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Bill is a Principal and Consulting Actuary with the St. Louis office of Milliman. Bill joined the Milliman in 1997. Bill's area of expertise is defined benefit actuarial consulting, including both pension and other post-retirement benefits. He manages the production of the actuarial calculations for valuations, cost studies, and liability projections. His clients include corporate, public, and multiemployer plans. He currently serves on Milliman's GASB 67/68 and GASB 74/75 Task Force as well as Milliman's internal Peer Review Committee. Bill recently authored an article as part of Milliman's series on GASB 67/68 implementation titled GASB 67/68: Depletion Date Projections.

Bill is an Enrolled Actuary under ERISA and a Member of the American Academy of Actuaries. He has a BS in Actuarial Science from The University of Illinois.

Michelle Boyles

Michelle Boyles is a consulting actuary with the Hartford office of Milliman. She currently consults on various actuarial projects for a number of employee benefit clients. She joined the firm in 2016.

Michelle provides actuarial and consulting services to both private and public sector retirement systems and OPEB plans. Michelle's work includes delivering actuarial valuations and FASB/GASB accounting disclosures, setting assumptions and modifying plan design to achieve client objectives for workforce management and budget needs, and advising clients on legislative updates and risk mitigation

Michelle is Fellow of the Society of Actuaries, an Enrolled Actuary under ERISA, and a Member of the American Academy of Actuaries. She has an MAS in Actuarial Science from Georgia State University and a BA in Economics from Brandeis University.

Aaron Shapiro

Aaron Shapiro is a consulting actuary in the Little Falls office of Milliman. He joined the firm in 2020.

Aaron has over 20 years of pension and employee benefit consulting experience. He has served as lead actuary to both public and private sector clients and his expertise includes large governmental retirement programs, multiemployer pension plans, church plans, and corporate single employer pension plans. Assignments have included actuarial valuations, GASB 67/68, experience studies, legislative cost analysis, sensitivity analysis, deterministic and stochastic asset liability modeling, union negotiations, zone status projections, plan design consulting, and expert witness testimony.

Aaron has worked with his clients to develop unique client-specific pension risk management frameworks to facilitate the decision making process regarding plan design changes, target funded ratios, and surplus management. He has also worked with his clients to identify the employee impacts of plan design changes including replacement income analysis.

Aaron has presented to boards of trustees as well as senior management and has led trustee education session on actuarial topics.

Aaron is Fellow of the Society of Actuaries, an Enrolled Actuary under ERISA, and a Member of the American Academy of Actuaries. He has a BBA in Finance from Baruch College.

David Kent

David Kent is a Consulting Actuary in the Dallas office of Milliman. He joined Milliman in April 2021 and has previous experience as a Consulting Actuary at RHI/Definiti, LLC and served as a Director in the Retirement Practice at Buck Consultants.

David began his retirement consulting career in 1996 and has experience in both the public and private sector. His corporate and governmental clients rely on him to provide valuations of their defined benefit programs, as well as provide advice on holistic retirement plan design.

His expertise incudes actuarial valuations for defined benefit and retiree medical plans, defined benefit and defined contribution design (qualified and nonqualified), projections to evaluate future retirement design changes, providing actuarial services required under ASC 715-20, 715-30, 715-60, and IAS 19, and analysis, review, and discussion of plan design issues

David has presented at professional conferences and corporate meetings on a variety of employee benefit topics. He has also provided pension plan educational training for employees, staff, and Board Members.

David is Fellow of the Society of Actuaries, an Enrolled Actuary under ERISA, and a Member of the American Academy of Actuaries. He has a BA in Mathematics from the University of Texas in Austin.

Risk-Based Funding Policy Description

Cost Method

Cost method is Entry Age Normal level percent of pay (level dollar if benefits are not pay related)

Asset Method

Market Value of Assets for this example. The policy can accept asset smoothing of up to 5 years with a 20% corridor. However, the policy requires that you must reduce the amortization period by the deferral period used for investment gains or losses so that total gains or losses are not deferred/amortized over a period greater than 15 years. In other words, if five year asset smoothing is reflected, then the maximum amortization period would be eleven years (fifteen less the four years of asset deferrals).

Amortization Method

Layered amortization as a level percent of pay (level dollar amount if benefits are not pay related or if benefit accruals are frozen) determined each year with total deferral period not to exceed 15 years. In addition, the amortization method should not result in negative amortization. Liability changes due to experience gains or losses and assumption changes, are amortized together over the same period. If using asset smoothing, reduce the 15-year amortization period by the deferral period used for investment gains or losses, as discussed above. Once the Funding Policy Shortfall is zero, all bases are eliminated.

Risk Adjustment

The Total Risk Factor is calculated by filling out the Risk Matrix and adding up the total investment risk, plan design risk, and plan sponsor risk. The Risk Load Factor is then determined based on the Total Risk Factor. The Risk Load Factor is added to 100% and the result is multiplied by the Accrued Liability to determine the Funding Policy Liability.

Please see Appendix A for the Risk Matrix and Risk Load Factor.

Contribution Policy

The Risk Based Funding Policy (RBFP) uses a standard normal cost, plus layered amortization approach. However, the Funding Policy Liability is the Accrued Liability adjusted for the risk level of the plan, but no less than 100% of the Accrued Liability.

Funding Policy Liability (FPL) = Accrued Liability X (100% + Risk Load Factor)

Funding Policy Shortfall (FPS) = FPL minus Actuarial Value of Assets (AVA).

Actuarially Determined Contribution (ADC) = Employer's portion of the Normal Cost (NC) plus a layered amortization of the FPS. See above for the maximum deferral period.

Contribution Surplus Account (CSA) = Contributions in excess of the ADC are allocated to a notional account called the Contribution Surplus Account. Contributions below the ADC reduce

the CSA. The CSA is adjusted each year based on actual investment return. The CSA may be used to fund benefit improvements (see below) or to reduce the ADC in future years.

Under the RBFP, plan sponsors must meet the ADC each year through cash contribution or reduction of the CSA. In addition, if assets are greater than the Funding Policy Liability, the plan sponsor contributions may be reduced by the surplus amount. For example, if the ADC equals the normal cost of $1 million, and there is a surplus of $500,000, then the plan sponsor may (1) contribute $1 million or (2) contribute $500,000, utilizing the surplus to meet the remainder of the ADC.

Benefit Improvements may be funded in one of three ways (or any combination of the three):

- Use the CSA
- Make an additional contribution equal to the cost of the benefit improvement. However, if the CSA is below zero, contributions must first be made to bring the CSA to zero before contributions are applied to the contribution required to fund benefit improvements.
- For well-funded plans, no contribution is required, as long as the AVA remains at or above the FPL after the amendment

Transition Elements

The initial FPS is amortized over 15 years for reasonably funded plans. For poorly funded plans, a longer amortization period may be considered for the initial FPS. However, for these plans, the initial ADC under this policy should not be less than the current contribution level.

Risk-Based Funding Policy Rationale

The main goal of a funding policy should be that current plan assets along with future contributions are sufficient to pay for the benefits of all plan members when due. We believe that the funding policy that we have proposed accomplishes that goal. In addition, the policy we have proposed addresses contribution volatility and intergenerational contribution equity and considers the nature of public sector plans and their governance. Each element of our proposed funding policy has a clear intent towards achieving the goal of a healthy and sustainable pension plan.

The Actuarial Cost Method for the proposed funding policy is the Entry Age Normal Level Percent of Pay method. This method spreads costs such that the expected cost each year is reasonably related to the expected cost of the member's benefit and the Normal Cost emerges as a level percent of member compensation. It also allows for a reasonable comparison with plan assets. This method provides a consistent Normal Cost contribution as a percent of pay which helps control volatility and aid public pension plans sponsors in contribution budgeting requirements.

The Asset Method used by the proposed funding policy does not include asset smoothing as a default aspect of the policy. Since asset gains and losses are already amortized based on the Amortization Method, additional smoothing when calculating the Actuarially Determined Contribution effectively extends the amortization period beyond the 15 years that we have targeted to fund the risk adjusted Funding Policy Liability. If the plan would like to use Asset Smoothing in the calculation of the Actuarially Determined Contribution, then it must reduce the 15-year amortization period by the deferral period used for investment gains or losses. We believe that keeping the total smoothing/amortization period to 15 years provides security for plan members while also controlling volatility by spreading out the recognition of gains and losses over an appropriate period of time. Further, by limiting the deferral period, this creates greater intergenerational equity as future generations are not funding the losses of past generations.

The Amortization Policy of the proposed funding policy is to amortize the initial Funding Policy Shortfall (FPS) over 15 years. While we believe that experience gains and losses and assumption gains and losses should be determined separately, we feel that a 15-year amortization period is also appropriate for both. Once the plan has eliminated its FPS, all bases are eliminated. Any excess of assets over the risk adjusted Funding Policy Liability can be used to offset the ADC. We believe this policy provides accountability and transparency of plan costs while also reducing contribution volatility by spreading out the recognition of gains and losses over an appropriate period of time.

All pension plans are subject to various risks. However, the level of risk in a pension plan will differ from one system to the next based on the decisions and circumstances of each plan. We have categorized these risks into three broad components: investment risk, plan design risk, and plan sponsor risk. The Risk Load Factor element of our proposed funding policy attempts to quantify that risk and adjusts the ultimate funding goal based on the Risk Factors of the plan. Plans that take on more risk through riskier investments, more volatile plan design, or less than ideal plan sponsor or plan administration actions are required to make an Actuarially Determined Contribution that is sufficient to achieve a higher risk adjusted funding level. This additional

funding level is expected to act as a buffer to offset the periods when the downside of the risk is realized. Plans with a less risky profile would need a smaller buffer to maintain their funded status, so the Actuarially Determined Contribution would reflect a lower funding target. Under this approach, the plan is funding to an appropriate level to pay all benefits based on the risk taken on by the plan.

The Contribution Surplus Account portion of the proposed funding policy helps to reduce volatility, while also acting as a "score card" to measure how well the plan is following the RBFP. In years where the plan sponsor makes a contribution that is higher than the Actuarially Determined Contribution, the additional amount is accounted for in the CSA. The CSA provides contribution flexibility for the plan sponsor since it can be applied without restriction to the ADC and for benefit improvements. It also keeps the plan accountable since the plan can't make benefit improvements until the CSA is brought back to zero in instances where they do fail to adhere to the funding policy.

Appendix A – Risk Matrix and Risk Load Factor

For each potential plan risk below, evaluate the level of risk exhibited by the plan and/or plan sponsor based on the guidance as well as actuarial judgment. Then, under risk factor, enter a number for that risk. Generally, neutral would be 0, low would be negative, and high would be positive. Once all risks have been assessed, sum the total risk factor and compare with the results table to determine the risk load factor you should apply in determining the funding policy contribution.

Description of Risk	**Analysis**	**Risk Factor**
Investment Risk		
- Portfolio Volatility	Measured by the standard deviation of the expected return: < 4 (*Risk Factor* -3) 4-6 (-2) 6-8 (-1) 8-10 (0) 10-12 (1) 12-14 (2) > 14 (3)	
- Portfolio Liquidity	Measured by portion of the portfolio in illiquid or difficult to sell assets: < 10% (*Risk Factor* 0) 10-20% (1) 20-30% (2) > 30% (3)	
- Well-defined investment policy	Robust investment policy (0) Missing key elements (1+)	

Description of Risk	Analysis		Risk Factor
Plan Design Risk			
- Benefit Accrual	Assess benefit risk:		
		Risk Factor	
	Frozen accruals	-1	
	Career average	-1	
	Final average (4 years or more)	0	
	Final average (less than 4 years)	1	
	Overtime, vacation, sick payout included	1-2	
- Optional Forms	Assess potential for adverse selection or "run on the bank":		
		Risk Factor	
	Traditional annuities, actuarial equivalent forms	0	
	Subsidized optional forms (like free J&S)	1	
	Level Income Option	1	
	Lump sums (other than return of contributions)	2	
- Early Retirement	Actuarial equivalence	0	
	Subsidized factors/unreduced early	1+	
- Disability	none or requires Social Security disability	0	
	Plan determines eligibility or highly subsidized benefit	1+	
- COLA	Sum the following, based on design:	*Risk Factor*	
	none	0	
	fixed rate < 2%	1	
	fixed rate > 2%	2	
	linked to CPI	3	
	Annual minimum rate	1	
	Annual maximum rate	-0.5	
	Lifetime maximum increase	-0.5	
	Delayed start	-0.5	
- DROP	If the plan offers DROP, add 1+ based on design		
- Other	Determined by the actuary		

Description of Risk	Analysis		Risk Factor
Plan Sponsor Risk			
- 10-year average % ADC contributed	95%+ < 95%	0 1+	
- Fiduciary risk	Follows good fiduciary practice Missing key elements (such as annual valuations, completing an experience study every five years, using a reasonable investment return assumption)	0 1+	
		Total Risk Factor	**0**

Total Risk Factor	Risk Load Factor
< 1	0%
1 - 2	5%
3 - 4	10%
5	15%
6	20%
7	25%
8	30%
9	35%
10+	40%

Appendix B - Implementation

As part of our cost method design process we implemented the Risk Based Funding Policy (RBFP) using the hypothetical plan data and the following assumptions:

Basic Plan Information ($'s in Mils)

1)	Plan Assets	$	7,666.50	
2)	Plan Payroll	$	1,539.60	
3)	Normal Cost	$	184.75	Currently 12% of Payroll
4)	Member Contributions		107.77	Fixed 7% of Payroll
5)	Employer Normal Cost	$	76.98	Currently 5% of Payroll
6)	Cost Method: Entry Age Normal			
7)	Current Investment Assumptions:	Assumed Return - 7% Portfolio Volatility - 12%		

8) Future hires are assumed to have similar characteristics to current actives.

9) The Plan is open to new hires and has only one tier.

10) The plan sponsor's fiscal health is moderately strong, but payroll growth was below plan expectations following the Great Recession.

Additional Assumptions Made for the Sample Implementation

11) The Plan is assumed to have a benefit formula based on a 3-year average pay.

12) Retirement benefits include a 1.5% annual COLA

13) Payroll is assumed to increase prospectively at 3.0% per year.

14) The plan sponsor has a history of contributing the ADC

15) The plan has a robust investment policy and follows responsible fiduciary practices

16) The plan is currently 80% funded.

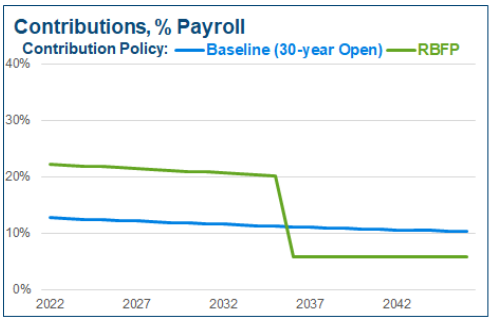
The Risk Matrix completed below for the hypothetical plan results in a risk score of 4 which translates into a funding policy liability equal to 110% of the actuarial accrued liability.

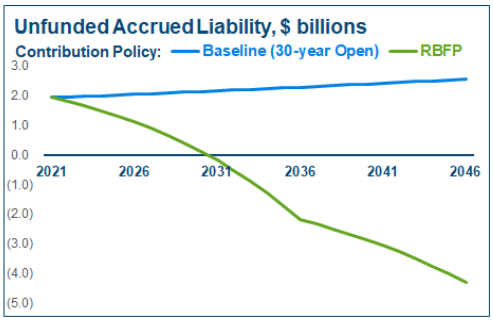
Description of Risk	Analysis		Risk Factor
Investment Risk			
- Portfolio Volatility	Measured by the standard deviation of the expected return:		
		Risk Factor	
	< 4	-3	
	4-6	-2	Standard
	6-8	-1	deviation = 12
	8-10	0	
	10-12	1	1
	12-14	2	
	> 14	3	
- Portfolio Liquidity	Measured by portion of the portfolio in illiquid or difficult to sell assets:		
		Risk Factor	
			Illiquid assets <
	< 10%	0	10%
	10-20%	1	
	20-30%	2	0
	> 30%	3	
- Well-defined investment policy	Robust investment policy	0	Robust Policy
	Missing key elements	1+	0
Description of Risk	**Analysis**		**Risk Factor**
Plan Design Risk			
- Benefit Accrual	Assess benefit risk:		
		Risk Factor	3 year Final
	Frozen accruals	-1	Average
	Career average	-1	Formula
	Final average (4 years or more)	0	
	Final average (less than 4 years)	1	1
	Overtime, vacation, sick payout included	2	
- Optional Forms	Assess potential for adverse selection or "run on the bank":		
		Risk Factor	Traditional
	Traditional annuities, actuarial equivalent forms	0	Annuities only
	Subsidized optional forms (like free J&S)	1	
	Level Income Option	1	0
	Lump sums (other than return of contributions)	2	
- Early Retirement	Actuarial equivalence	0	1
	Subsidized factors/unreduced early	1+	
- Disability	none or requires Social Security disability	0	0
	Plan determines eligibility or highly subsidized benefit	1+	
- COLA	Sum the following, based on design:	*Risk Factor*	
	none	0	
	fixed rate < 2%	1	Fixed COLA of
	fixed rate > 2%	2	1.5%
	linked to CPI	3	
	Annual minimum rate	1	1
	Annual maximum rate	-0.5	
	Lifetime maximum increase	-0.5	
	Delayed start	-0.5	
- DROP	If the plan offers DROP, add 1+ based on design		
- Other	Determined by the actuary		
Description of Risk	**Analysis**		**Risk Factor**
Plan Sponsor Risk			
- 10-year average % ADC contributed	95%+	0	0
	< 95%	1+	
- Fiduciary risk	Follows good fiduciary practice	0	0
	Missing key elements (such as annual valuations, completing an experience study every five years, using a reasonable investment return assumption)	1+	
		Total Risk Factor	**4**

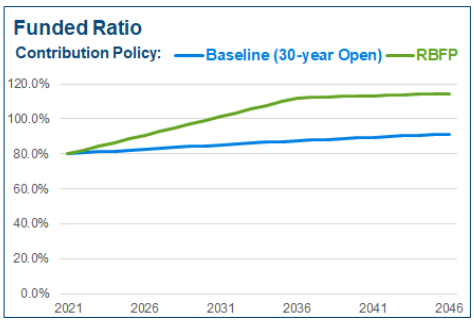
Total Risk Factor	Risk Load Factor
< 1	0%
1 - 2	5%
3 - 4	10%
5	15%
6	20%
7	25%
8	30%
9	35%
10+	40%

We performed deterministic projections for the hypothetical plan under the Risk Based Funding Policy (RBFP) using a 15-year layered amortization and an actuarial value of assets equal to the market value of assets. We have compared the projections against the same plan using a 30 year open level percent of pay amortization.

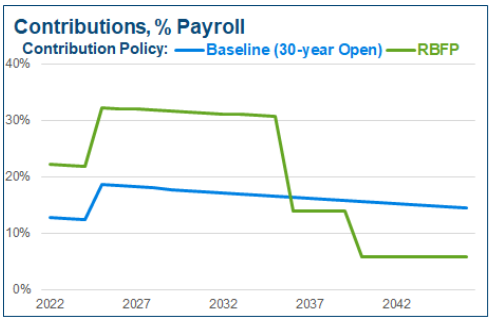
Scenario 1 shows the results of our projections assuming all of the assumptions are met. The RBFP results in higher contribution requirements during the first 15 years. While the baseline traditional 30 year open amortization policy has lower contribution requirements in the short term, the Unfunded Actuarial Liability continues to increase over the projection period.

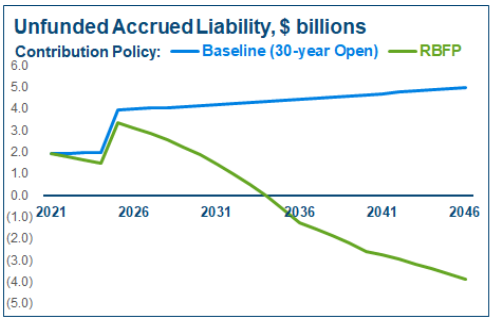


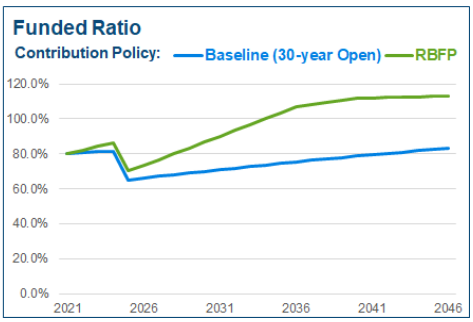




Scenario 2 demonstrates how the proposed and baseline policies react to adverse investment experience. For this scenario we assumed that assets return a -15% during 2023 and earned the assumed rate of return for all other years of the projection. The RBFP contribution requirements significantly increase as the investment loss is amortized over a 15 year period. The baseline method doesn't have as dramatic an increase in contribution requirements; however it never makes up for the increase in UAL and barely recovers to its starting funding percentage by the end of the projection period.

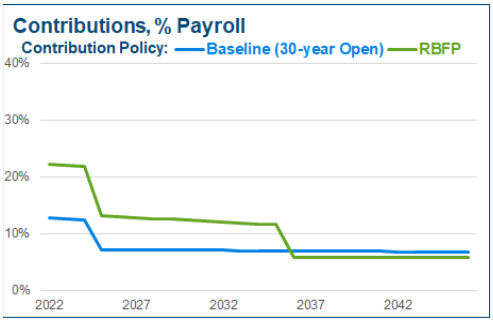


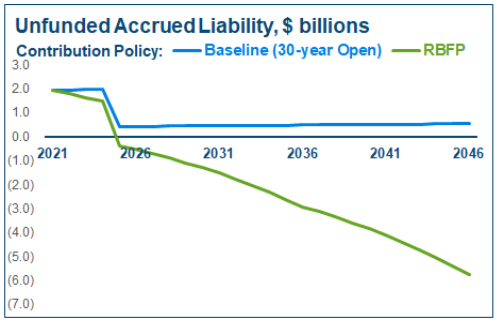


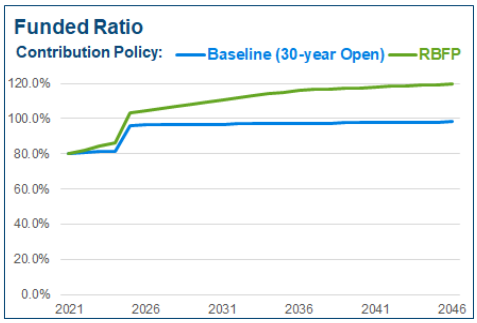


Scenario 3 demonstrates how the proposed and baseline policies react to positive investment experience. For this scenario we assumed that assets return a 25% during 2023 and earned the assumed rate of return for all other years of the projection. Both polices result in a significant decrease in the contribution requirements with the RBFP retaining a higher overall contribution

rate until the plan achieves its funding target. Note under the RBFP the plan sponsor has the option to use assets in excess of the 110% Funding Policy Liability (FPL) to reduce cash contributions. This option was not illustrated in the projections for simplicity.







Conclusion

The RBFP generally results in higher contribution requirements when compared to a traditional open amortization policy until the plan achieves its funding target. This would be the case even if the plan's risk factor was set to zero. The traditional policy has lower initial contributions because it is not paying down its unfunded liability. However over the full projection period, the RBFP results in lower total contributions as contribution requirements are surpassed by the traditional policy under all three scenarios modeled. The RBFP also results in a higher funded ratio over the entire projection period.

The RBFP has higher downside contribution volatility as it fully pays for the adverse experience and does so over a shorter period of time. It is important to note that in these examples the contribution volatility is a direct result of the inherent investment volatility of the plan's investment policy, an investment policy with a lower standard deviation would have lower investment related contribution volatility. We point this out since the traditional open amortization approach doesn't necessarily minimize investment volatility, it simply defers it for future generations of stakeholders. Also note that the RBFP includes a Contribution Surplus Account (CSA) that, if established through excess contributions during good financial years, can be used to smooth out some of the short term contribution volatility due to adverse experience.