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RE: PRAD Single-Employer Contribution Policy Assumption
SE-PIMS, FY 2019 Projections Report

The requirements and incentives for employers to make contributions to their pension plans have changed during the past decade and have evolved rapidly in the past several years, as the variable rate premium (VRP) has increased and the per participant cap has become applicable for many plans. In response, PRAD updated the assumption used to project future single-employer plan contributions in SE-PIMS for the FY 2019 Projections Report. The level of contributions assumed has a material effect on projection results. It impacts the funded status of plans which then impacts both the level of variable rate premium paid and the amount of underfunding included in projected PBGC claims.

The single-employer contribution assumption adopted for the FY 2019 Projections Report is intended to reflect plan sponsor behavior that has been observed in recent years. The contributions reflect approaches associated with the economic circumstances faced by each plan in each SE-PIMS scenario. This should represent actual plan sponsor behavior better than the prior assumption and allow for modeling of proposed legislative changes, such as changes in minimum funding rules and premium rate changes, in a more effective way.

Each year plan sponsors make contributions substantially in excess of the minimum requirement (see Appendix B). Decisions about pension contributions are based on a variety of legal requirements and financial incentives that have differing impacts in different circumstances. Many aspects of a sponsor's financial situation and the state of their pension plan, together with the state of the overall economy and the financial markets might impact how they approach determining an amount to contribute each year. The perspective of each plan sponsor differs, too, so different decision-makers might make different decisions in the same circumstances.

The objective of the assumption is to reflect the key incentives, and generally how those incentives might change based on plan status and in different economic circumstances. This should provide a realistic projection of how plan sponsor contributions will impact PBGC's premium income and future financial status. In addition, the assumption is structured to shift contribution incentives as the legislative or regulatory framework evolves, for example if variable rate premium rates or minimum contribution requirements are changed.



SE-PIMS Contribution Assumption prior to FY 2019

Prior versions of SE-PIMS assumed that plans made minimum required contributions (with maximum use of credit balance) as a baseline. In addition, for the purpose of projecting future PBGC premiums, two adjustments were made. The first adjustment represented, in a general way, that plan sponsors make contributions higher than the minimum requirement for a variety of reasons. The second adjustment reflected the increasing incentive to make additional contributions due to higher variable premium rates. These adjustments were made only to the extent they impacted the variable premium estimate in the simulation but were not included in the plan assets used to estimate claims.

Reasons for Change

A review of the SE-PIMS contribution assumption was undertaken primarily because VRP collections have been higher than projected in recent years. Contribution behavior by plan sponsors is a key driver of VRP revenue, which is a key factor in SE PIMS' projection of PBGC's future financial position. SE-PIMS uses a scaling factor to reconcile the initial premium estimate calculated by the model with actual observed premium income. The scaling factor is the ratio of the actual premium income in the latest year available, e.g. for 2019 for the FY 2019 Projections Report, to the premium estimate for that initial year by SE-PIMS. It compensates for any systematic inaccuracies in the model and is applied to all future years in the model projections. This scaling factor had become large which was an indicator that the contribution assumption could be improved.

The approach used to estimate contributions in prior versions of SE-PIMS did not represent the variety of behaviors practiced by different plan sponsors and by the same plan sponsors in different years. Most importantly, plan sponsors that benefit from the per participant cap on variable premiums generally contribute less, which was not factored into the prior approach. Under the prior assumption, modeling expected changes in contribution behavior due to proposed changes to the Adjusted Funding Target Attainment Percentage (AFTAP)¹, minimum contribution requirements, or the per participant cap on variable premiums required comprehensive modification of the assumption. The structure of the new approach allows modeling of expected changes in behavior by simply adjusting parameters.

Per Participant Cap on VRP

Reducing PBGC premiums is a key incentive to make excess contributions for corporate pension plan sponsors. The prior contribution assumption in SE-PIMS did not recognize that the per participant cap generally reduces that incentive. Some plan sponsors are willing to pay the variable rate premium even as the rate increases, in part because of the cap. The chart below is from a webcast on contribution strategies put on by the Conference of Consulting Actuaries early in 2020 while the new contribution assumption was being developed. It shows that many plan sponsors fund just enough to eliminate the variable premium. It also shows that others have not eliminated the premium and that many of those benefit from the per participant cap on the variable premium.

¹ The AFTAP is equal to the assets of a plan after subtracting credit balances, divided by the PPA funding target. If the AFTAP for a plan is under 80%, then plans are restricted from paying lump sum benefits and certain other types of benefit payments.

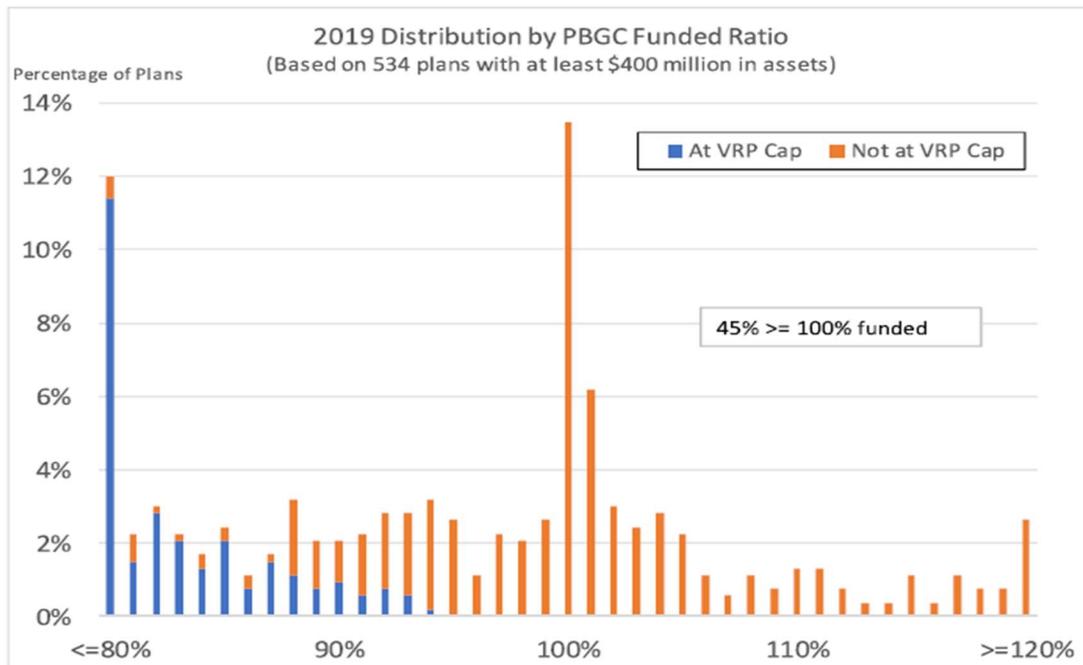


Chart published with permission of October Three. The following plans were excluded from the analysis: non-calendar year plans, those engaged in a merger or spin-off during 2019 and those funded below 80% in both 2010 and 2019 or funded above 120% in both 2010 and 2019

The tables below show how the per participant cap is likely influencing plan sponsors’ decisions to try to eliminate the VRP. In each table, the final column shows the “return” received by reducing the VRP, expressed as the amount of the VRP reduction achieved if the contribution shown in the first column is made, divided by the contribution amount. The economic choice that faces a plan sponsor is whether to put additional money into the plan to generate investment earnings and to reduce the PBGC premium vs. alternate uses of cash, such as funding corporate investment or debt reduction. The total rate of return for the additional contribution, including premium reduction, can be compared to a company’s cost of capital to inform a decision about the level of contribution to make to the pension plan. A plan sponsor’s choice to not fully fund the PBGC Vested Benefit Liability (VBL)² has a similar effect to borrowing from the pension plan at the rate equal to a low-risk interest rate such as Treasury yields, plus the return on premium reduction rate, adjusted for taxes.

Table A shows the effect of different potential contribution amounts for a plan sponsor that benefits from the per participant cap on variable premiums. Table B shows a plan with the same level of funding but with more participants (lower levels of benefit) that does not benefit from the cap. Table C also shows a plan that does not benefit from the cap but for a different reason -- because it is already funded at a high level to reduce the variable premium below the cap.

² The PBGC variable rate premium is determined as a percentage of the unfunded VBL and can be thought of as part of the rate paid to, in concept, borrow from the pension plan by not fully funding.



The first row in each table shows the situation with no contribution as a reference point for the other situations with different levels of contribution. The remaining rows show the return (from lower premium, but not including any investment return on additional assets in the pension fund) achieved by making contributions that lower the variable rate premium. In the second row of Table A, the plan sponsor chooses to make a \$50M contribution but would see no VRP reduction because the cap would still apply even after the \$50M contribution is made. The return available from higher levels of contribution is limited by the benefit being received from the cap. The other two tables show that the return on premium reduction is 4.5% of the contribution - the full effect of the premium rate (\$45 per \$1,000 of unfunded VBL in 2020). This higher return shown in the second two tables illustrates the stronger incentive to make additional contributions to the plan if the cap does not apply.

Impact of Four Contribution Levels on VRP
(numbers in 000's)

A. Impact from per participant cap

Contribution	Participants	Assets after Contribution	VBL	UVBL	VRP, no cap	VRP, with cap	Return on premium reduction
\$0	10,000	\$800,000	\$1,000,000	\$200,000	\$9,000	\$5,600	n/a
50,000	10,000	850,000	1,000,000	150,000	6,750	5,600	0.0%
100,000	10,000	900,000	1,000,000	100,000	4,500	4,500	1.1%
200,000	10,000	1,000,000	1,000,000	0	0	0	2.8%

B. More participants - no impact from per participant cap

Contribution	Participants	Assets after Contribution	VBL	UVBL	VRP, no cap	VRP, with cap	Return on premium reduction
\$0	17,000	\$800,000	\$1,000,000	\$200,000	\$9,000	\$9,000	n/a
50,000	17,000	850,000	1,000,000	150,000	6,750	6,750	4.5%
100,000	17,000	900,000	1,000,000	100,000	4,500	4,500	4.5%
200,000	17,000	1,000,000	1,000,000	0	0	0	4.5%

C. Higher funded level - no impact from per participant cap

Contribution	Participants	Assets after Contribution	VBL	UVBL	VRP, no cap	VRP, with cap	Return on premium reduction
\$0	10,000	\$900,000	\$1,000,000	\$100,000	\$4,500	\$4,500	n/a
50,000	10,000	950,000	1,000,000	50,000	2,250	2,250	4.5%
100,000	10,000	1,000,000	1,000,000	0	0	0	4.5%



Modeling Legislative Changes

The new approach to projecting future sponsor contributions also makes it easier to model effects of changes in the minimum required contribution (MRC) rules. For example, if MRC rules are relaxed so that the MRC is lower, plans will be more likely to contribute additional amounts above the new, lower MRC. The new contribution projection approach includes parameters to adjust the percentage of plan sponsors that choose contribution levels based on the MRC and the portion of credit balance used to represent this kind of shift in behavior.

Research Method

The new assumption was created based on a framework of contribution incentives and the specific parameters were determined based on back-testing. The framework was based in part on a 2017 analysis commissioned by the PBGC that cataloged different approaches and mapped them to specific behaviors and incentives. This analysis was based on publicly available data through 2014. Since 2014, funding relief (reducing MRC levels) has been extended by the Budget Act of 2015, and PBGC variable premium rates have increased significantly. Actual sponsor contribution data through 2018 was used to analyze and support the new assumption.

Actual contribution data shows that many sponsors continued to contribute amounts above the MRC even when their plan was funded well above the VBL. In addition, data shows some sponsors are not aggressively trying to eliminate the VRP. The impact of the per participant cap in dampening the economic incentive to reduce underfunding has become more apparent in recent years as the VRP rate has increased. These observations and the prior experience of PRAD's actuaries understanding plan sponsors' contribution decisions were used to generate contribution assumptions for testing. Approaches for modeling contributions were compared to actual contributions for plans at different levels of funding over the period 2013 – 2018. Recognition of the effect of changing corporate tax rates on contributions in 2017 (contributions increased ahead of tax rate reduction in the *Tax Cuts and Jobs Act of 2017*) and 2018 (contributions decreased after the higher contributions made in 2017) was part of this back-testing process.

Back-testing included analyzing the contribution patterns under a variety of factors including frozen plans, plan size, corporate financial status using PIMS bankruptcy probability as a proxy, and actual contribution levels. The key back testing results, showing the comparison of actual contributions from 2013 – 2018 to the contributions generated by the new assumption, are included in the Appendix.

The following pages describe the new SE-PIMS contribution assumption in detail. The assumption is a key factor influencing PBGC's projected future premium income, future claims, and future financial status. The variety of incentives and individual sponsor situations at play make this assumption complex. The assumption continues to be analyzed and is the subject of a current peer review study of the SE-PIMS model.



SE-PIMS Contribution Assumption for FY 2019 Projections Report

Plan sponsor contribution behavior is assumed to be motivated primarily by three incentives:

1. Meeting minimum contribution requirements (MRC).
2. Reducing the PBGC variable rate premium (VRP).
3. Maintaining a certain funded level.

Each plan sponsor is assumed to use a mix of contribution behaviors driven by these incentives. The contribution projected under the assumption for any particular plan is not necessarily based on a single approach but might be a portion of one approach and a portion of another approach to represent that different plan sponsors make different decisions in the same circumstances.

These incentives are assumed to influence plan sponsor behavior as follows:

1. Plan sponsors are assumed to meet the legal requirement to make the MRC, except in the case of severe financial distress prior to bankruptcy. Plan sponsors may not choose to contribute more than the MRC in order to use funds for other purposes. The other incentives - reducing the VRP and targeting a specified funding level - push contributions higher than the MRC. In addition, it is assumed that plan sponsors choose to preserve their credit balance and therefore may not use the full amount of credit balance available, even if the contribution amount is based on the MRC. If the MRC is decreased through legislation, plan sponsors may place relatively more importance on other incentives and the contribution assumption parameters can be adjusted to reflect such a change in law.
2. As the VRP rate rises, the incentive to reduce or eliminate the VRP is assumed to increase and this is a key driver of projected contribution behavior. The VRP cap decreases the effective VRP rate and thus mitigates the influence of this incentive.
3. Some plan sponsors choose to maintain the current plan funding level or seek to regain any prior, higher level of plan funding since it may represent a funding objective benchmark. Plan sponsors may be targeting certain levels of funding and would make additional contributions to regain that level or to make progress toward that level if the plan's funding level drops.

Two other motivations – to minimize benefit restrictions by funding to 80% of PPA target liability and eliminate contributions prior to a distress termination - are also utilized but have only minor impact because there are few plans in these situations.

Under the new assumption, these various incentives and motivating factors are translated into specific contribution amounts based on the following rules. Plans that are already funded to or beyond the 100 percent of the VBL are assumed to be motivated by different factors than plans that have not funded to that level. The PBGC Vested Benefit Liability (VBL) is used as the primary measure of funded status because it is based on spot (unsmoothed) interest discount rates and reducing the unfunded VBL is a primary funding objective for most plan sponsors.



1. **Plans funded above 100% VBL within the last three years will make the largest of the following.**³
 - a. Maintain the VBL funded status by continuing to make contributions, potentially based on corporate pension accounting liabilities or service cost. The contribution is assumed to be a multiple of PPA⁴ normal cost with the multiple decreasing as plan funded status increases.
 - b. If the VBL funded ratio drops, seek to regain the highest VBL funded ratio in the last 3 years, making up 30% of the deficit relative to the higher funded ratio in each year.
 - c. If the VBL funded ratio drops below 100%, seek to eliminate the Unfunded VBL (UVBL) over a period of years, eliminating up to 5% of VBL underfunding each year.

2. **Plans that have not been above 100% VBL in the past three years will make contributions that reflect a combination of possible contribution behaviors based on the AFTAP or VBL ratio. The combination of different behaviors represents that plan sponsors in the same circumstances may use different approaches.**³
 - a. For plans with an Adjusted Funding Target Attainment Percentage (AFTAP) below 80%, a combination of these contributions with the mix between i) and ii) varying based on the size of the contribution needed to eliminate any funding restrictions.
 - i) Eliminate any benefit restrictions by funding to 80% on a PPA basis as soon as possible; and
 - ii) Conserve cash for other purposes by making only the minimum required contribution, using 90% of the available credit balance.

 - b. For plans with an AFTAP above 80%, the sponsor will make a combination of these contribution levels with the mix between i) and ii) varying based on the effective VRP rate being paid.
 - i) The sum of these two contributions:
 - (1) Reduce the VRP by seeking to eliminate the UVBL over a period of years, eliminating up to 5% of VBL underfunding each year; plus
 - (2) Seek to regain any higher funded ratio in the past 3 years over a period of years, making up 30% of the deficit relative to the higher funded ratio in each year.
 - ii) Conserve cash by making only the minimum required contribution, using 90% of the available credit balance.

One of the most significant aspects of this structure is the assumed portion of plan sponsors using funding approach 2.b(i) versus the assumed portion of plan sponsors using funding approach 2.b(ii). The allocation toward 2.b(i) (funding to reduce the VRP) is increased as the VRP rate increases, but is reduced if the per participant cap applies, as explained in the next section on Parameter Details. The assumed portion of plan sponsors using funding approach 2.b(i) is referred to as the “VRP factor” below and is represented as “VRP%” in the Allocation Table in the next section.

³ Minimum required contributions are applied as a floor for all situations.

⁴ PPA in this document refers to the original Pension Protection Act rules as amended for “funding relief” by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Highway and Transportation Funding Act (HAFTA)



Contribution behavior 2.b(i) assumes that plan sponsors will be seeking to reduce the variable rate premium, but that they will not necessarily want to fully fund the VBL immediately. The rate at which the unfunded VBL is paid off is explained below.

Contribution behaviors 2.b.(i)(1) & 2.b.(i)(2) are combined to represent the situation where a plan sponsor is primarily focused on eliminating the VRP and falls back from a previously achieved level of funding and corresponding VRP. For example, a plan sponsor that had achieved 96% VBL funding would be assumed to fully fund the VBL in the next year (contribute 4% of VBL). However, if the plan then fell back to 93% VBL funded, they would be assumed to fully fund the VBL over two years (contribute only 3.5% of VBL). In this situation, the plan sponsor is also assumed to be motivated to make up some of the funding progress that had been made, by making an additional contribution of 30% of the drop in funding or $30\% \times 3\% = 0.9\%$, for a total VRP-motivated contribution of 4.4%. This 4.4% of VBL contribution would be multiplied by the VRP factor and combined with the MRC-motivated contribution.

The incentive to regain a prior level of funding is assumed to be relevant to some degree for plans above and below 100% VBL funding, but the 30% factor reflects that some plan sponsors will not be influenced by this incentive and that they may not make up all of a loss in funded status within one year.

As seen in the next section on parameter details, discrete ranges are used rather than linear functions for many parameters. For example, for plan sponsors assumed to target reducing the VRP, the unfunded VBL is assumed to be paid off over 3 years (33% of the deficit) for plans with a VBL funded ratio between 85% - 90% and over 2 years (50% of the deficit) for plans with a VBL funded ratio between 90% - 95%. This would result in a plan that is just above 90.2% funded contributing 4.9% of VBL and a plan that is 89.8% funded contributing 3.4% of VBL. This result may not represent real life funding decisions precisely but communicating the assumed behaviors with discrete ranges is easier to understand and simplifies the model.

PRAD Single-Employer Contribution Policy Assumption for PIMS FY2019 Projections Report – Parameter Details

The tables and descriptions below provide the specific parameters used to represent SE plan sponsor contribution behavior. Five different behaviors are used:

- AFTAP – eliminate restrictions on benefits that apply to adjusted funding target attainment percentages (AFTAP) below a certain level.
- MRC – comply with minimum funding requirements (MRC).
- UVBL – gradually reduce the unfunded vested benefit liability (UVBL) to reduce the PBGC variable rate premium.
- MAXP3 – seek to regain any prior, higher level of VBL funding in the past three years.
- TNC – maintain a current level of funding by funding the target normal cost (TNC), which is the present value of benefits earned during the year.

The item labeled “VRP%” is the VRP factor and identifies the percentage of plan sponsors assumed to be seeking to reduce the VRP as their primary contribution objective. “PPA TL” represents the PPA target liability and the ratio of adjusted asset values to this target liability determine the AFTAP.



Allocation Table

This table shows the circumstances under which different contribution behaviors are applied and how portions of each plan sponsor’s contribution is allocated to each behavior. The combination of contributions assumed to be made by one plan sponsor represents that some plan sponsors in the same circumstances use one contribution approach and other plan sponsors use another.

Rule	Funded level	Target	Percent of plan sponsor using each approach				
			AFTAP	MRC	UVBL	MAXP3	TNC
PPA	0% - 70%	80% PPA TL		100%			
PPA	70% - 75%	80% PPA TL	50%	50%			
PPA	75% - 80%	80% PPA TL	100%	0%			
VBL	>100% in last 3 yrs	100% MAXP3			100% Max(UVBL, MAXP3, TNC)		
VBL	<100% each of last 3 yrs	100% VBL		1-VRP%	VRP%* (UVBL+ MAXP3)		
Claim	Eliminate last 3 years of contributions to represent financial distress prior to bankruptcy						

Calculation of Contributions

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

1. **AFTAP** - Fund to reach an AFTAP of 80% in one year.
2. **MRC** - Fund MRC using 90% of available credit balance.
3. **UVBL** - Fund the percentage of UVBL from the table below.

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

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

VBL Funded %	< 110%	110-115%	115%
% of Drop	30%	25%	20%

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

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



***VRP Factor – VRP%**

The parameters for UVBL funding are adjusted assuming no plan sponsors would use UVBL funding if the VRP rate was \$0 and all plans would immediately fund their UVBL if the VRP rate was \$100. A baseline VRP rate of \$30 per \$1000 of UVBL aligns with a 50% MRC/50% UVBL split (VRP% = 50%) and the percent of plan sponsors assumed to use UVBL funding is increased when the VRP rate is greater than the baseline rate. The change in parameters is linear between the \$30 baseline and the \$100 maximum⁵. If the VRP rate is \$50, then 64.3% [$50\% + (\$50 - \$30)/(\$100 - \$30) * (1-50\%)$] of plans are assumed to use UVBL funding.

Similarly, if the VRP rate is below \$30, due to legislative changes, or based on the “effective VRP rate” described below, the percent of plan sponsors assumed to use UVBL funding is decreased below 50%. For example, if a plan faces an effective VRP rate of \$20, then 33% [$50\% + (\$20 - \$30)/(\$30 - \$0) * 50\%$] of plans are assumed to use UVBL funding.

If a plan is at the VRP cap, then an “effective VRP rate” is calculated equal to capped VRP/UVBL. The effective VRP rate is compared to the \$30 rate baseline to do the adjustment described above.

If the VRP rate is above \$60, then the “amortization” percentages in the UVBL table (the table under item 3 above) are adjusted. If a plan is 82% funded and the VRP rate rises to \$65, then 34.4% [$25\% + (\$65 - \$60)/(\$100 - \$60) * (1 - 25\%)$] of the UVBL is assumed to be contributed for the portion of the plan assumed to use UVBL funding.

⁵ The \$100 maximum was identified as a level at which it is presumed no plan sponsor would opt to pay the premium since it represents an implicit borrowing cost of a riskless return rate on assets invested in the plan plus 10% – i.e. Treasury yield + 10%. The model assumes that premium rate increases have smaller effects on sponsor contributions after the rate reaches a certain threshold. The baseline threshold is set at \$30 above which point the effects of further rate increases are reduced.



Appendix A – Sample Calculations

Example A.1 - Plan funded < 100% of VBL in each of last three years

Rule	Funded level	Target	Percent of plan sponsor using each approach				
			AFTAP	MRC	UVBL	MAXP3	TNC
PPA	0% - 70%	80% PPA TL		100%			
PPA	70% - 75%	80% PPA TL	50%	50%			
PPA	75% - 80%	80% PPA TL	100%	0%			
VBL	>100% in last 3 yrs	100% MAXP3			100% Max(UVBL, MAXP3, TNC)		
VBL	<100% each of last 3 yrs	100% VBL		1-VRP%	VRP%* (UVBL+ MAXP3)		
Claim	Eliminate last 3 years of contributions to represent financial distress prior to bankruptcy						

Data

- Plan participants = 12,000
- Assets = \$810M
- Vested Benefit Liability (VBL) = \$1,000M (\$1B)
- Funding Target Liability = \$850M
- Highest VBL funded ratio during last three years = 90%
- Minimum Required Contribution (MRC) prior to applying credit balance (MRC) = \$20M
- Credit Balance = \$50M
- VRP rate = \$45 per \$1,000 UVBL
- Per participant cap on VRP = \$561

SE PIMS Contribution Determination

A portion of the contribution is based on reducing the UVBL and a portion is based on making the minimum required contribution but preserving some credit balance. An additional contribution is added based on the incentive of regaining a recent higher funded ratio.

- Determine the contribution based on reducing the UVBL
 - UVBL = \$1,000M - \$810M = **\$190M**
 - VRP = lesser of (\$190M x 4.5%) or (\$561 x 12,000) = **\$6.732M** (per participant cap applies)
 - Effective VRP rate = \$6.732M / \$190M = **\$35.43 per \$1,000**
 - VRP% (percentage of plan sponsors using VRP reduction as contribution incentive)
= 50% + [(\$35.43 - \$30) / (\$100 - \$30)] x (1-50%) = **53.88%** assumed to fund based on UVBL
 - 1 – VRP% = 1 – 53.88% = **46.12%** assumed to fund based on MRC
 - Percentage of UVBL to fund (fund over 4 years)

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

- UVBL Contribution = 25% x \$190M = **\$47.5M**



2. Determine the contribution based on the minimum required contribution
 - MRC Contribution = \$20M – 90% x MIN (MRC, Credit Balance) = **\$2M**

3. Determine contribution to regain prior funded ratio
 - Deficit relative to highest funded ratio during prior three years = 90% - 81% = **9% of VBL**
 - MAXP3 Contribution = 30% x 9% x \$1,000 = **\$27M**

4. Determine total contribution
 - Total Plan Sponsor Contribution = 53.88% x \$47.5M + 46.12% x \$2M + 27M = **\$53.52M**

Example A.2 – Plan funded above 100% VBL

Rule	Funded level	Target	Percent of plan sponsor using each approach				
			AFTAP	MRC	UVBL	MAXP3	TNC
PPA	0% - 70%	80% PPA TL		100%			
PPA	70% - 75%	80% PPA TL	50%	50%			
PPA	75% - 80%	80% PPA TL	100%	0%			
VBL	>100% in last 3 yrs	100% MAXP3			100% Max(UVBL, MAXP3, TNC)		
VBL	<100% each of last 3 yrs	100% VBL		1-VRP%	VRP%* (UVBL+ MAXP3)		
Claim	Eliminate last 3 years of contributions to represent financial distress prior to bankruptcy						

Data

- Assets = \$1110M
- Vested Benefit Liability = \$1,000M (\$1B)
- Funding Target Liability = \$850M
- Highest VBL funded ratio during last three years = 120%
- Normal Cost = \$25M

SE PIMS Contribution Determination

The contribution is determined as the largest of three contributions based on three different incentives.

1. Determine the contribution based on reducing the UVBL
 - UVBL = 0
 - UVBL Contribution = **0**



2. Determine the contribution to regain prior funded ratio
 - Deficit relative to highest funded ratio during prior three years = 120% - 111% = 9% of VBL
 - Percentage of lost funded status to regain

VBL Funded %	< 110%	110-115%	115%
% of Drop	30%	25%	20%

- MAXP3 Contribution = 25% x 9% x \$1,000 = **\$22.5M**

3. Determine contribution based on covering current year benefit accrual
 - Determine percentage of current year PPA normal cost

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

- TNC Contribution = 1.3 x \$25M = **\$35.5M**

3. Determine total contribution
 - Total Plan Sponsor Contribution = MAX(0, \$22.5M, \$35.5M) = \$35.5M



Appendix B – Back Testing Results

The following tables compare actual contributions by plan sponsors to the contribution estimate made according to the new SE-PIMS contribution assumption. The tables represent different plan sponsor circumstances based on the funded percentage relative to the Vested Benefit Liability (VBL). The comparison of estimated contributions to actual contributions at the different levels of VBL funding provided a sense of how the contribution assumption represented actual contribution behavior in different circumstances. The amount of minimum required contribution is also shown to provide perspective on the amount of contribution in excess of the minimum requirement that plan sponsors have made.

In 2017, plan sponsors accelerated their contributions to take advantage of the deduction resulting from the *Tax Cuts and Jobs Act* while higher corporate tax rates were still in effect. Correspondingly, contributions in 2018 were lower. Thus, the back testing for 2017 and 2018 was done on a combined basis.

Table B.1 - 2013 Contribution Analysis				
VBL Funded Percentage	Minimum Required Contribution	Actual Contributions	New SE-PIMS Estimate	Dollar Difference
0% - 60%	\$183	\$1,180	\$229	-\$951
60% - 70%	\$884	\$1,009	\$1,056	\$47
70% - 80%	\$4,416	\$6,116	\$5,445	-\$671
80% - 85%	\$3,071	\$5,594	\$4,490	-\$1,103
85% - 90%	\$2,524	\$7,962	\$6,415	-\$1,547
90% - 95%	\$1,566	\$10,430	\$10,302	-\$129
95% - 100%	\$1,213	\$11,792	\$8,009	-\$3,784
100% - 105%	\$1,541	\$14,984	\$16,147	\$1,163
105% - 110%	\$76	\$2,626	\$5,152	\$2,525
110% - 115%	\$28	\$3,197	\$2,084	-\$1,113
115% - 120%	\$31	\$2,058	\$1,958	-\$100
120% - 130%	\$17	\$1,727	\$2,886	\$1,159
130% - 150%	\$19	\$1,758	\$2,083	\$325
150% +	\$45	\$1,185	\$1,071	-\$114
< 100% VBL	\$13,856	\$44,083	\$35,945	-\$8,137
> 100% VBL	\$1,757	\$27,535	\$31,381	\$3,846
Total all plans	\$15,613	\$71,618	\$67,327	-\$4,292

Amounts in millions. Analysis based on 2014 PBGC premium filings with reported VBL and assets.



Table B.2 - 2014 Contribution Analysis

VBL Funded Percentage	Minimum Required Contribution	Actual Contributions	New SE-PIMS Estimate	Dollar Difference
0% - 60%	\$100	\$1,171	\$126	-\$1,045
60% - 70%	\$1,236	\$1,393	\$1,637	\$244
70% - 80%	\$2,175	\$3,874	\$5,443	\$1,570
80% - 85%	\$1,668	\$5,748	\$5,045	-\$704
85% - 90%	\$1,572	\$8,433	\$9,868	\$1,435
90% - 95%	\$420	\$7,615	\$8,882	\$1,266
95% - 100%	\$281	\$6,341	\$6,325	-\$16
100% - 105%	\$1,070	\$10,729	\$12,094	\$1,365
105% - 110%	\$181	\$5,211	\$7,591	\$2,380
110% - 115%	\$23	\$2,813	\$3,141	\$328
115% - 120%	\$18	\$4,630	\$3,118	-\$1,511
120% - 130%	\$22	\$2,708	\$2,988	\$280
130% - 150%	\$14	\$1,042	\$1,294	\$252
150% +	\$70	\$715	\$791	\$76
< 100% VBL	\$7,452	\$34,574	\$37,325	\$2,751
> 100% VBL	\$1,398	\$27,848	\$31,018	\$3,170
Total all plans	\$8,850	\$62,422	\$68,343	\$5,921

Amounts in millions. Analysis based on 2015 PBGC premium filings with reported VBL and assets.



Table B.3 - 2015 Contribution Analysis

VBL Funded Percentage	Minimum Required Contribution	Actual Contributions	New SE-PIMS Estimate	Dollar Difference
0% - 60%	\$464	\$1,215	\$522	-\$693
60% - 70%	\$1,062	\$3,357	\$2,047	-\$1,311
70% - 80%	\$1,897	\$4,015	\$7,010	\$2,995
80% - 85%	\$576	\$3,689	\$7,811	\$4,121
85% - 90%	\$244	\$6,069	\$7,475	\$1,406
90% - 95%	\$126	\$7,959	\$9,146	\$1,187
95% - 100%	\$140	\$5,683	\$6,763	\$1,080
100% - 105%	\$470	\$16,894	\$11,108	-\$5,786
105% - 110%	\$54	\$4,380	\$4,281	-\$99
110% - 115%	\$14	\$840	\$2,009	\$1,169
115% - 120%	\$18	\$2,630	\$2,782	\$151
120% - 130%	\$11	\$927	\$1,419	\$492
130% - 150%	\$39	\$802	\$943	\$141
150% +	\$65	\$506	\$530	\$24
< 100% VBL	\$4,509	\$31,987	\$40,773	\$8,786
> 100% VBL	\$672	\$26,979	\$23,071	-\$3,908
Total all plans	\$5,181	\$58,966	\$63,843	\$4,878

Amounts in millions. Analysis based on 2016 PBGC premium filings with reported VBL and assets.



Table B.4 - 2016 Contribution Analysis

VBL Funded Percentage	Minimum Required Contribution	Actual Contributions	New SE-PIMS Estimate	Dollar Difference
0% - 60%	\$188	\$2,278	\$232	-\$2,047
60% - 70%	\$1,642	\$2,303	\$2,442	\$139
70% - 80%	\$4,102	\$6,779	\$8,872	\$2,092
80% - 85%	\$1,144	\$5,356	\$6,300	\$944
85% - 90%	\$712	\$9,257	\$7,012	-\$2,245
90% - 95%	\$322	\$12,822	\$8,057	-\$4,765
95% - 100%	\$247	\$8,632	\$7,033	-\$1,599
100% - 105%	\$769	\$22,298	\$14,934	-\$7,365
105% - 110%	\$162	\$7,537	\$6,116	-\$1,420
110% - 115%	\$45	\$4,667	\$4,268	-\$399
115% - 120%	\$16	\$1,800	\$1,803	\$3
120% - 130%	\$25	\$2,545	\$1,890	-\$655
130% - 150%	\$20	\$796	\$886	\$90
150% +	\$74	\$1,017	\$687	-\$331
< 100% VBL	\$8,357	\$47,427	\$39,947	-\$7,480
> 100% VBL	\$1,111	\$40,660	\$30,584	-\$10,076
Total all plans	\$9,468	\$88,087	\$70,531	-\$17,556

Amounts in millions. Analysis based on 2017 PBGC premium filings with reported VBL and assets.



Table B.5 - Combined 2017 and 2018 Contribution Analysis

VBL Funded Percentage	Minimum Required Contribution	Actual Contribution	New SE-PIMS Estimate	Dollar Difference
0% - 60%	\$302	\$278	\$366	\$88
60% - 70%	\$2,457	\$2,985	\$3,574	\$589
70% - 80%	\$4,356	\$11,874	\$11,231	-\$643
80% - 85%	\$2,047	\$6,621	\$9,333	\$2,712
85% - 90%	\$1,667	\$10,181	\$11,497	\$1,316
90% - 95%	\$1,795	\$18,590	\$14,659	-\$3,930
95% - 100%	\$675	\$14,003	\$12,280	-\$1,722
100% - 105%	\$1,119	\$27,680	\$26,557	-\$1,123
105% - 110%	\$443	\$13,902	\$10,873	-\$3,029
110% - 115%	\$96	\$10,914	\$7,025	-\$3,889
115% - 120%	\$105	\$6,106	\$3,552	-\$2,555
120% - 130%	\$49	\$5,432	\$3,945	-\$1,486
130% - 150%	\$63	\$2,444	\$2,746	\$301
150% +	\$130	\$2,605	\$1,447	-\$1,158
< 100% VBL	\$13,297	\$64,531	\$62,940	-\$1,591
> 100% VBL	\$2,006	\$69,084	\$56,145	-\$12,939
Total all plans	\$15,302	\$133,615	\$119,085	-\$14,530

Amounts in millions. Analysis based on 2018 & 2019 PBGC premium filings with reported VBL and assets.