are assumed.

Benefit Improvement Restriction. ME-PIMS assumes that critical status plans and endangered status plans will not adopt future benefit improvements.

Mass Withdrawal. ME-PIMS assumes all plans go through mass withdrawal upon plan insolvency but does not assign a probability of mass withdrawal prior to plan insolvency.

PBGC Premiums. ME-PIMS models premiums based on the rate under current law with projected rates increasing under the indexing provisions in current law. There is no allowance in premium projections for write-offs of uncollectable premiums and for the fact that a portion of the premium collected is not credited with interest under MPRA.

PBGC's Assets. All assets in the Multiemployer Program are, by law, placed in revolving funds. PBGC's policy is to invest revolving fund assets in United States Treasury securities. Asset returns in ME-PIMS are bound by the modeling of Treasury returns in future years.

Discounting Future Claims. When ME-PIMS discounts future claims, the discount factor is a single interest factor which models the curve of interest factors described in the 2018 financial statement. Those factors are based on a survey of private-sector annuity market prices.

Determining Discounted Future Present Values Shown in Report Tables. For calculations involving discounting future amounts, the discount rate used is the simulated 30-year Treasury rate generated for the particular year and economic path.

Assumptions to Facilitate Suspension and Partition. This FY 2018 Projections Report reflects the similar assumptions used in the FY 2017 model.

- o   In a partition, the guaranteed portion of benefits for some participants is spun off to a separate, insolvent plan, for which PBGC will provide financial assistance. The model assumes benefits of terminated vested participants are assumed to be partitioned first;

- o   The assumed average return on plan assets used in MPRA solvency tests is 6 percent (6.5 percent was used in the FY 2017 model).

- o   The assumed threshold for partition based on a reduction in PBGC's long-run loss is 1 percent.

- o   Plans that have gone through a suspension will be re-tested for the suspension every 5 years. Deterioration in financial conditions will allow plans to further suspend benefits up to a limit of 110 percent of the PBGC guarantee. For improvement in financial conditions, plans are assumed to slowly phase-in the reduction in suspension (over four years) to allow for a smoothed change and to prevent flip flopping between suspended and not suspended during the projections. To be conservative, a lower asset return of 5 percent is used to test for suspension percentage changes (5.5 percent was used in the FY 2017 model).

Plan Demographics to Facilitate Cash Flow Modeling. To determine the cash flows in multiemployer plans, ME-PIMS utilizes a number of assumptions (same assumptions as FY 2017):

- o   Proportion of active population assumed to be male: 70%,

- o   Proportion of retirees (in ongoing plans) assumed to be male: 80%,

- o   Proportion of terminated vested participants (in ongoing plans) assumed to be male: 94%,

- o   Age difference: females three years younger than their male spouses,

- o   Proportion of active population assumed to elect joint and survivor form: 60%,

- o   Proportion of retirees assumed to possess a joint and survivor form: 30%,

- o   Proportion of terminated vested assumed to elect joint and survivor form: 35%,

- o   Joint and survivor form: joint and 50% survivor benefit,

- o   Proportion of participants assumed married for pre-retirement death benefit: 80%, and

- o   Conversion factors based on PBGC rates for the joint and 50% survivor benefit: 0.8730 for male participants; 0.9135 for female participants.

The FY 2018 version of ME-PIMS recognizes the following changes in assumptions from those used in the FY 2017 version of the model.

Mortality Table used to Determine Plan Experience. The Blended RP-2014 annuitant and non-annuitant tables projected to 2032 using the MP-2016 scale.

Mass withdrawal is no longer assigned a stochastic probability of occurrence prior to plan insolvency. As in the FY 2017 model, all plans are assumed to have a mass withdrawal at insolvency.

Per Capita Contribution Growth Rate:

- Green zone plans – Recent historical per capita growth rate phases down to the NAWI (national average wage index) over 15 years.
- Yellow zone plans – Plans implement a funding improvement plan with a 12 percent increase in per capita contribution growth for up to 10 years. Per capita growth is lowered to inflation after 10 years.
- Red zone plans – Plans implement a rehabilitation plan with a 7 percent increase in per capita contribution growth for up to 15 years (including 10 years of increases in yellow zone, if applicable). Per capita growth is lowered to inflation after 15 years.
- Critical and declining status plans – Annual per capita contribution growth equal to active population decline. Thus, resulting in constant contribution amount.

Changes to the Multiemployer Program Model

ME-PIMS was recoded during 2018 to provide additional flexibility, capacity, and speed. The recoded model greatly facilitated the delivery of timely responses to the range of technical assistance requests from the 2018 Joint Select Committee on Solvency of Multiemployer Pension Plans (JSC) and from other Congressional entities (e.g., Congressional Budget Office and Joint Committee on Taxation). Except as described below, the recoded model uses the same underlying methodologies, assumptions, and algorithms as the FY 2017 model, but with added flexibility.

Significant efforts were made to assure that the results from the recoded model meet the rigid actuarial standards required for the Projections Report and there was internal consistency in the results from the FY 2018 and FY 2017 models. Two actuarial reviews were also performed. Differences were identified and reconciled through the testing process. Accordingly, the actuaries responsible for the accuracy and integrity of the results concluded that, in their professional judgment, the recoded model should be used for the FY 2018 multiemployer plan projections.

The adoption of the recoded multiemployer model for the FY 2018 Projections Report provides the following key advantages:

- The recoded model calculates values for each of the 1,400 multiemployer plans that PBGC insures. The FY 2017 model relied on a sample of 300 plans and assigned sample weights to incorporate the other insured plans. Many of the requests from the JSC required plan-by-plan analysis which would not have been possible with the FY 2017 model.

- The recoded model extends the projection period from 20 years to 50 years. While the Projections Report focuses on the next ten and twenty years, the ability to project insolvency dates for longer

periods is necessary to analyze legislative proposals that require projections over a longer time horizon and, under current law, MPRA requires projections of at least 30 years.

- The recoded model reflects complexities and details of features of the multiemployer program that could not be readily captured with the FY 2017 model.

- Under the recoded model it is easier to verify results and explain outcomes.

- The recoded model also facilitates timely responses to a wide range of technical assistance requests for analysis of proposed legislative changes to the multiemployer program.

Possible Future Refinements to the ME-PIMS Model

PBGC expects to continue to modify and improve ME-PIMS in the future. Areas under study include incorporating additional modeling of plans' actual responses to PPA, dynamic simulations of evolving plan census, partial employer withdrawals, employer contributions changes and employer benefit and funding decisions, and responses to MPRA in the area of suspension of benefits and partition.

A plan becomes insolvent when it does not have enough assets to pay benefits as they become due. A single-employer plan has one sponsor for which financial information is often available and whose financial condition can be assessed and modeled. By contrast, among multiemployer plans, even the identity of some individual employers that participate in particular multiemployer plans has only recently become available. Others remain unknown.[30] PBGC expects to continue to explore improvements to the model of plan insolvency that might reflect other plan or industry characteristics.

The ME-PIMS model is not fully dynamic in the development of the annual evaluation, as it is based on adjusting and rolled forward cash flow. Thus, projections assume static distribution of active population and all demographic and mortality experience are realized.

Also, projected guaranteed benefits for active employees are approximated with an estimated "guarantee normal cost benefit stream" due to the non-dynamic nature of the model. The impact of using this approximation is expected to be non-material.

SE-PIMS

SE-PIMS — Overview

No single underfunding number or range of numbers is sufficient to evaluate PBGC's exposure and expected claims over the next 10 years. Claims are sensitive to changes in interest rates and investment returns, overall economic conditions, contributions, changes in benefits, the performance of some particular industries and bankruptcies.

Large claims from a small number of terminations characterize PBGC's claims experience throughout its history and are likely to affect PBGC's potential future claims experience as well.

---

[30] Consistent with ERISA Section 103(f)(2)(B), Form 5500 requires only that multiemployer plans identify employers that contributed more than 5% of the total contributions to the plan during the plan year.

SE-PIMS starts with data on PBGC's single-employer position and data on the funding status of more than 500 plans that are weighted to represent the universe of PBGC-covered plans. The model produces results under 5,000 different simulations (500 economic paths times 10 bankruptcy simulations). The probability of any particular outcome is estimated by dividing the number of simulations with that outcome by 5,000. The model uses funding rules as prescribed by current law.

PBGC's expected claims under the Single-Employer Program depend on two factors: the amount of underfunding in the pension plans that PBGC insures (i.e., exposure) and the likelihood that corporate sponsors of these underfunded plans will encounter financial distress that results in bankruptcy and plan termination (i.e., the probability of claims).

SE-PIMS — Data

SE-PIMS relies on a detailed database of more than 500 actual plans, sponsored by more than 330 firms. These plans represent over half of PBGC's insurance exposure in the single-employer defined benefit system measured from the 2016 Form 5500 filings which contain information for plan years that commenced during 2016 and ended either as of December 31, 2016 or during 2017 (the most recent year of complete Form 5500 filing data available). SE-PIMS also reflects any available contributions from later years' filings that are available when the initial results are generated.

The database includes:

- summary statistics on plan demographics,
- plan benefit structure,
- asset values,
- liabilities,
- actuarial assumptions, and
- key financial information about the employer sponsoring the plan.

Data on plans is primarily derived from the Form 5500, filed annually by each covered plan. Selected numeric entries from Schedules SB, R, and H/I are automatically downloaded from the 5500 FOIA dataset to the PIMS database. The most recent 6 years are automatically downloaded. In addition, information on plan provisions, demographics of active workers and plan assumptions as to future demographic changes are keyed in by double entry by PBGC's data contractor and reviewed against signed forms and attachments. Where there is missing data concerning a pension plan's population, data is extrapolated from other plans of similar size, demographics, or industry, as appropriate for the missing data elements.

The plans selected for the sample are those with sponsors that have the largest shares of total plan liabilities in the single-employer defined benefit system and where (1) sufficient publicly accessible data is available on the sponsor to use the SE-PIMS bankruptcy probability model, and (2) plan details can be sufficiently captured in the SE-PIMS model.

Data on firms is primarily derived from Compustat data provided by S&P Global Market Intelligence and linked to plans. Where there is missing data for an individual pension plan sponsor, data is imputed for the plan using industry averages, averages for plan sponsors of comparable size, or other measures as appropriate for the missing data elements.

Historical economic data is gathered from Federal Reserve Economic Database tables, Interest Rate Tables provide by the Internal Revenue Service and SBBI® Yearbooks. Data on PBGC's historical financial position is based on PBGC sources, which also supply the information published in the PBGC Data Tables.

PBGC staff have a documented process for reviewing the data inputs for each year's Projections Report, including the review of economic inputs (annual returns of stock and bond market indices, other historical data, generated stochastic paths), regulatory inputs (various IRS pension plan limits and information regarding CPI and national average wage growth), firm data (plan affiliation, firm economic data, weight as part of sample universe) and plan data (Form 5500 data and adjustments for missing or inconsistent data).

SE-PIMS — Methodology

The SE-PIMS sample of more than 330 large plan sponsors is weighted to represent the universe of PBGC-insured, single-employer plans. The weighted representation reflects the values of total liabilities and underfunding, and the distribution of funding levels among plans in the insured universe that were available publicly as of the preceding spring (generally information for plan years that began in 2016).

The weights in SE-PIMS scale the sample of plans to be representative of the entire universe of single-employer plans (generally trying to capture the distribution of plans by size). This is done by creating scaled copies (referred to as "partners") of the sponsors in the SE-PIMS sample. Each partner is projected to sponsor scaled copies of the same plans sponsored by its source sponsor. Partners begin each simulation with the financial conditions copied from their source sponsors but are scaled in the sizes of their balance sheet entries and employment and receive individual projections of their financial conditions and bankruptcy experiences. Because the SE-PIMS sample is drawn from larger than average plans and corporations, each partner is scaled (in plan size and sponsor size) to one-fifth the size of its source.

Partners are allocated to sponsors in SE-PIMS to create a weighted sample that approximates the distribution of plan liabilities by funding status in the insured universe.

For example, the weighted sample's total value of plan liabilities among plans 50 to 60 percent funded is compared to the same total for the insured universe, and similarly for plans 60 to 70 percent funded, 70 to 80 percent funded, etc. Partners are allocated for a best fit to the entire distribution.

SE-PIMS simulates contributions, premiums, and underfunding for these plans using the minimum funding and premium rules, and then extrapolates the results to the universe of single-employer plans.

Funding rules and PBGC premiums under current law are reflected in the modeling. SE-PIMS also uses each employer's financial information as the starting point for assigning probabilities of bankruptcy, from which it projects losses to the insurance program.

Projections of claims against the insurance program are made stochastically. Claims against the pension insurance program are modeled by simulating the occurrence of bankruptcy for plan sponsors. The model reflects the relationship that occurred from 1980 to 1998 between the probability of bankruptcy and the firms' contemporaneous financial health variables (equity-to-debt ratio, cash flow, firm equity, and employment), modified as described below. For each period, the model assigns a random change in each of

these variables to each firm, correlated with changes in the economy. The simulated financial health variables determine the probability of bankruptcy for that year.

The model assumes, with the exception noted below regarding variable-rate premiums, that all plan sponsors contribute the minimum amount each year. The model runs 500 economic paths (varying interest rates and equity returns) with each plan's sponsor being "cycled" through each economic path 10 times (with varying financial health experiences, bankruptcy probabilities, etc.) for a total of 5,000 different simulations.

SE-PIMS then extrapolates the results of these simulations to the universe of insured single-employer plans.

SE-PIMS — Assumptions

The following variables are stochastically projected:

Interest Rates, Stock Returns, and Related Variables. (e.g., inflation, wage growth, and multiplier increases in flat-dollar plans).[31] These variables are determined by the underlying means, standard deviations, and correlation matrix established in SE-PIMS.

  o Stock returns are modeled as independent from one period to the next. To determine a simulated sequence of stock returns, the model randomly draws returns from a distribution that reflects historical experience going back to 1926.

  o Interest rates are modeled as correlated over time. With the Model, the Treasury yield for a given period is expected to be equal to the yield for the prior period, plus or minus some random amount.

  o The random draws affecting the bond yields and stock returns are correlated according to an estimate derived from the period 1973-2007. Stock returns are more likely to be high when the Treasury yield is falling and vice versa. Credit spreads on investment-grade corporate bonds are modeled to regress toward their historic mean values.

Sponsor Financial Health Variables. (equity-to-debt ratio, cash flow, firm equity, and employment).

Asset Returns. Plan asset returns are based on an internal study of historic asset returns among large plans. Using the financial rates directly modeled in PIMS (stock market returns, long-term Treasury bond returns and yields) the study estimated mixtures of those rates to best fit the historic returns of plans in the study. PIMS projects annual plan returns using the following weighting based on the average of the estimated rate mixtures: 48 percent stock market returns, 23 percent long-term Treasury bond returns, and 30 percent long-term Treasury bond yield, with a -2.5 basis points additive return adjustment (percentages are rounded). Future plans for PIMS may include modeling of additional asset class returns allowing PIMS to use the investment allocation information sponsors now report as part of the annual Form 5500 filings.

Plan Demographics. Starting with plans' population data from the Form 5500, the distribution of active participants for a plan varies throughout the forecast, according to that plan's actuarial assumptions regarding retirement, disability, and termination of employment. Age and service also vary over time

---

[31] In a flat-dollar plan, the pension benefit is determined by multiplying a fixed amount by the participant's years of service. In a salary-related plan, the benefit is determined by multiplying a percentage of the participant's salary by the years of service.

due to hiring patterns that are determined separately in each simulated path of the projections. Unless the plan is frozen, PIMS assumes a stationary mean active participation level for the plan. The distribution of ages and benefits for retired and terminated vested participants are imputed from long-term projections of the starting active population and normalized to the actual counts furnished by the Schedules SB. All participants are assumed to be male and are assumed to elect straight life annuities.

Probability of Bankruptcy. Sponsors are subjected to an annual stochastic chance of bankruptcy. That probability of bankruptcy is determined by formulas estimated from historical bankruptcies and various measures of companies' financial health over the period 1980 to 1998. The bankruptcy risks generated for PIMS are compared to market indices and the largest outliers have their modeled risk recalibrated to equal the mean of the market estimate of bankruptcy risk for their class of bonds. Bankruptcy probability formulas generally do not vary by industry.[32] A plan presents a loss to participants and/or the pension insurance program if its sponsor is simulated to experience bankruptcy and the plan is less than 80 percent funded for termination liability.

PBGC plans to update its bankruptcy model to look beyond book values of the firms to their market values in determining bankruptcy risk.

The following non-stochastic assumptions are also used in SE-PIMS projections:

Mortality. For purposes of determining sample plans' year by year mortality experience during the projection period: the blended RP-2014 annuitant and non-annuitant mortality table times 1.09, projected with MP-2017 (using just the ultimate improvement rates for all years after 2018) to the specified projection year on a static basis. For purposes of determining the present value of PBGC assistance: the blended RP-2014 Healthy male mortality table times 1.09, projected to 2032 using the MP-2017 scale for FY 2018. For projections of future fiscal years, the static projections are updated by one additional year, using the MP-2017 scale, for each year beyond FY 2018. PBGC has replaced the static projections with generational projections starting in the FY 2017 Annual Report; however, PRAD is still using statically projected mortality as an approximation. For purposes of determining statutory minimum funding requirements beginning in 2018, the blended IRS table for 2018 is used, projected on a static basis each year beyond 2018 using scale MP-2016. It is assumed that large collectively bargained plans opt to use a substitute mortality table whose rates are assumed to be 9 percent higher than the standard table.

Contribution Level/Credit Balances. The credit balance is increased each year by the plan's rate of return on assets and decreased by the amount assumed to be used to satisfy the minimum funding requirement. For purposes of modeling future claims, SE-PIMS assumes that employers will contribute the minimum required amount each year as determined using the further smoothing authority under the Bipartisan Budget Act of 2015 and that any credit balance remaining will be used to the maximum extent permitted until the balance is completely depleted. Updated actual 2016 and

---

[32] SE-PIMS makes an exception for the financial and utilities industries, where relatively high degrees of leverage are considered not to signal a risk of bankruptcy. SE-PIMS also increases the bankruptcy probabilities of a few large companies, especially in the retail industry, whose model probabilities greatly underestimate the risk of bankruptcy as measured by their bond ratings.

2017 contributions and the associated Minimum Required Contributions are reflected where available as of the data compilation date.

Benefit Improvements/Benefit Improvement Restriction. For flat-dollar plans, benefit multipliers are assumed to increase annually by the rate of inflation and productivity growth. For salary-related plans, the benefit formula is assumed to remain constant, but annual salary increases are reflected based on the rate of inflation, productivity growth, and a factor measuring merit and/or seniority. Because SE-PIMS does not model benefit increases that exceed the average wage increase of affected employees, benefit improvement restrictions are not applicable in PIMS.

Cash Balance Plans. SE-PIMS assumes that plans will pay the full accrued benefit (the account balance) as a lump sum to all retiring and terminating active participants in any plan that is at least 80 percent funded.

Plan Accrual Benefit Restrictions. Plans with funding percentages below 60 percent must cease benefit accruals. SE-PIMS reflects this rule, and assumes that once a plan is frozen, it will remain frozen, even if the percentage increases above 60 percent at some future time.

Declassification of Credit Balances. When determining funding percentages for triggering benefit restrictions, SE-PIMS reduces assets by credit balances. Sponsors have the option of declassifying credit balances at any time to raise the funding percentage to the level needed to avoid a benefit restriction. For modeling purposes, SE-PIMS assumes that sponsors will choose to declassify credit balances to the extent necessary to avoid the benefit freeze restriction (60 percent threshold) but assumes that traditional plan sponsors will not declassify balances to attain the 80 percent threshold. Because cash balance plans are assumed to pay the full accrued benefit as a lump sum to departing participants, contingent on sufficient funding, these plans are assumed to declassify credit balances to achieve 80 percent funding.

PBGC Premiums. SE-PIMS models premiums based on the rate under current law with projected rates increasing under the fixed increases and indexing provisions in current law. There is no allowance in premium projections for write-offs of uncollectable premiums. Premiums are assumed paid by the employer.

Variable-Rate Premiums. PBGC's experience has been that many companies make plan contributions in excess of the minimum, in part to avoid or reduce their variable-rate premium payments. Virtually all of these companies have been at a low risk of bankruptcy, and their plans have not accounted for a material portion of PBGC's claims. By contrast, the relatively small number of plans that result in claims are sponsored by companies that have not made contributions above the required minimum for an extended period prior to the claim. Using the general PIMS projections that companies will make the minimum required contributions would overstate the estimate of PBGC's variable-rate premium income. Accordingly, for variable-rate premium projections only (i.e., not for ongoing funding), the SE-PIMS model reflects an adjustment to plan assets phased in over five years to offset the assumption that plans generally contribute at the minimum. The adjustment to assets also reflects increasing tendencies for sponsors to reduce underfunding through extra contributions as variable-premium rates increase. Variable-rate premiums are further scaled to match recent experience. This report reflects a one-year delay in the portion of asset increase related to premium rates in order to better match PBGC's actual experience in variable-rate premium collection as premium rates rise.

PBGC's Assets. Projected returns are based on analysis of historical returns, return volatilities, and correlations between the different asset class returns. Investment portfolio risk is gradually reduced as PBGC's funding status improves in accordance with the formal investment policy which calls for increasing the allocation to long-term fixed income investments as the Single-Employer Program's funding status improves.[33]

Discounting Future Claims. When SE-PIMS discounts future amounts, the discount factor is a single interest factor which approximates / projects the curve actually used for PBGC's financial statements with an assumed reversion to the relationship of market interest rate and annuity pricing factors observed prior to the 2008 financial crisis. Those factors are based on a survey of private-sector annuity market prices.

Determining Discounted Future Present Values Shown in Report Tables. For calculations involving discounting future amounts, the discount rate used is the simulated 30-year Treasury rate generated for the particular year and economic path.

(For additional information on SE-PIMS and the assumptions used in running the model, see PBGC's *Pension Insurance Data Book 1998*, Pages 10-17, which also can be viewed on PBGC's website at http://www.pbgc.gov/documents/1998databook.pdf.)

The FY 2018 version of SE-PIMS recognizes the following changes in assumptions from those used in the FY 2017 version of the model.[34]

Mortality Table used to Determine the Amount of Underfunding at Termination: The Blended RP-2014 Healthy male mortality table times 1.09, projected to 2032 using the MP-2017 scale. This table was updated to approximate the generational mortality tables used for the FY 2018 Annual Report.

Mortality Table used to Determine Plan Experience: For purposes of determining plan experience, updates to the table were modeled by changing this assumption to 1.09 times the Blended RP-2014 annuitant and non-annuitant tables projected to the valuation date using the MP-2017 scale (using just the ultimate improvement rates for all years after 2018). The anticipated experience for plans was updated to reflect emerging long-term mortality experience in general, as reported by the Society of Actuaries.

Investment Policy Modeling: Prior SE investment policy modeling had been developed when the SE program had been reporting substantial deficits. That modeling assumed an abrupt shift in policy to eliminate most investment portfolio risks at any projected point where the program's funding status is improved to the extent of having assets exceeding 130 percent of its liabilities. As the Single-Employer Program's financial position has greatly improved in recent years, PBGC has adopted an investment approach where investment portfolio risk is gradually reduced as its funding status improves. The investment policy modeling in SE-PIMS is also changed to follow that new policy.

---

[33] https://www.pbgc.gov/sites/default/files/april-2019-ips-pbgc.pdf.

[34] This list excludes changes that arise merely from changes in economic conditions or from annual updates, for example changes in interest rates and asset returns, or one additional year of mortality improvement.

SAMPLE STATISTICS FROM FY 2018 RUNS IN ME-PIMS AND SE-PIMS

The following tables show selected output statistics from runs of ME-PIMS and SE-PIMS for this report. These statistics are specific to the model runs for this report.

Table 1

Arithmetic Means, Standard Deviations and Correlations of Key Financial Market Values FY 2018 Single-Employer and Multiemployer Model Runs
(across 2019-2028 for 500 economic paths)

	Long-Term Treasury Yield	Return on 30-year Treasury Bonds	Stock Market Return
Mean	3.3%	3.2%	9.0%
Standard Deviation	1.2%	8.7%	20.1%
Correlations:			
Long-Term Treasury Yield	1.00	-0.30	-0.00
Return on 30-year Treasury		1.00	0.20
Stock Market Return			1.00

Table 2

Arithmetic Means and Standard Deviations of Market Rates Derived from Projected Long-Term Treasury Yields in FY 2018 Single-Employer and Multiemployer Model Runs

	Long-Term Corporate Rate	Inflation Rate	Wage, Salary and Flat Benefit Growth Rate
Mean	4.4%	2.8%	4.4%
Standard Deviation	1.2%	1.1%	1.2%

Table 3

Projected Plan Returns[35]
FY 2018 Single-Employer and Multiemployer Model Runs

Arithmetic Mean	5.9%
Geometric Mean	5.5%
Standard Deviation	10.2%

Table 4

Projected Annual Bankruptcy Probabilities[36]
FY 2018 Single-Employer Model Runs

Arithmetic Mean	0.5%
Standard Deviation	1.3%

Table 5

Annual Rate of Plans' Projected Insolvency
FY 2018 Multiemployer Model Runs
Assuming MPRA Election Rates

Arithmetic Mean	0.9%
Standard Deviation	0.2%

---

[35] The geometric rate of return reflects that negative asset returns set plans back more than positive returns help them, by reducing the base of assets. This is particularly important for plans whose benefit payments exceed contributions.

[36] The bankruptcy probability modeling methods and results are more fully described in Boyce, S. and Ippolito, R.A. (2002), The Cost of Pension Insurance. Journal of Risk and Insurance, 69: 121–170. doi: 10.1111/1539- 6975.00012.