



**Texas Employees
Retirement System
Audit of the 2021 Actuarial Valuations**

Bolton

Submitted by:

James Ritchie, ASA, EA, FCA, MAAA

President Bolton Retirement

443.573.3924

jritchie@boltonusa.com

Thomas Lowman, FSA, EA, FCA, MAAA

Senior Consulting Actuary

443.573.3909

tlowman@boltonusa.com

Jordan McClane, FSA, EA, FCA, MAAA

Consulting Actuary

667.218.6935

jmcclane@boltonusa.com

Thomas Vicente, FSA, EA, FCA, MAAA

Senior Consulting Actuary

443.573.3918

tvicente@boltonusa.com



Employee Benefits, Actuarial & Investment Consulting

February 24, 2022

Board of Trustees
Employee Retirement System of Texas
200 East 18th Street
Austin, TX 78701

Re: *Audit of the 2021 Actuarial Valuations for the Employees Retirement System of Texas*

Dear Members of the Board:

Attached is Bolton's actuarial audit of GRS's actuarial valuations of the Employees Retirement System of Texas. We are grateful to the GRS and Texas ERS staff for their assistance and cooperation throughout the audit process. This is a "level two" sample life testing audit. The purpose of the audit is to:

- Validate the results of the August 31, 2021 actuarial valuations for the Employees Retirement System of Texas using appropriate mathematical modeling and review of appropriate sample lives to conclude if the actuarial liabilities are reasonable. The review includes the Employees Retirement System of Texas (ERS), the Law Enforcement and Custodial Officer Supplemental Retirement Fund of the Employees' Retirement System of Texas (LECOS) and the Judicial Retirement System of Texas Plan 2 (JRS2).
- Determine whether the actuarial valuation methods, assumptions and procedures used by the System's actuary, GRS, are reasonable and consistent with all applicable laws, Board policies, and generally accepted actuarial principles and practices; are appropriate for the plan structure and funding objectives; and are applied as stated by GRS.
- Assess whether the valuation results are complete and accurate, and the conclusions of the valuation reports accurately portray the actuarial status of the System.

The plan liabilities are the sum of the liabilities for all of the members. We audited the liability and normal cost calculations that are the heart of these valuations by replicating the results of 50 sample lives that we believe fairly represent the various plans and types of benefits offered by the System. The sample size was based on the concept that it was more important to cover a variety of situations (known as stratified sampling) than multiple common situations, since valuation system errors will often apply to all members with a common set of facts (e.g., in the same plan/tier). Therefore, the sample size and selection process are not the same as might be the case with a data audit, where errors would apply to a single individual.

As part of our review of methods, we have commented on how the funding methods compare to Actuarial Standards of Practice and the guidance provided by the Conference of Consulting Actuaries (CCA) and we have provided recommendations for changes where appropriate.

This audit report includes the following sections:

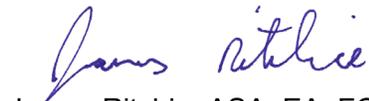
- I. *Executive Summary* – A summary of the key findings.
- II. *Purpose, Scope and Methodology of Audit* – A description of the purpose and limitations of the audit.
- III. *Data Review* – A discussion of the procedures used to validate the participant data.
- IV. *Review of Sample Lives* – A review of the test lives selected and a detailed review of the findings.
- V. *Analysis of Methods and Assumptions* – An analysis and benchmarking of the actuarial assumptions and a review of the actuarial methods utilized in determining the funded status and accrued liability as of August 31, 2021 for compliance with generally accepted actuarial principles and Actuarial Standards of Practice (ASOP).
- VI. *Comments on 2021 Actuarial Valuation Reports* – A review of the valuation reports and results for compliance with actuarial standards and required disclosures under the Actuarial Standards of Practice.
- VII. *Comments on Experience Study* – A review of the most recent experience study.
- VIII. *Conclusions* – Our conclusions and a discussion of potential changes and future studies that the Board should consider.

In addition, Appendix I provides commentary on some of the actuarial aspects of the new cash balance program introduced under Senate Bill 321.

This review was conducted under the supervision of Thomas Lowman FSA, EA, FCA, MAAA and James Ritchie, ASA, EA, FCA, MAAA. All of the undersigned actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. We are not aware of any direct or material indirect financial interest or relationship, including investments or other services, that could create a conflict of interest that would impair the objectivity of our work.

Respectfully submitted,

BOLTON PARTNERS, INC.



James Ritchie, ASA, EA, FCA, MAAA



Thomas Lowman, FSA, EA, FCA, MAAA



Jordan McClane, FSA, EA, FCA, MAAA



Thomas Vicente, FSA, EA, FCA, MAAA





Table of Contents

	Page
Section I. Executive Summary	1
Section II. Purpose, Scope and Methodology of the Audit.....	3
Section III. Data Review	6
Section IV. Review of Sample Lives.....	11
Section V. Analysis of Methods and Assumptions	16
Funding Methods	17
Actuarial Assumptions	21
Section VI. Comments on 2021 Actuarial Valuation Reports	29
Section VII. Comments on Experience Study	30
Section VIII. Conclusions	31
Appendices	33
Appendix I – Cash Balance Program	33
Appendix II – CCA Public Pension Plans White Paper	35



Section I. Executive Summary

The Employee Retirement System of Texas (Texas ERS or the System) retained Bolton Partners, Inc. to conduct an independent review of the System's 2021 actuarial reports' calculations, assumptions and methods. Bolton reviewed the actuarial reports for:

- Employee Retirement System of Texas (ERS)
- Law Enforcement and Custodial Officer Supplemental Retirement Fund (LECOSRF)
- Judicial Retirement System of Texas Plan 2 (JRS2)

Texas ERS requested an assessment of whether the actuarial valuation methods, assumptions and procedures used by the System's consulting actuary, Gabriel Roeder Smith & Company (GRS), are reasonable and consistent with all applicable laws, Board policies, generally accepted actuarial principles and practices, are appropriate for the plan structure and funding objectives, and are applied as stated by GRS. Texas ERS also requested confirmation of the actuarial valuation results, including a determination of actuarial accrued liability and normal cost, and the effects of any recent legislation.

The objective of an actuarial audit is to validate that the liabilities and costs of the System are reasonable, calculated as intended, and in accordance with the assumptions stated in the valuation report and experience study. This audit is a partial replication of the actuarial valuation results and includes a review of the key components in the valuation process that derive the liabilities and costs for the System. These key components consist of the census data, the benefits valued, the actuarial assumptions, funding method, and the asset valuation method. The valuation reports and the valuation output for the plan provide the detail necessary to provide an opinion on each of these key components.

We reviewed all information supplied to us. We also requested and reviewed additional information provided by GRS. Finally, we considered the reasonableness of the actuarial assumptions and methods in the context of our own experience, and those of other governmental pension systems. This report documents our findings, recommendations, and suggestions from the review of the material.

Statement of Key Findings

1. Data

In our review of the data files supplied by GRS (valuation data), we computed key data statistics from the valuation census data and compared them to the summary of data provided in the valuation reports. We found that the data was consistent with the summaries provided in the valuation report with one small exception. The summary of the benefits for JRS2 terminated vested employees were based on the benefits after reductions for assumed early commencement of benefits rather than the benefits prior to reduction (i.e. the normal service retirement benefits). This discrepancy in optics from what is typically shown in valuation reports for members with deferred benefits did not impact the valuation results.

2. Validation of the Accuracy of the Sample Life Results

We developed a model to validate the accuracy of the key results for certain individual plan members. In order to have enough data to make an assessment on the reasonability of the valuation results, we selected 50 *sample lives* that represent an appropriate cross section of



the total participant population for testing all key plan provisions and assumptions. We calculated the present value of future benefits, the actuarial liability, and the normal cost and compared our results to those produced by GRS. In total, the results for the key valuation metrics were reasonably similar to GRS's, but there were some individual samples for which our calculations differed from GRS's. Further details of the differences are discussed in Section IV of this report but have limited materiality for the plans as a whole.

3. Assumptions and Methods

We reviewed the methods and assumptions used in the valuations and concluded that they are generally reasonable, appropriate for the valuations, and appropriately applied in the actuarial models. We also found the assumptions and methods to be consistent with Actuarial Standards of Practice (ASOPs). Additionally, we provided a few considerations, generally related to disclosure, that may improve the presentation or results. These considerations are not material.

4. Experience Study

We reviewed the June 2019 experience study and concluded that the analysis performed in the study is thorough and reasonable and meets Actuarial Standards of Practice.

Conclusions

Our audit validates the findings of the 2021 actuarial valuations and present some suggestions for Board consideration that may improve the quality of the calculations and the valuation reports. These suggestions are detailed throughout this report, with the most impactful items summarized in the *Section VIII. Conclusion*. We commend the Board and the State for their recent progress in greatly improving the financial outlook of the ERS plan.

Section II. Purpose, Scope and Methodology of the Audit

Purpose of the Audit

Texas ERS retained Bolton to conduct an independent review to determine if the System's current actuarial calculations are complete and accurate, and that the assumptions and methods used are reasonable and internally consistent.

Texas ERS requested Bolton to perform a level two independent audit and evaluation of the actuarial services provided by Texas ERS's actuarial consultant, GRS. The audit included, for each of the plans administered by Texas ERS, an evaluation of the reasonableness and accuracy of GRS's most recent valuations (including actuarial accrued liabilities), experience study, and employer contribution rate recommendations. As this engagement was for a level two audit, Bolton did not fully replicate GRS's valuations, but instead used appropriate sampling of participant data to test the valuation results. The audit also included a review and analysis of the actuarial methods and assumptions recommended and used by GRS for appropriateness, internal consistency, and consistency with applicable professional standards.

Texas ERS requested a written report that provides a detailed evaluation of the services provided by GRS; expresses an actuarial opinion regarding the reasonableness, accuracy, and actuarial soundness of the valuation and experience study results, actuarial assumptions, and actuarial methods; and makes any recommendations for improvements by Texas ERS or its actuarial consultant.

Scope of the Audit

The structure of the audit consisted of several phases of review. The first phase assessed GRS's application of the plans' benefit provisions, methods, and assumptions in their valuation model. The assessment encompassed a review of sample lives to ensure internal consistency and that they accurately represented the liability and normal cost values used in determining the appropriate annual contribution amounts. The next phase evaluated whether the assumptions and methods are appropriate and consistent with prior experience as reflected in the experience study, the actuarial standards of practice, and the legislated provisions regarding plan funding. Next, we reviewed the actuarial results communications in the three valuation reports to determine whether these communications accurately and completely communicate the actuarial status of the plans, including through the appropriate calculation of annual employer contribution rates. Finally, for the issues we identified, we analyzed the effect of the errors and discrepancies on the results of the valuations.

Based on the scope, this audit should be able to provide the following:

- Assurances as to whether benefits are being valued appropriately;
- Confirmation that the valuation system is accurately calculating present value of benefits and appropriately dividing these present values into accrued liabilities and normal cost, by verifying a reasonable sampling of each plan;
- Confirmation that the program is valuing benefits as described in the valuation reports and consistent with applicable statutes;

- A review of the demographic actuarial assumptions for consistency with generally accepted actuarial practices and the specific experience of the plans, as documented in the last experience study;
- A measurement of economic actuarial assumptions against those used by other public plans and an assessment of their reasonableness;
- A review of the reasonableness of actuarial funding and asset valuation methods;
- An indication as to whether the liabilities and contribution rates shown are not reasonable or are incorrectly calculated; and
- Recommendations for changes in procedures, methods, assumptions and forecasts of expectations.

Methodology of the Audit for the 2021 Actuarial Valuation

The purpose of this audit is to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, methods, and valuation results.

The measurement of the reasonableness of the funding levels encompasses three key analyses:

- A verification of the benefits being projected for future payment;
- A verification of the appropriateness of the actuarial assumptions that are used in calculating the liability; and
- A verification of the appropriateness of the funding and asset valuation methods.

Benefits Analysis

Critical to projecting future benefits is receiving complete and accurate data. We reviewed the data prepared by Texas ERS to be used in the actuarial valuation. We tested the data for completeness and compared it to the summary information found in the GRS reports.

We developed models that enabled us to compare the results of our sample lives with GRS's results. These models also allowed us to confirm that the GRS valuation projects benefits in a manner consistent with the *Summary of Plan Provisions* in the valuation reports and that the summary is consistent with state statutes applicable to the Employees Retirement System of Texas.

Assumptions Analysis

The second critical component in assessing the reasonableness of the funding levels is the selection and the application of the actuarial assumptions. With respect to the assumptions, we:

- Reviewed the recent GRS Experience Study report presented to the Board in May 2020;
- Benchmarked the economic assumptions against a survey of state and local employee retirement systems and examined several individual test life calculations to ensure that the assumptions were properly applied.



Methods Analysis

The third component in assessing funding levels is the selection and application of the actuarial cost method (including the method for amortizing the unfunded actuarial accrued liability) and the asset valuation method (including smoothing techniques). This includes items unique to a particular system, such as Texas ERS. We compared the funding methods used with (1) best practices, based on the Conference of Consulting Actuary's (CCA)s white paper (included in Appendix II) as well as our own experience, and (2) the overall funding goals of the Board and Legislature.

Section III. Data Review

Method of Data Review

We reviewed the following three sources of data from the retained actuary (GRS) and Texas ERS:

1. The raw data provided to GRS from Texas ERS personnel,
2. The scrubbed data that GRS used in their valuation system to produce valuation liabilities, and
3. Documentation in the actuarial report of any data manipulations or missing data plugs applied to the raw data by GRS before running through their valuation system.

We received multiple data files through the Texas ERS secure file share portal from GRS and Texas ERS.

To confirm that the data used with the valuation software is the underlying basis for the resulting liabilities, we calculated certain statistics from the scrubbed data provided by GRS and compared those statistics to those reported in the valuation reports.

Additionally, we reviewed the actuarial report for any adjustments GRS may have made to the data to provide an opinion as to whether any assumptions about missing or incomplete data was reasonable.

Summary of Data Review Findings

Based on our review of the data used to determine the liabilities in the August 31, 2021 actuarial valuation reports, we are comfortable that the reconciliation and data scrubbing steps taken were reasonable and that the overall accuracy of the data used is sufficient for determining the valuation liabilities.

We have two suggestions for improvement:

1. The valuation report could provide more detail (than is currently provided on page F-13) on how the valuation payroll is determined. In particular, the report could note that the projected payroll includes assumed new hires for the coming year and also reflects terminations and other exits for the year.
2. Page G-2 of JRS2 report should show the sum of the deferred annuities prior to any assumed early retirement reduction.

Review of Valuation Data

The tables that follow compare our replication of the valuation data's statistics (listed as *Bolton*) and the data statistics provided in the valuation reports (listed as *GRS*). In general, the comparisons are very close, as they relate to participant counts, payroll amounts, and benefit amounts except for the annuity benefits for deferred vested participants from JRS2. As noted above, we understand from GRS that the annuity benefits they showed for deferred vested participants included a reduction for assumed early commencement of benefits. We did not include a reduction in our summation of deferred annuity payments.



Employee Retirement System

Active Members	Male			Female		
	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	57,657	57,655	(2)	79,069	79,051	(18)
Avg. Annual Salaries	\$ 55,253	\$ 55,254	\$ 1	\$ 49,472	\$ 49,472	\$ (0)
Avg. Age	44.1	44.1	0.0	43.9	43.9	0.0
Avg. Entry Age	35.4	35.2	(0.2)	35.5	35.2	(0.3)
Avg. Service	8.7	8.7	0.0	8.4	8.4	0.0

Active Members	Regular State Employees			Elected Class			LECO Members		
	GRS	Bolton	Difference	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	103,893	103,893	-	335	335	-	32,498	32,498	-
Avg. Annual Salaries	\$ 53,442	\$ 53,442	\$ (0)	\$ 75,658	\$ 75,658	\$ (0)	\$ 46,768	\$ 46,768	\$ 0
Avg. Age	44.7	44.7	0.0	54.1	54.1	0.0	41.7	41.7	(0.0)
Avg. Entry Age	36.0	35.8	(0.2)	45.1	45.4	0.3	33.6	33.5	(0.1)
Avg. Service	8.7	8.7	0.0	9.0	8.7	(0.3)	8.1	8.1	0.0

Annuitants	Service Retirees			Beneficiaries			Disabled Retirees		
	GRS	Bolton	Difference	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	108,948	108,948	-	9,279	9,279	-	2,067	2,067	-
Sum of Annual Annuities	\$ 2,398,690,020	\$ 2,397,706,138	\$ (983,882)	\$ 143,415,132	\$ 143,198,598	\$ (216,534)	\$ 19,148,208	\$ 19,145,514	\$ (2,694)
Avg. Annual Annuities	\$ 22,017	\$ 22,008	\$ (9)	\$ 15,456	\$ 15,433	\$ (23)	\$ 9,264	\$ 9,262	\$ (2)
Avg. Age	69.7	69.7	(0.0)	74.6	80.7	6.1	68.3	68.3	0.0

Term Vesteds	TV not Active TRS			TV Active TRS		
	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	11,946	11,946	-	2,921	2,921	-
Sum of Annual Annuities	\$ 145,459,560	\$ 145,458,214	\$ (1,346)	\$ 59,185,404	\$ 59,185,477	\$ 73
Avg. Annual Annuities	\$ 12,176	\$ 12,176	\$ 0	\$ 20,262	\$ 20,262	\$ 0
Avg. Age	50.9	50.9	(0.0)	51.6	51.6	0.0

Term Non-Vesteds	NVT not Active TRS			NVT Active TRS		
	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	115,885	115,885	-	14,298	14,298	-
Sum of Account Balance	\$ 417,307,934	\$ 417,246,447	\$ (61,487)	\$ 72,114,319	\$ 72,114,319	\$ (0)
Avg. Account Balance	\$ 3,601	\$ 3,601	\$ (0)	\$ 5,044	\$ 5,044	\$ (0)
Avg. Age	40.9	40.9	0.0	45.0	45.0	(0.0)

Active Payroll	GRS	Bolton	Difference
Reported Payroll	\$ 7,097,447,703	\$ 7,097,442,212	\$ (5,491)
Valuation Payroll	\$ 7,144,623,435	\$ 7,233,538,445	\$ 88,915,010

Law Enforcement and Custodial Officer Supplemental Retirement Fund

Active Members	Male			Female		
	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	19,652	19,650	(2)	12,846	12,846	-
Avg. Annual Salaries	\$ 50,467	\$ 50,470	\$ 3	\$ 41,109	\$ 41,109	\$ 0
Avg. Age	41.8	41.8	0.0	41.4	41.4	(0.0)
Avg. Entry Age	33.1	33.1	(0.0)	34.1	34.0	(0.1)
Avg. Service	8.7	8.7	0.0	7.3	7.4	0.1

Inactive Members	Service Retirees			Beneficiaries			Disabled Retirees		
	GRS	Bolton	Difference	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	14,409	14,409	-	855	855	-	79	79	-
Sum of Annual Annuities	\$ 82,070,940	\$ 82,070,062	\$ (878)	\$ 3,448,872	\$ 3,448,861	\$ (11)	\$ 717,912	\$ 717,918	\$ 6
Avg. Annual Annuities	\$ 5,696	\$ 5,696	\$ (0)	\$ 4,034	\$ 4,034	\$ (0)	\$ 9,087	\$ 9,088	\$ 1
Avg. Age	63.4	63.4	0.0	73.2	77.1	3.9	69.7	69.7	(0.0)

Term Vested Members	Term-Vested Participants		
	GRS	Bolton	Difference
Count	112	112	-
Sum of Account Balances \$	712,188	\$ 712,173	\$ (15)
Avg. Account Balance \$	6,359	\$ 6,359	\$ (0)
Avg. Age	48.1	48.1	(0.0)

Non-Vested Members	Non-Vested Participants		
	GRS	Bolton	Difference
Count	29,514	29,514	-
Sum of Account Balances \$	8,764,166	\$ 8,764,166	\$ (0)
Avg. Account Balance \$	297	\$ 297	\$ (0)
Avg. Age	36.2	36.2	(0.0)

Active Payroll	GRS	Bolton	Difference
Reported Payroll	\$1,519,867,666	\$ 1,519,868,434	\$ 768
Valuation Payroll	\$1,585,643,659	\$ 1,585,643,361	(297.6)

Judicial Retirement System Plan 2

Active Members	GRS	Male		Female		
		Bolton	Difference	GRS	Bolton	Difference
Count	332	332	-	252	252	-
Avg. Annual Salaries \$	156,627	\$ 156,128	\$ (499)	\$ 154,241	\$ 153,992	\$ (249)
Avg. Age	58.7	58.7	(0.0)	53.2	53.2	0.0
Avg. Entry Age	49.1	49.1	0.0	46.1	46.2	0.1
Avg. Service	9.6	9.6	(0.0)	7.1	7.1	(0.0)

Inactive Members	Participants with Deferred Benefits			Service Retirees		
	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	41	41	-	475	475	-
Sum of Annual Annuities \$	2,640,888	\$ 2,984,803	\$ 343,915	\$ 33,299,880	\$ 33,299,877	\$ (3)
Avg. Annual Annuities \$	64,412	\$ 72,800	\$ 8,388	\$ 70,105	\$ 70,105	\$ 0
Avg. Age	60.4	60.4	0.0	71.0	71.0	0.0

Inactive Members	Beneficiaries			Disabled Retirees		
	GRS	Bolton	Difference	GRS	Bolton	Difference
Count	50	50	-	3	3	-
Sum of Annual Annuities \$	2,749,404	\$ 2,749,363	\$ (41)	\$ 269,880	\$ 269,880	\$ -
Avg. Annual Annuities \$	54,988	\$ 54,987	\$ (1)	\$ 89,960	\$ 89,960	\$ -
Avg. Age	74.7	80.6	5.9	66.3	66.3	0.0

Non-Vested Members	Non-Vested Participants		
	GRS	Bolton	Difference
Count	151	151	-
Sum of Account Balances \$	3,787,509	\$ 3,787,509	\$ (0)
Avg. Account Balance \$	25,083	\$ 25,083	\$ (0)
Avg. Age	63.2	63.2	(0.0)

Active Payroll	GRS	Bolton	Difference
Reported Payroll	\$ 90,640,510	\$ 90,640,490	\$ (20)
Valuation Payroll	\$ 90,868,738	\$ 92,204,303	\$ 1,335,565

Actuarial Standards of Practice

Each of the three August 31, 2021 actuarial valuation reports states:

This valuation was based upon information as of August 31, 2021, furnished by ERS staff, concerning system benefits, financial transactions, plan provisions and active members, terminated members, retirees, and beneficiaries. We checked for internal and year-to-year consistency but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by ERS staff.

In addition, each report further states:

Census Data and Assets

- *The valuation was based on members of [Plan] as of August 31, 2021 and does not take into account future members, with the exception of determining the funding period.*
- *All census data was supplied by ERS and was subject to reasonable consistency checks.*
- *There were data elements that were modified for some members as part of the valuation in order to make the data complete. However, the number of missing data items was immaterial.*
- *Asset data was supplied by ERS.*

While ASOP 23 (*Data Quality*) does not require the actuary to audit the census data, it does require the actuary to determine if the census data is appropriate, sufficient, and reasonable to use for the stated actuarial purpose. GRS does not explicitly indicate if they believe the data is sufficient to perform the actuarial work product. However, the comments in the *Census Data and Assets* section seem to imply that belief. We recommend GRS consider providing an expanded statement in future actuarial valuation reports that explicitly indicates if they believe the data is sufficient.

Also required in ASOP 23, the actuary must disclose the source of the data and the extent to which the actuary is relying on data supplied by others. The actuary notes that the source of the census data is Texas ERS personnel. The actuary also notes that the accuracy of the results presented in their reports are dependent on the completeness of the underlying information and that the plan sponsor is responsible for the validity and completeness of the information provided. In our opinion, GRS's statements in the report meet the requirements of the ASOP with respect to this issue.

The actuary must also note any known significant limitations of the data. As noted in ASOP 23 Section 3.3(b) for inconsistent or missing data:

If the actuary believes questionable or inconsistent data values could have a significant effect on the analysis, the actuary should consider taking further steps, when practical,



to improve the quality of the data. The actuary should disclose in summary form any unresolved questionable data values that the actuary believes could have a significant effect on the analysis, in accordance with section 4.1(d). The actuary also should disclose any significant steps the actuary has taken to improve the data, in accordance with section 4.1(e).

The GRS statement that missing data is immaterial meets this requirement of the ASOP.

Overall, we believe that GRS has appropriately followed the requirements of ASOP 23 regarding the quality of the data and performed a reasonable level of review of the data used to determine the August 31, 2021 liabilities.

Section IV. Review of Sample Lives

Background

This audit engagement includes a review of sample lives as a *level two* audit under the Government Finance Officers Association’s (GFOA’s) *Best Practices* guidelines for actuarial audits. Generally, samples for such an engagement should be selected such that they:

- Collectively encompass a broad spectrum of the various combinations of plan benefits, eligibilities, and valuation assumptions;
- Cover long service and recently hired members, as well as individuals that align with the average age, service, and salaries of the plans;
- Test a variety of coding *switches* within a valuation’s coding such as gender, which is used to determine which mortality rates to use, and various service fields, which can be used for determining benefit eligibility and which decrements to use.

The number of samples selected should balance having enough samples to make an assessment on the reasonability of the valuation coding with the time and resources available during the audit period. Based on the above selection considerations, we requested the following number of sample lives from GRS:

	Count of Sample Lives			
	ERS	LECOSRF	JRS2	Total
Active	13	6	4	23
TV/Refund	4	2	1	7
In Pay	13	4	3	20
Total	30	12	8	50

We selected the most samples from ERS and the least from JRS2 since, within the System, they are the largest and the smallest plans, respectively. Additionally, since the System is mature, with approximately 65% of the System’s liability associated with non-active participants, we selected inactive (terminated vested, terminated nonvested owed a refund of member contributions, or in pay) participants for more than half of the sample life population.

Data Provided

In order for Bolton to perform the replication of the sample life results necessary for a level two audit, Texas ERS and GRS provided Bolton multiple files, notably the following:

- Raw data sent to GRS for processing the valuations
- Final data used by GRS to produce the valuations
- Tables containing decrement assumptions (termination rates, disability rates, retirement rates, and mortality rates/improvement scales) and salary scale assumptions used by GRS for the valuations
- The 2019 experience study report

Methodology

When conducting a sample life audit, auditing actuaries are often initially interested in reconciling differences in the *present value of future benefits (PVFB)* between their audit results and the results produced by the valuation actuary. The PVFB is the total estimated dollar value of providing the benefits under the plan and represents the anticipated ultimate cost of plan benefits.

Generally, matching the PVFB for inactive members (i.e. terminated vested, terminated nonvested, and in-pay individuals) is a relatively straightforward process since they are no longer accruing benefits and their benefits are already determined. There are far fewer unknowns (assumptions and permutations of possible events) with inactive participants. As such, auditing actuaries often will use a fairly narrow margin of difference when comparing results to the valuation actuary. Coding the benefits for active members is a much more laborious process involving service and salary projections, multiple decrements, and benefit projections. Consequently, actuaries may expand their margin of difference for actives to account for such complexity.

Using an actuarial cost method, the PVFB is broken down into the *actuarial accrued liability (AAL)*, the *normal cost (NC)* and the *present value of future normal costs (PVFNC)*. The AAL is the value, in dollars as of the valuation date, that has been accrued as of the valuation date based on the actuarial cost method for providing the benefits under the plan; i.e. the portion of the PVFB that has been accrued through the valuation date. The NC is the value in dollars as of the valuation date assigned to accruing an additional year of service for active members. Under the *Entry Age Normal (EAN)* cost method used for the Texas ERS valuations, liability is accrued as a level percentage of salary. Typically, actuarially determined contributions are a function of an amortization of the unfunded AAL and the normal cost. Given their importance to valuations and contribution development, our sample life comparison in the *Results by Plan* and *Results by Participant* sections below display the differences between the PVFB, AAL, NC, and present value of future salary (PVFS).

It is important to note that pension valuation software has advanced over the years by adding functionality and user flexibility, which in turn has led to an increase in intricacy and complexity. As such, the exact methodology for breaking down the PVFB into its component units (AAL and NC) may differ between valuation systems, even if two actuaries use the same valuation software. Accordingly, actuaries often broaden their range of acceptable differences for the AAL and NC.

Findings

Based on our review of the 50 sample lives, we have the following findings:

1. **In total and by plan, the PVFB, AAL, and PVFS produced by our model closely match (within approximately 2%) those produced for the GRS valuation.**
2. **Some deviations between the GRS and the Bolton results for the NC by plan and the liability for certain individual samples are outside ideal tolerances.**

Some of these differences (such as for #1, #33, and #45 in the *Results by Participant* section presented on the following pages) may be attributable to potential differences between the methodologies employed by the GRS and Bolton software for rounding age and service for decrement and salary scale lookups, as well as entry age and benefit eligibilities.

One notable difference is that GRS used slightly different payroll and benefit projections when calculating NC compared to their PVFB calculation. Bolton used the same payroll and benefit projections in calculating both PVFB and NC. We suggest that GRS consider adding some disclosure around the use of different methodologies for calculating NC and PVFB liabilities.

3. Minor Coding Issues – Areas for Improvement

- a. The Tier 2 and Tier 3 LECO members who terminate with more than 10 years of service, but less than 20 years of service are assumed to receive an unreduced benefit from ERS beginning at age 55 in the GRS valuation. Our understanding of the plan provisions is that an early reduction factor should apply from age 60 and age 62 for Tier 2 and Tier 3, respectively for retirements prior to those ages.
- b. The ERS valuation report notes that eligibility for the elected class service retirement annuity is based on years of elected class service. However, in at least one (#1 in the *Results by Participant* section) elected class member sample, GRS uses the sum of regular employee class service and elected service to determine service retirement eligibility. Given that the elected class members represent a very small percentage (<0.25%) of the active population, this perceived coding error does not have a material impact on the valuation.
- c. The ERS valuation report notes that, for elected class members, disability rates cease upon eligibility for the service retirement benefit. However, in our correspondence with GRS regarding the samples, GRS noted that in at least one (#2 in the *Results by Participant* section) of the elected class member samples, the disability rates did not cease upon retirement eligibility. Similar to the issue noted above, this coding error does not have a material impact on the valuation due to the size of the impacted group.
- d. In the JRS2 valuation report, GRS notes that entry age is calculated as the age on the valuation date minus eligibility service. For three of the four JRS2 active samples that we selected, the eligibility service listed in the valuation census file provided by GRS is greater than judicial service. During discussions with GRS, they noted that entry age in the valuations is determined using only the applicable service in JRS2, not the eligibility service listed in the data. We suggest that GRS add some documentation to the *Eligibility Service* field in the data to denote it is not used for members in the JRS2 plan.
- e. The JRS2 valuation report does not specify the assumed age of commencement for terminated vested members on the valuation date or active members assumed to terminate employment.



Results by Plan

Comparison of Results for Sample Lives

(\$)	ERS			LECOSRF			JRS2		
	GRS	Bolton	% Diff	GRS	Bolton	% Diff	GRS	Bolton	% Diff
PVFB									
-Active	3,624,418	3,618,910	-0.2%	101,287	103,089	1.8%	2,607,276	2,625,462	0.7%
-Inactive	5,421,464	5,409,502	-0.2%	288,421	287,146	-0.4%	3,467,536	3,469,290	0.1%
Total	9,045,882	9,028,412	-0.2%	389,708	390,235	0.1%	6,074,812	6,094,752	0.3%
AAL									
-Active	2,806,043	2,842,082	1.3%	85,127	87,199	2.4%	1,688,936	1,700,571	0.7%
-Inactive	5,421,464	5,409,502	-0.2%	288,421	287,146	-0.4%	3,467,536	3,469,290	0.1%
Total	8,227,507	8,251,584	0.3%	373,548	374,345	0.2%	5,156,472	5,169,861	0.3%
NC	18.74%	17.19%	-8.3%	1.06%	1.03%	-2.5%	25.10%	25.69%	2.3%
PVFS	3,823,578	3,838,875	0.4%	1,210,548	1,227,819	1.4%	3,676,092	3,669,572	-0.2%



Results by Participant

Employees Retirement System											
Participant Information			PVFB			AAL			NC		
#	Plan	Pay Form	GRS	Bolton	% Diff	GRS	Bolton	% Diff	GRS	Bolton	% Diff
1	ERS		587,569	601,627	2.4%	579,365	599,479	3.5%	231.75%	60.68%	-73.8%
2	ERS		295,881	283,145	-4.3%	52,061	48,785	-6.3%	406.66%	389.70%	-4.2%
3	ERS		538,736	528,097	-2.0%	363,505	370,809	2.0%	19.74%	17.41%	-11.8%
4	ERS	LA	252,300	256,945	1.8%	252,300	256,945	1.8%			
5	ERS	LA	904,638	906,091	0.2%	904,638	906,091	0.2%			
6	ERS	10CC	501,622	499,593	-0.4%	501,622	499,593	-0.4%			
7	ERS	100JS w/Pop-up	478,792	479,105	0.1%	478,792	479,105	0.1%			
8	ERS	LA	381,576	379,313	-0.6%	381,576	379,313	-0.6%			
9	ERS		908,934	912,787	0.4%	832,541	838,132	0.7%	14.72%	14.38%	-2.3%
10	ERS		96,790	97,997	1.2%	40,643	44,052	8.4%	10.63%	10.22%	-3.9%
11	ERS		210,757	212,699	0.9%	159,815	161,882	1.3%	15.71%	15.68%	-0.2%
12	ERS		17,216	17,243	0.2%	106	0	-100.0%	10.12%	10.24%	1.2%
13	ERS		284,083	285,120	0.4%	267,312	268,249	0.4%	15.69%	15.79%	0.6%
14	ERS		326,019	327,479	0.4%	291,318	294,240	1.0%	13.68%	13.10%	-4.2%
15	ERS		138,429	138,845	0.3%	107,066	109,513	2.3%	17.29%	16.17%	-6.5%
16	ERS		147,001	141,974	-3.4%	102,851	99,669	-3.1%	12.66%	12.13%	-4.2%
17	ERS		36,320	36,473	0.4%	5,613	4,752	-15.3%	15.74%	16.26%	3.3%
18	ERS		36,683	35,424	-3.4%	3,847	2,520	-34.5%	13.33%	13.36%	0.2%
19	ERS	LA	108,933	108,953	0.0%	108,933	108,953	0.0%			
20	ERS	LA	104,778	104,081	-0.7%	104,778	104,081	-0.7%			
21	ERS	50JS w/Pop-up	707,847	705,115	-0.4%	707,847	705,115	-0.4%			
22	ERS	50JS w/Pop-up	632,071	629,289	-0.4%	632,071	629,289	-0.4%			
23	ERS	75JS w/Pop-up	214,847	214,094	-0.4%	214,847	214,094	-0.4%			
24	ERS	LA	179,052	178,631	-0.2%	179,052	178,631	-0.2%			
25	ERS	100JS w/Pop-up	312,791	311,758	-0.3%	312,791	311,758	-0.3%			
26	ERS	LA	65,248	63,757	-2.3%	65,248	63,757	-2.3%			
27	ERS	LA	48,264	46,965	-2.7%	48,264	46,965	-2.7%			
28	ERS	LA	40,418	39,341	-2.7%	40,418	39,341	-2.7%			
29	ERS	LA	51,090	50,836	-0.5%	51,090	50,836	-0.5%			
30	ERS	LA	437,197	435,635	-0.4%	437,197	435,635	-0.4%			
Total			9,045,882	9,028,412	-0.2%	8,227,507	8,251,584	0.3%	18.74%	17.19%	-8.3%

Law Enforcement and Custodial Officer Supplemental Retirement Fund											
Participant Information			PVFB			AAL			NC		
#	Plan	Pay Form	GRS	Bolton	% Diff	GRS	Bolton	% Diff	GRS	Bolton	% Diff
31	LECOSRF		8,214	8,309	1.2%	7,329	7,437	1.5%	0.67%	0.66%	-1.5%
32	LECOSRF		61,594	61,833	0.4%	58,854	59,158	0.5%	2.56%	2.50%	-2.3%
33	LECOSRF		20,826	22,142	6.3%	11,489	13,043	13.5%	2.18%	2.05%	-6.0%
34	LECOSRF		4,862	4,946	1.7%	3,855	3,913	1.5%	0.60%	0.62%	3.3%
35	LECOSRF		4,577	4,629	1.1%	3,442	3,503	1.8%	0.63%	0.62%	-1.6%
36	LECOSRF		1,214	1,230	1.3%	158	145	-8.2%	0.54%	0.56%	3.7%
37	LECOSRF	LA	1,899	1,899	0.0%	1,899	1,899	0.0%			
38	LECOSRF	LA	2,382	2,382	0.0%	2,382	2,382	0.0%			
39	LECOSRF	100JS w/Pop-up	57,727	57,531	-0.3%	57,727	57,531	-0.3%			
40	LECOSRF	75JS w/Pop-up	157,180	156,514	-0.4%	157,180	156,514	-0.4%			
41	LECOSRF	LA	51,507	51,196	-0.6%	51,507	51,196	-0.6%			
42	LECOSRF	LA	17,726	17,624	-0.6%	17,726	17,624	-0.6%			
Total			389,708	390,235	0.1%	373,548	374,345	0.2%	1.06%	1.03%	-2.5%

Judicial Retirement System, Plan 2											
Participant Information			PVFB			AAL			NC		
#	Plan	Pay Form	GRS	Bolton	% Diff	GRS	Bolton	% Diff	GRS	Bolton	% Diff
43	JRS2		727,420	739,489	1.7%	552,405	556,884	0.8%	30.82%	32.17%	4.4%
44	JRS2		655,619	673,518	2.7%	406,239	413,032	1.7%	31.17%	32.62%	4.7%
45	JRS2		419,424	401,856	-4.2%	97,456	95,968	-1.5%	19.85%	18.91%	-4.7%
46	JRS2		804,813	810,599	0.7%	632,836	634,687	0.3%	25.07%	25.65%	2.3%
47	JRS2	LA	309,756	308,191	-0.5%	309,756	308,191	-0.5%			
48	JRS2	100JS w/Pop-up	1,540,151	1,533,501	-0.4%	1,540,151	1,533,501	-0.4%			
49	JRS2	LA	1,058,446	1,070,786	1.2%	1,058,446	1,070,786	1.2%			
50	JRS2	LA	559,183	556,812	-0.4%	559,183	556,812	-0.4%			
Total			6,074,812	6,094,752	0.3%	5,156,472	5,169,861	0.3%	18.29%	17.81%	-2.7%

Section V. Analysis of Methods and Assumptions

Introduction and Summary

Setting of methods, assumptions, and report disclosures are completed through a mix of data analysis, projections of future trends and plan and employer specific factors. In auditing these elements of the actuarial reports, we relied on industry standards set by the Conference of Consulting Actuaries White Paper on Funding Policies, the American Academy of Actuaries Actuarial Standards of Practice (ASOPs) and survey information from peer pension programs.

There are several ASOPs that cover pension valuation work of this nature:

- No. 4 – Measuring Pension Obligations and Determining Pension Plan Costs or Contribution
 - In general, the report meets the requirements.
- No. 27 Selection of Economic Assumptions for Measuring Pension Obligations
 - In general, the report meets the requirements
- No. 35 Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
 - In general, the report meets the requirements
- No. 41 – Actuarial Communications
 - In general, the report meets the requirements
 - The report does not contain any reference to subsequent events that may impact results such as the COVID pandemic. ASOP 41 section 3.4.6 requires such a disclosure and we believe the pandemic effects are sufficient to have a potential impact.
- No. 44 – Selection and Use of Asset Valuation Methods for Pension Valuations
 - In general, the report meets the requirements
- No. 51 – Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions
 - In general, the report meets the requirements
- No. 56 – Modeling
 - The report meets the requirements

In total we find the reports meet the ASOPs and follow the CCA White Paper guidance. Assumptions and methods largely are in step with those used by other large pension systems. We do have a few areas for consideration and improvement which we review in the following sections. The two issues we outline are the use of mid-year decrement timing and the disclosure of emerging trends. In our opinion, neither issue has any meaningful impact on the results of the valuations.

Mid-Year Timing Issues

All valuation systems project benefits and decrements as annual events. For example, we do not assume there is a chance that someone will become disabled in each of the next 12 months but simply that there is a single probability that a person will become disabled in the 12-month period. In order to simplify the calculation, an actuarial valuation system assumes one point in

time in each 12-month period when a participant is assumed to decrement. Usually the timing is either the beginning of the plan year or the middle of the plan year. GRS's valuation system assumes all exits (i.e. decrements) will happen in the middle of the plan year. This is a common assumption and is probably a better representation of actual events than assuming beginning of year decrements. However, mid-year decrements can result in additional complications compared to beginning of year decrements. For example, using mid-year decrements requires an assumption that a portion of the assumed pay increases (the merit and longevity portion) happens mid-year and a portion (inflation) occurs at the beginning of the year.

The combination of the timing of the pay increase assumptions added a layer of complexity when reviewing the single life tests. For example, there was an issue with the mid-year decrement for an older active member who was several years beyond the year they were assumed to have retired. GRS assumed this person would retire at the middle of the current year. The mechanics of the funding method used to determine liabilities and the normal cost requires a determination of the present value at a point in time in the past, specifically at the date the participant entered the plan. The present value at entry age would assume the participant was fully retired at the last decrement age. Therefore, the calculation of this participant's cost appears to include two conflicting assumptions, one assumption that they were fully retired at an age before the valuation year and one assumption that they retire in the valuation year. GRS's method results in one-half year of normal cost as opposed to no normal cost if a beginning of year decrement assumption timing was used. However, to arrive at GRS's result required changing the assumption of 100% retirement before the valuation date to 0% in order to produce their Normal Cost. In our opinion, either result is reasonable. We could even argue that valuing one-half year cost is more appropriate as it is more likely that everyone that worked beyond the latest assumed retirement date will on average retire evenly throughout the year. We recommend that GRS review their method for valuing the cost for this situation at entry age to ensure all assumptions are consistent.

Disclosure of Emerging Trends

ASOP 41 Section 3.4.6 provides for the actuary to disclose what current events or emerging trends might impact the plans' valuations. These could include statements about the COVID pandemic and its impact on markets, turnover, retirement, inflation or other assumptions. It is largely too early to have strong long-term indicators of the impact of these events on the valuation and assumptions but a disclosure to that effect would improve the reports both from an ASOP standpoint and a readability standpoint.

Funding Methods

There are three key components to the funding methods that are part of any plan's funding policy:

1. An **actuarial cost method**, which allocates the total present value of future benefits into three categories: all past years (Actuarial Accrued Liability or AAL), this year (Normal Cost), and future years (Present Value of Future Normal Cost).
2. An **amortization policy**, which determines the length of time and the structure of the increase or decrease in contributions required to systematically fund any Unfunded Actuarial Accrued Liability or UAAL. In the unusual situation where assets are in excess of the AAL, the policy should state how the surplus assets will be recognized. Since the plan does not have a traditional amortization of the unfunded liability we have also commented on the determination of an Actuarially Determined Contribution (ADC).

3. An **asset smoothing method**, which reduces the effect of short-term market volatility while still tracking the overall movement of the market value of plan assets. This is discussed below in the “Asset Valuation Method” section.

In addition to providing our own opinion on the three methods used by the plans, we compared these methods to the approaches contained in the CCA White Paper on funding methods. The CCA paper also contains rationale and objectives that we will sometimes refer to in this report.

In addition to discussing the funding method components, we have also provided a comment below about one aspect of the System’s funding policy.

We generally find that the funding methods chosen are consistent with appropriate funding practices, except as noted below.

Actuarial Cost Method

The actuarial cost method for the Texas ERS, LECOSRF, and JRS2 plans is the individual entry age normal method. This is a reasonable and common funding method, used by well more than half of all public plans. The individual entry age normal method (EAN) is attractive to public sector employers because the EAN Normal Cost is developed to be level with respect to salary. In other words, the EAN Normal Cost increases at the same rate as salary. Most public sector pension plan sponsors prefer to state their pension contribution as percent of active payroll. Thus, the entry age normal cost method is a natural fit for public sector plans. The individual EAN method is considered a Model Practice in the CCA White Paper.

We support GRS’ use of the individual entry age normal method. However, the use of different benefit projections (and current year salary) to produce a NC rate is not something we would recommend. The difference is not material and we appreciate that the GRS method may be trying to make the NC more level over a person’s career.

As described later in the report, GRS validates the current funding policy by use of an open group projection.

Amortization of Unfunded Actuarial Accrued Liability (UAAL)

The LECOSRF and JRS2 plans do not use a traditional amortization policy. The funding policy is a fixed percentage of payroll contribution (0.5% for LECOSRF and 15.663% for JRS2) as amended from time to time. The ERS plan policy is a fixed percentage (19.5%) plus an additional contribution amount, referred to as the Legacy Payment. This is an amount that is recomputed prior to each legislative session and is the level annual payment that (in addition to the fixed rate contribution) is projected to be sufficient to bring the plan to 100% funding by no later than the fiscal year ending August 31, 2054. The JRS2 and LECOSRF plans do not have any additional funding above the fixed rate contribution and are projected to fully deplete plan assets in the future

The addition of the Legacy Payment contribution is a strong signal of the commitment of Texas to fully fund the ERS plan and has put the plan on a good path to full funding over time. However, from an actuarial practice basis, the long amortization period is beyond what is typically considered sound practice and would not fit under the CCA White Paper as a Model or Recommended Practice.

The valuation reports do not use the term Actuarially Determined Contribution (ADC) but rather

a similar term called the Actuarially Sound Contribution Rate (ASC). We understand that the ASC is a key number for the Board to focus on to decide if the fixed rate funding plus the Legacy Payment (currently \$510 million per year) is sufficient to fund the liability by August 31, 2054 (currently 33 years). The ASC is based on an open group valuation and 33 years is a longer than ideal time to amortize the unfunded liability. We understand that the 33 years will decrease each year, which will make the amortization period more in line with standard practices. We understand that the Legacy Payment amount was determined based on a more traditional ADC calculation. We recommend that the development of the Legacy Payment be disclosed in the actuarial report.

The Actuarial Standards Board publishes a series of Actuarial Standards of Practice (ASOPs) to guide the methods and practices of actuaries. ASOP 4, which discusses funding methods and approaches, has recently been revised and will be published soon. In light of the expected language in the revised ASOP we recommend that GRS and Texas develop a separate and more traditional measure of an Actuarially Determined Contribution (ADC) based on a closed group valuation and shorter amortization period. This could serve as a benchmark for how the current funding policy is doing and whether it is approaching standard practice. It may be 10-20 years before the ASC gets below the level of the ADC but the purpose would be to show when a more traditional contribution level is reached and the progress toward that result. We understand that some parts of the ASC calculation (level dollar payments for the \$510 million) will be more conservative than the ADC (which is likely a level percentage of payroll value).

Asset Valuation Method

An essential part of the public sector budgeting process is that material budget items, including pension contributions, should have a level cost pattern from year to year to the extent possible. Bolton recognizes the importance of this requirement and assists clients in establishing reasonable methodologies for recognizing investment gains and losses and limiting the potential volatility that may result in increased contributions due to investment results.

Assets in the Trust are valued using the expected value of assets with a five-year phase in of the difference between the expected return and the actual return of plan assets. Offsetting unrecognized gains and losses are netted out and the net remaining original bases recognized over its remaining schedule. This method smooths investment gains and losses (that is, investment returns above or below the assumed investment return of 7.0%) The current method does not impose a collar (such as limiting the actuarial value to be between 80% and 120% of market value) and could result in significant differences between the actuarial value of assets (AVA) and the market value of assets (MVA).

This method of offsetting bases has the potential to slow the recognition of gains and losses from investment performance in circumstances with the new (gain)/loss exceeds the existing balance from prior losses/(gains). For example, if a loss of \$500,000 occurred in a year and was the only loss to be amortized, \$100,000 would be recognized over each of the next 5 years. If the next year experienced a gain of \$1,000,000, a net gain of \$600,000 (\$1,000,000 gain minus the \$400,000 loss left to be recognized) would be recognized over the next 5 years (i.e. \$120,000 gain per year for the next 5 years.) This is equivalent to recognizing the gain over 5 years (i.e. \$200,000 per year) and re-amortizing the remaining \$400,000 loss over 5 years (i.e. \$80,000 per year). This results in the original loss of \$500,000 being recognized over 6 years instead of 5 years. The converse is also true. If newer (gains)/losses are less than existing losses/(gains) the recognition is accelerated. Overall, we do not believe this aspect of the method is significant and do not object to the form of active management of the smoothing method.

The actuary's guide for determining the reasonableness of an asset smoothing method is Actuarial Standard of Practice (ASOP) No. 44. The following is an excerpt from this ASOP that establishes the qualities a reasonable asset smoothing method must exhibit.

Actuarial Standard of Practice No. 44

Selecting Methods Other Than Market Value – If the considerations in section 3.2 have led the actuary to conclude that an asset valuation method other than market value may be appropriate, the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. The qualities of such an asset valuation method include the following:

1. The asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.
2. The asset valuation method is likely to produce actuarial values of assets that, in the actuary's professional judgment, satisfy both of the following:
 - The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.
 - Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace that the actuary deems reasonable, if the investment return assumption is realized in future periods.

In lieu of satisfying both (1) and (2) above, an asset valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period.

Two key principles arise from ASOP 44. These are that acceptable asset smoothing must create asset values that fall within a reasonable range around market value and are recognized in a reasonable period of time. In lieu of satisfying both of these principles, a smoothing method could satisfy the requirements if, in the actuary's professional judgment, the range around market value is sufficiently narrow or the differences are recognized in a sufficiently short period.

It can be reasonably argued that the ERS' method does not necessarily meet the first item but does meet the second requirement:

1. The method could result in significant variation from the market value of assets in the event of large asset gains or losses since it does not include a "collar" to keep the actuarial value within a sufficiently narrow range around the market-related value of assets.
2. Phasing in differences between market value and actuarial value of assets will provide for a sufficiently short period for recognizing the differences between the market value and the actuarial value of assets.

The CCA Model Practice includes fixed smoothing periods and a corridor tied to the number of years in the smoothing period.

In our opinion the five-year fixed smoothing period with offsetting gains and losses is a reasonable method for calculating AVA, but we suggest the actuary consider adding a corridor around MVA.

Actuarial Assumptions

A prerequisite to evaluating the reasonableness and accuracy of the October 1, 2021 actuarial valuation reports produced by GRS is a comprehensive review of the actuarial assumptions, methods, and data underlying the results. Since these three components represent the primary inputs to valuation software and contribution development models, any deviations from generally accepted actuarial practices and principles or from requirements specified in state laws and statutes could have a material impact on the results. The sections that follow present our findings based on a review of whether the assumptions are appropriate for the valuations, align with industry best practices through conformance with the relevant Actuarial Standards of Practice (ASOPs), and adhere to law.

Summary

Based on our review of the assumptions used in the August 31, 2021 actuarial valuation reports, we have the following comments:

- The Texas ERS policy of reviewing economic assumptions at least annually is a prudent and appropriate policy.
- The economic and demographic assumptions used in the August 31, 2021 are reasonable, appropriate, and consistent among themselves and among the plans and they comply with the ASOPs.

Overview

Assumptions are used in actuarial valuations for various approximations, including but not limited to expected future (1) economic activity impacting plan benefits (e.g. inflation and COLA), (2) investment activity (e.g. discount rate), (3) demographic experience (e.g. increases in salary, decrements from active employment, and mortality), and (4) unknown data elements (e.g. spouse and dependent information). They are generally long-term in nature due to the duration of pension plan liabilities and the extenuation of expected benefit payments decades beyond the valuation date; however, they are generally derived based on a consideration of expectations in both the near and long term.

Given the collective breadth of the numerous individual assumptions, actuaries often condense them into the following two broad categories for analysis:

- Economic Assumptions
- Demographic Assumptions

As the terminology implies, the economic assumptions are generally dependent on expected future economic activity, typically centering on inflation, whereas demographic assumptions attempt to capture the anticipated interaction of the plan population makeup and participant behavior with the employer and plan provisions. The table below lists the major economic and demographic assumptions reviewed for this actuarial audit along with the approximate impact that changes to each assumption could have on the plans' unfunded liability and contribution development.

Assumption	Impact on Unfunded Liability and Contributions
<i>Economic Assumptions</i>	
Inflation (Price and Wage)	1
Payroll Growth	Low
Cost-of-Living Adjustments	Low
Discount Rate	High
<i>Demographic Assumptions</i>	
Service Retirement for Active Participants	Medium
Service Retirement for Inactive Participants	Low
Disability	Low
Employee Termination	Medium
Pre-Retirement Mortality	Low
Healthy Mortality (post-retirement)	High
Disabled Mortality	Low
Salary Scale	High
Other (gender blending, % married, etc.)	Low

Highlighted in bold orange font as high impact, the discount rate is the most important assumption in the valuation of most public sector plans as even small changes (50 basis points or less) can have significant impacts on normal cost and liabilities. Changes to the normal cost impact the actuarially determined contribution dollar for dollar, whereas changes to the liability are generally amortized over a number of years in accordance with the funding policy.

Changes to the assumption for future post-retirement cost-of-living adjustments (COLA) are not expected to have a substantial impact on liabilities given the plan provisions.

Furthermore, since the liability for healthy, retired (both current and future) participants (i.e., non-disabled liability) represents a large percentage of total liability, changes to healthy mortality also may have a large impact. Finally, the salary scale estimates the salary progression of a single active employee over the course of the member’s employment history. It is also labeled as high impact since it directly affects the projected benefit amounts for active participants, and therefore, can materially influence normal cost and active participants’ liabilities.

The impacts due to changes to the termination rates and active retirement rates fall in the middle of the spectrum, as these assumptions affect the timing and amount of benefits, including the eligibility for and magnitude of any early retirement subsidies offered by the plans.

¹ The inflation assumption is the shared building block used in the development of the other economic assumptions. As such, our discussion of economic assumptions begins with commentary on the inflation assumption.

However, disability rates are low and the plans include mostly non-uniformed members; therefore, the liability for *healthy* participants' regular service retirement benefits encompasses nearly the entire liability for the plans.

Although we have assigned changes to the assumptions into high-, medium-, and low-impact tranches, we want to emphasize that assumptions do not determine the *cost* of the plans. The cost of the plans is a function of the benefits paid and those benefits are funded through investment return on the trusts' assets and contributions (employee and employer) offset by expenses. As stated previously, the assumptions are used to *estimate* future experience; therefore, although they impact liability and normal cost and consequently drive short-term contribution calculations, actual experience determines which benefits ultimately will be paid, when they will be paid, their magnitude and duration of payment. Thus, an appropriate assumption should be based on an actuary's best estimate of future experience and should be unbiased in nature.

We reviewed the principal assumptions used in the actuarial valuation in light of the experience study report for the five-year period ending August 31, 2019. For this purpose, we have reviewed the assumptions for reasonableness. We also compared the current investment return assumptions to the NASRA (National Association of State Retirement Plan Administrators) survey covering other state and local plans. We found the assumptions reasonable. We strongly suggest the monitoring of experience to update the actuarial assumptions for the revisions in the economic and demographic experience in the last two years due to the COVID pandemic and accompanying inflation surge,

When reviewed in the timeframe of the 2019 Experience Study as well as currently, the economic and demographic actuarial assumptions adopted by the System are reasonable and consistent with generally accepted actuarial standards and practices contained in Actuarial Standards of Practice (ASOP).

Assumptions requiring attention are shown in approximate order to their effect on the results of an actuarial valuation.

Economic Assumptions

ASOP 27 (Selection of Economic Assumptions for Measuring Pension Obligations), section 3.6, provides the criteria for selecting a reasonable assumption:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account historical and current economic data that is relevant as of the measurement date;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed under section 3.5.1, or when alternative assumptions are used for the assessment of risk.

Unlike demographic assumptions which are generally specific to the plan population, economic assumptions are often broader in scope as they consider the state of the overall (local or broader) economy and, as such, they are generally consistent (often the same or very similar) for all plans within a pension plan system.

As a means of gathering an appropriate amount of information for setting these economic assumptions, ASOP 27 specifically mentions (section 3.5.6) the use of other experts:

Economic data and analyses are available from a variety of sources, including representatives of the plan sponsor and administrator, investment advisors, economists, and other professionals...the actuary may incorporate the views of experts, but the selection or advice should reflect the actuary's professional judgement.

Investment Return

Expected returns provided by the plans' investment advisor (NEPC) have declined since the experience study was completed in 2019. NEPC provided the Board with expected return in March 2020 and March 2021 on both a 10 and 30 year time horizon. These expected returns were:

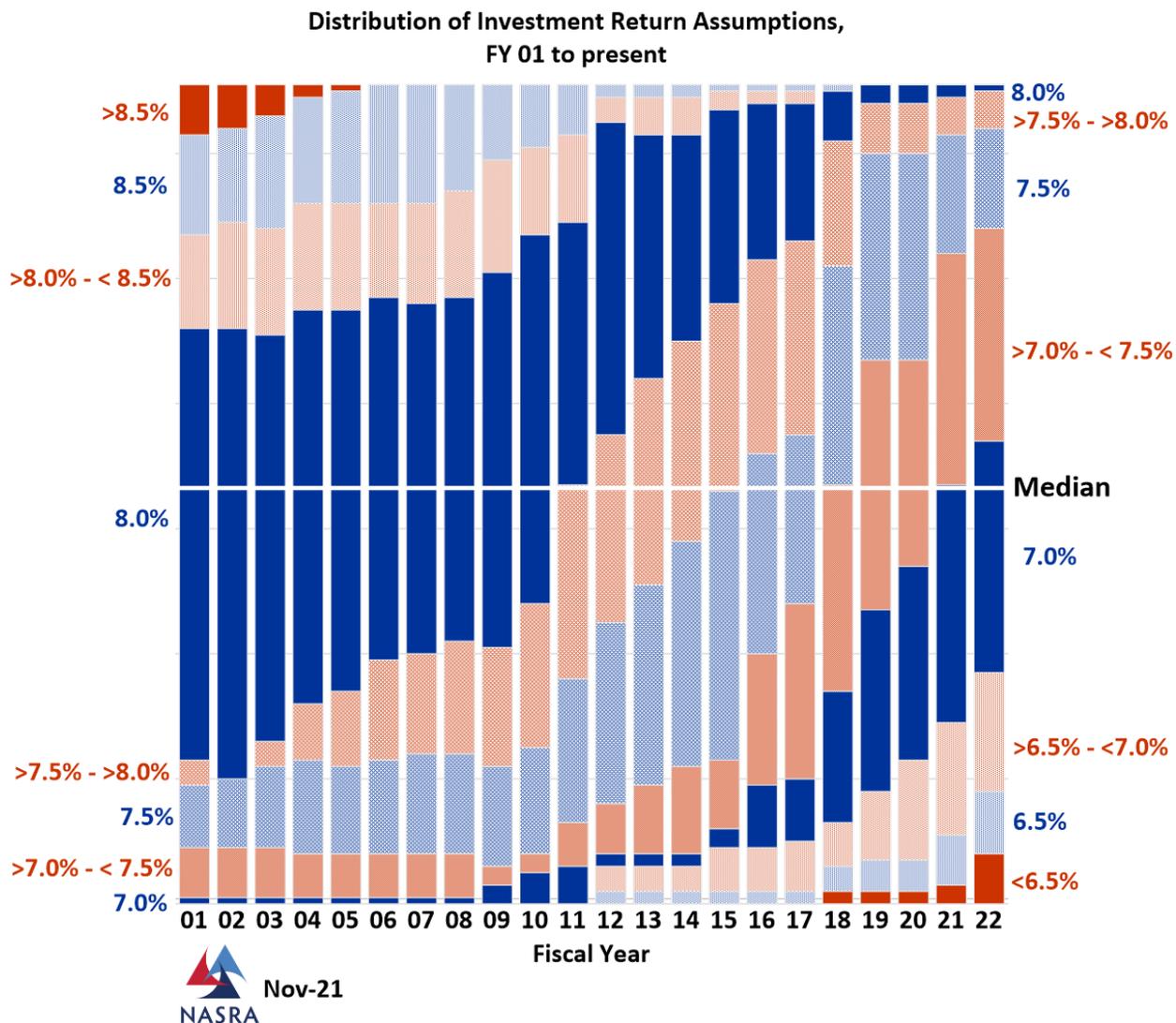
	10-Year Time Horizon	30-year time horizon
March 2020	6.82%	7.40%
March 2021	5.63%	6.78%

As shown above, the newer expectations are all below 7.0%. Attention should be given to the next release of NEPCs updated return expectations. We understand that GRS looks at more than the estimates produced by NEPC.

The Texas plans used a 7.0% investment return assumption for the 2021 valuation, consisting of a 2.3% inflation rate and a 4.7% real investment return assumption. When compared to the peer group, the 7.0% investment return assumption is at the median of 7.0%.

NASRA has provided us with rate information for 131 individual plans over the last two years. 52 of the 131 plans have lowered their rate over the last two years with reductions of 0.25% and 0.5% being the most common. For all 132 plans (including those who have not changed assumptions) the average annual decline was 0.074% per year (or 0.15% over the two years). We expect future survey results to continue to show decreases in the average and median investment return assumptions.

In November 2021 NASRA published the chart below showing a median rate of 7.00% for fiscal 2022. The graph demonstrates the decline in this assumption over time.



Horizon Actuarial Services also publishes an annual survey of expected future returns. Their 2021 survey of 39 investment firms found only a 31.9% chance of making 7% over a 10-year time horizon and a 38.0% over 20 years. This was based on a typical portfolio and not specific to the investment mix for the Texas plans.

We find the 7.0% investment return assumption acceptable for the 2021 valuation of the ERS plan but suggest the following considerations:

- Perform and include additional analysis of the sensitivity of the results to aid in understanding and being prepared for investment results that differ from the assumed return
- The JRS2 plan is projected to become insolvent by 2075. Consideration should be given to whether this affects the investment return assumption over time and making that adjustment now.
- The LECOSRF plan is projected to become insolvent by 2050. Due to this relatively short investment horizon (when compared to the other plans) consideration should be given to whether this affects the investment return assumption over time and making that adjustment now

CPI and Other Economic Assumptions

In addition to the investment return assumption, the Consumer Price Index (CPI), Cost-of-living adjustment (COLA), the salary increase and payroll growth assumption should be related. In each of the plans' valuations, these assumptions are tightly tied to each other. The inflation component of the salary increase assumption is consistently equal to the CPI and payroll growth (for the three funded plans). All of these assumptions are consistently 2.3%.

This inflation assumption is in line with the available information at the time of the experience study as well as when the valuation reports were completed. However, recent inflation experience may be signaling a different environment going forward and the Trustees should monitor and understand the implications if inflation levels stay elevated.

Demographic Assumptions

We compared the August 31, 2021 actuarial valuation assumptions for each plan to the assumptions derived in the 2019 experience study and determined that the demographic assumptions used for the valuations match the corresponding assumptions.

Generally, actuarial assumptions should reflect expected future experience. Consequently, unless the employer wishes to implement a conservative funding strategy which includes a contingency for adverse deviation the assumptions should reflect the actuary's best estimate of future experience. Given that GRS's assumption recommendations in the 2019 experience study are "best estimates" developed from recent experience they do not contain significant bias and are appropriate for the purpose of the valuation measurements.

The 2019 experience study reviewed the following demographic assumptions:

- Merit salary increases
- Retirement rates
- Termination rates
- Disability rates
- Pre-retirement mortality
- Post-retirement healthy mortality
- Post-retirement disabled mortality

The recommendations of the experience study are based on experience in conjunction with the actuary's professional judgement. For instance, determining (1) an appropriate number of years of data to include in the study for each decrement, (2) the minimum number of decrements² per number of exposure units for credibility³ and (3) reasonable Actual/Expected (A/E) and r-squared thresholds, which, when surpassed, warrant consideration of a change to the assumption, are left to the actuary's judgement. Additionally, trends or results that appear to be correlated to specific events are analyzed in the overall context of the decrement experience.

² A decrement, such as termination, retirement, disability, or death, defines how an individual leaves active employment.

³ ASOP 25 (Credibility Procedures) defines credibility as "[a] measure of the predictive value in a given application that the actuary attaches to a particular set of data (*predictive* is used here in the statistical sense and not in the sense of predicting the future)."

We believe that the methodologies applied for reviewing assumptions and recommending assumptions (based on best estimates) are reasonable and appropriate. A review of assumptions should also consider other factors which are specific to each type of assumption and are addressed by the ASOPs.

ASOP 35 (Selection of Demographic and other Non-Economic Assumptions), section 3.3.5, provides the criteria for a reasonable assumption:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account historical and current demographic data that is relevant as of the measurement date;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in section 3.10.1) and disclosed under section 4.1.1 or when alternative assumptions are used for the assessment of risk.

We believe that the primary demographic assumptions noted above that are used in the August 31, 2021 actuarial valuation reports are reasonable as defined by ASOP 35 (Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations). A review of each demographic assumption and our commentary is provided below.

Mortality for Employees and Retirees

There are multiple choices in selecting a mortality table. We prefer the use of generational mortality tables, as this includes a projection of future mortality improvement. Mortality improvement scales are being applied across all of the groups using the ultimate end of the scale developed by the Society of Actuaries (SOA). This approach is being used to increase stability in results. However, the SOA improvement scales generally start at a higher level of projected improvement and then grade down to the ultimate rate. By skipping the higher initial rates of improvement, the plan is potentially understating the rate of future mortality improvements. Additional rationale on the selection of the improvement scale would be beneficial to the report.

The active participant mortality rates chosen are standard tables for active mortality. The PUB 2010 tables for General Employees are applied to the non-LECO employees and the PUB 2010 tables for Safety employees are applied for LECO employees. The retiree group is valued based on the 2020 State Retirees of Texas mortality table. The experience study could be improved by adding commentary on the credibility of the plan's experience.

The Judges plan (JRS2) uses the same mortality assumption tables as the ERS plan. Given the difference in the socio-economic status of the average populations of these plans as represented by the average salaries for the groups (\$155,597 for JRS2 v. \$51,910 for ERS) some level of mortality difference could be assumed to apply, although the JRS2 group is too small to have its own credible experience.



Other Assumptions

In addition to the significant assumptions that should be reviewed as part of an experience study and assumption review, we suggest that the following minor assumptions also be considered in an experience study:

1. Retirement assumptions are detailed in the experience study for the ERS and LECOS groups. However, they are not shown for the JRS2 group. Retirement patterns for LECOS members may be more substantially impacted by the COVID pandemic. Trustees should continue to monitor those patterns for any material deviations.
2. Administrative expenses are tied to payroll, although the reason for any such relationship is not clear. We also note that both the number of retirees and the percentage of total participants that are retired has been increasing. The level of expense in relation to payroll was generally trending upward over the last five years and the five-year average was larger than the assumption for this cost. We suggest that expenses be tied to the average of the last two or three years of expenses as a percent of payroll in order to stay in line with current trends.
3. We note that the ERS valuations do not reflect either the retirement benefit limits of IRC §415 or the limit on pay used to compute a plan benefit in IRC §401(a)(17). These limits are complicated and not material to the results of the valuation. We do not have a concern with this simplification to the valuation and commend GRS for disclosing this information.

Section VI. Comments on 2021 Actuarial Valuation Reports

The reports are highly detailed and provide a thorough review of the computations and methodology being used. They contain details on all of the key aspects of the valuations.

We found that the three reports were consistent in the presentation and ordering of information for primary results making them easy for a reader to follow. The information was clear and the results and tables in each report were internally consistent. We reviewed the reports for compliance with the applicable ASOPs and made the following conclusions:

- ASOP 4 Measuring Pension Plan Obligations – in compliance; however, the Board should be aware that the upcoming revised ASOP 4 will likely contain requirements that differ from what is in the current actuarial reports.
- ASOP 23 Data Quality – in compliance.
- ASOP 27 Economic Assumptions – in compliance
- ASOP 35 Demographic Assumptions – in compliance
- ASOP 41 Actuarial Communications – the report meets the requirements for actuarial communications set out in ASOP 41 other than the disclosure of subsequent events discussed earlier
- ASOP 44 Selection and Use of Asset Valuation Methods – Section III of each report discloses and describes the computation of the Asset Valuation method. We believe the Asset Valuation method complies with ASOP 44 (see the Funding Methods of the report for more detail).
- ASOP 51 Assessment and Disclosure of Risk – Section II of each report provides a risk assessment and disclosure. The reports provide disclosures that we believe are within the scope of ASOP 51 and would be deemed to meet the Standard.
- ASOP 56 Modeling – The report meets the disclosure requirements of the ASOP.

The report contains a section that references an open group projection. This is an important description since it is how GRS determines that the ERS unfunded liability will be paid off by 2054. The purpose of the open group projections is that it validates whether the plan will remain solvent and move toward full funding or whether it will become insolvent. For the ERS plan, an additional annual contribution of \$510 million (above the fixed rate amount) is made in accordance with Texas Code 815.407. We suggest the determination of the additional contribution be shown in the actuarial report as well as a detailed exhibit showing the year-by-year projection of how the plan will be fully funded by 2054.

In addition to the comments above, we had a few less significant comments. The *Summary of Plan Provisions* section of the ERS report should be updated to be consistent with the certified early retirement factors for Plan 1 and Plan 3. Furthermore, the retirement rates (ERS page F-6) section reports: “rates prior to age 62 are multiplied by 75% for each year prior to age 62.” This meaning of this description was not immediately apparent to us. We suggest adding a footnote for clarity to explain that each year means that the reduction is compounded.

Our primary finding is that the reports meet the actuarial standards and are suitable for the purposes defined.

Section VII. Comments on Experience Study

Overview

We reviewed a copy of the most recent experience study report, “Study of August 31, 2019 Experience” prepared by GRS dated May 20, 2020

The August 31, 2019 experience study supports the assumptions used in the August 31, 2021 actuarial valuations of the plans.

Overall, the analysis performed in the study is thorough and reasonable and meets Actuarial Standards of Practice. It addresses many of the findings from the prior actuarial audit and improves many of the assumptions by moving them more toward current best practices.

We suggest the actuary consider making the following enhancements to the next experience study.

1. **Additional display of comparisons between actual and expected results.** Often referred to as A/E charts these help a reader to understand quickly how the prior assumptions and the proposed assumptions compare to each other and to the actual experience of the program. We suggest the next report provide these charts for all of the assumptions reviewed and not just a select few.
2. **Mortality credibility:** we suggest the report document the amount of statistical credibility being given to the plan’s own experience and how much is blended with standard published tables.
3. **JRS2 plan information:** The population of the JRS2 plan is too small to develop all of its own assumptions. However, providing some displays as to how the JRS2 experience compared to the assumed experience would be informative. As mentioned earlier in the report, the socio-economic differences (implied by the difference in pay levels) signal that this group may have mortality and other decrement patterns that differ from the overall group.

We found GRS’s experience study report thorough and in compliance with Actuarial Standards of Practice.

Section VIII. Conclusions

This partial replication audit reviewed the data used, the benefits valued, and the actuarial methods and assumptions employed in the August 31, 2021 actuarial valuations. With a few exceptions, the 50 sample lives provided by the actuary reflect the plan provisions of the applicable plans as stated in the 2021 actuarial valuation reports. Similarly, these sample lives also demonstrate, with a few exceptions, the appropriate application of the actuarial assumptions to the benefits as stated in the valuation report. Using the 50 samples, we were able to produce a relatively close match for key valuation metrics in total among the samples, but our model results deviated more than anticipated from GRS's for some samples. In the *Results by Participant* subsection of *Section IV. Review of Sample Lives*, we note the sources of deviation (if known). Overall, the actuarial assumptions, methods, and procedures are reasonable and reflect the benefit promises made to the System members.

The primary finding of the audit of the three Texas ERS 2021 actuarial reports is that they meet all applicable standards and are reasonable and complete. However, throughout this report we provided detailed suggestions for your consideration. Below, we summarize these suggestions.

Data Review

- We recommend that the valuation report provide a more detail than is provided on page F-13 of the actuarial report on how the valuation payroll is determined.
- We recommend that the sum of the deferred annuities shown on page G-2 of the JRS2 valuation report should be prior to any reduction for assumed early commencement.

Review of Sample Lives

- Since the prior audit, GRS switched their decrement timing methodology from the beginning of the year (BOY) to the middle of the year (MOY). This change made it more challenging to match their results. In previous valuation reports that used BOY decrement timing, a section was included that explained the rounding of age and service. We recommend that GRS add a similar section to the 2021 reports.
- We matched very closely the present value of future benefits (PVFB), indicating a likely close match on the benefits and assumptions applied in the valuation. We had more difficulty matching the accrued liability and normal cost, which are functions of the allocation of liability under the funding method.

Funding Methods

- While the liabilities and normal cost are based on the individual entry age funding method, we understand that the determination of the additional \$510 million contribution and the test of the adequacy of the contributions to fully fund the plan are based on an open group projection. An open group projection is generally less conservative than the calculation of a traditional Actuarially Determined Contribution (ADC). We realize that the \$510 million is a fixed dollar payment which is better than a level percent of pay amount.
- We recommend showing a more traditional ADC in addition to the open group projection.

Assumptions

- While the 7% discount rate is reasonable, we recommend that the Board continually monitor this assumption as trends and projections continue to decrease.
- We recommend that GRS compare the actual administrative expenses to their assumption to determine if the current assumption remains valid.

Actuarial Valuation Reports

- We recommend adding an exhibit that shows an open group projection on a year-by-year basis to demonstrate that the contribution fully funds the plan by 2054.
- We recommend the actuarial report contain an exhibit showing the development of the additional \$510 million contribution.

Experience Study

- We recommend the experience study show an additional display of comparisons between expected and actual results.
- We recommend that for the purpose of the mortality experience, the report documents the amount of statistical credibility being given to the plan's own experience and how much is blended with standard published tables.
- We recommend that the JRS2 plan population assumptions be reviewed and potentially adjusted from the entire group to account for likely socio-economic differences in that group versus the larger participant population.

Appendices

Appendix 1 – Cash Balance Program

The new Cash Balance Tier does not apply to any of the plan participants that were in the 2021 valuations. However, assumptions were made about aspects of the benefits for this Tier as part of the open group projection to determine the projected solvency of the ERS and LECOSRF plans. Due to the limited materiality in the 2021 valuation and the fact that some benefits are undefined, we are placing these comments in an Appendix.

- A feature of the program is a “Cost Sharing” provision that provides a varying level of interest credit to the notional Cash Balance accounts. The provision provides for a supplemental credit provided annually based on the average return for plan assets compared to a benchmark of 4%. The credit above 4% is based on half of the return between 4% and 10%. GRS has assumed annual variable credit of 1.5% which is consistent with the 7.00% long term rate of return and some level of investment volatility. We were able to roughly match the 4%+1.5% assumption using a stochastic model to build in the impact of volatility. We understand that GRS also used a stochastic model. A stochastic analysis captures the distributions average supplemental credits. There is one additional factor that, while uncommon, should be considered because of the five-year averaging of returns. Stochastic models often focus on the correlations between different asset classes but not the correlation of returns between years⁴. For example, the return in one year might be correlated with the return from the prior year. We suggest that GRS look at the materiality of a non-IID return when performing a stochastic model of the five-year average of returns.
- Disclosure of the Normal Cost for the Cash Balance projection (split between the employer and employee pieces) would be informative in future actuarial reports as would a comparison of the Cash Balance accounts and the Entry Age Actuarial Liability. We understand that this benefit will be funded using the Entry Age method which will produce materially different results from other methods.
- We understand the full details of the Cash Balance Tier are still being determined. It has been our experience that ancillary benefits such as death and disability benefits can be significant in these types of plans and need to be further detailed.
- Related to the prior bullet is the concept of leverage. We understand that the supplemental credit never ends and continues into retirement in the form of a COLA. The expected interest credit of 5.5% is less than the investment assumption which means the Normal Cost is likely below the expected 15% pay credits (6% employee contribution + 6% x 150% match = 15%). It appears there is no lump sum option for the full benefit but it is clear that the employee can withdraw their 6% (with interest) and forfeit the employer provided benefit. This and other factors will impact the Normal Cost.

⁴ The term IID (Independent Identical Distribution) is often used to describe modeling one year's return independent of the prior year's return and with the same distribution of returns each year.

- In addition to establishing the details of plan provisions, assumptions need to be made about pre-age 65 refunds (forfeiting 150% employer match) and assumed forms of payment. Current traditional plan assumptions would lead us to assume no forfeitures are expected if there is a choice to get a deferred benefit that includes the employer match. Future experience may differ. The single life annuity form of payment is generally the most valuable annuity form as long as the discount rate less the assumed post retirement increases (e.g., 7% - 1.5%) is more than the conversion assumption. If a bond rate were used as the discount rate (e.g. in the proposed ASOP 4 Low-Default-Risk Obligation Measure) the J&S option may be the most valuable.



Appendix II – CCA Public Pension Plans White Paper



**Conference of Consulting Actuaries
Public Plans Community (CCA PPC)**

Actuarial Funding Policies and Practices for Public Pension Plans

October 2014



Contents

An Open Letter.....	3
Introduction.....	5
Transition Policies	8
General Policy Objectives.....	9
Principal Elements of Actuarial Funding Policy	11
Actuarial Cost Method	12
Asset Smoothing Methods	17
Amortization Policy	21
Direct Rate Smoothing.....	28
Items for Future Discussion.....	30



Paul Angelo



Tom Lowman

An Open Letter

**From: Paul Angelo, Chair and
Tom Lowman, Vice Chair Conference of
Consulting Actuaries Public Plans Community**

To: Interested Parties in the Public Pension Arena

**Re: Public Plans Community White Paper on
Public Pension Funding Policy**

On behalf of the Conference of Consulting Actuaries' Public Plans Community (CCA PPC), the following "White Paper" is presented to provide guidance to policymakers and other interested parties on the development of actuarially based funding policies for public pension plans. The CCA PPC includes over 50 leading actuaries whose firms are responsible for the actuarial services provided to the majority of public-sector retirement systems in the US. All of the major actuarial firms serving the public sector are represented in the CCA PPC as well as in-house actuaries from several state plans. As a result, the CCA PPC represents a broad cross section of public-sector actuaries with extensive experience providing valuation and consulting services to public plans, and it is that experience that provides the knowledge base for this paper.

The White Paper is based on over two years of extensive and detailed funding policy discussions among the members of the CCA PPC, and reflects the experience of those members in providing actuarial consulting services to state and local public pension plans throughout the US. While there were naturally disagreements and compromises during those discussions, the White Paper reflects the resulting majority opinions of the CCA PPC as developed through those discussions. We believe this White Paper reflects a substantial consensus among the actuaries who provide valuation and consulting services to public pension plans.

This White Paper represents groundbreaking actuarial research in that it develops a principles based, empirically grounded Level Cost Allocation Model (LCAM) for use as a basis for funding policies for public pension plans throughout the US. In particular, we believe that the funding policies developed herein could serve as a rigorously defensible basis for an "actuarially determined contribution" under Statements 67 and 68 of the Governmental Accounting Standards Board.

The distinguishing feature of this approach is that it begins with stated policy objectives and then develops specific policy guidance consistent with those objectives. One of the main results is that an effective funding policy often represents a balancing of policy objectives. Another is that adherence to the policy objectives may lead to a narrower range of acceptable practices than is sometimes found in current practice.

The LCAM White Paper is intended to provide guidance not just in the evaluation of particular current policy practices but also in the development of actuarially based funding policies in a consistent and rational manner. For that reason, the reader is strongly encouraged to focus not only on the specific practice guidance but also on the detailed discussions and rationales that lead to that guidance. Also note that while this discussion is comprehensive it is not all-inclusive. There is a list of "items for future discussion" at the end of the paper. In addition, there may be other "level cost allocation models" that are appropriate in some circumstances.

The CCA PPC would like to acknowledge and thank the California Actuarial Advisory Panel for their seminal work in developing the principles-based level cost allocation model on which this White Paper is based. We also thank all the members of the Conference of Consulting Actuaries Public Plans Community who helped in the development of this paper.

Introduction

This “white paper” is based on funding policy discussions among the members of the Conference of Consulting Actuaries Public Plans Community (CCA PPC) and reflects the majority opinions the CCA PPC members¹. Those discussions relied heavily upon and generally concurred with the funding policy white paper prepared by the California Actuarial Advisory Panel (CAAP) and the level cost allocation model developed therein². For that reason, the CCA PPC has chosen to build directly on the CAAP document in developing its own funding policy guidance.

The CCA PPC wishes to express its sincere appreciation to the CAAP for its seminal work in preparing a principles-based funding policy development. However, while much of the text of this CCA PPC white paper comes directly from the CAAP document, this white paper is presented solely as the majority opinions of the CCA PPC.

This CCA PPC white paper is intended for a national audience, as part of a nation-wide review and discussion of funding policies for public pension plans. Our hope is that the principles and policies developed herein may provide an actuarial basis for others developing funding practices and that legislative, regulatory and other industry groups may build these concepts into their guidance.

This white paper develops the principal elements and parameters of an actuarial funding policy³ for US public pension plans. It includes the development of a Level Cost Allocation Model (LCAM) as a basis for setting funding policies. This white paper does not address policy issues related to benefit plans where a member’s benefits are not funded during the member’s

1 These comments were developed through the coordinated efforts of the Conference of Consulting Actuaries’ (CCA) Public Plans Steering Committee. However, these comments do not necessarily reflect the views of the CCA, the CCA’s members, or any employers of CCA members, and should not be construed as being endorsed by any of those parties.

2 See “Actuarial Funding Policies and Practices for Public Pension and OPEB Plans and Level Cost Allocation Model” at http://www.sco.ca.gov/caap_resources.html

3 As used in this paper, an “actuarial funding policy” has the same meaning as a “Contribution Allocation Procedure” as defined in the Actuarial Standards of Practice (ASOPs). We further note that the actuarial policies that determine the level and timing of contributions must also include policies related to setting the actuarial assumptions. As noted at the end of this section, this paper does not address policies and practices related to setting actuarial assumptions.

working career, e.g., plans receiving “pay-as-you-go” funding or “terminal” funding.

While this white paper develops guidance primarily for pension plans, we believe the general policy objectives presented here are applicable to the funding of OPEB plans as well. However, application of those policy objectives to OPEB plans may result in different specific funding policies based on plan design, legal status and other features distinctive to OPEB plans. We encourage those involved in the valuation and funding of OPEB plans to consider the applicability to those plans of the policy guidance developed here.

Some pension plans have contributions rates that are set on a fixed basis, rather than being regularly reset to a specific, actuarially determined rate. The CCA PPC believes that such plans should develop an actuarially determined contribution rate for comparison to the fixed rate. However, this white paper does not address procedures for evaluating that comparison, or for determining whether the fixed rate is sufficient or when and how the fixed rate should be changed. The CCA PPC intends to prepare a separate white paper on fixed rate plans including these considerations.

As developed here the LCAM is a level cost actuarial methodology⁴, which is consistent with well-established actuarial practice. The LCAM is a principles-based mathematical model of pension cost. The model policy elements are developed in a logical sequence based on stated general policy objectives, and in a manner consistent with primary factors that affect the cost of the pension obligation.

The particular model that we develop is based on a combination of policy objectives and policy elements that has been tested over many years and, we believe, is well understood and broadly applicable. However, there are other models and policy objectives that

⁴ Here a “level cost actuarial methodology” is characterized by economic assumptions based on the long term expected experience of the plan and a cost allocation designed to produce a level cost over an employee’s active service. This is in contrast to a “market-consistent” actuarial methodology where economic assumptions are based on observations of current market interest rates, and costs are allocated based on the (non-level) present value of an employee’s accrued benefit.

practitioners may use that are internally consistent and may be as appropriate in some circumstances as the model that is developed herein, and it is not our intention to discourage consideration of such other policies⁵. Furthermore, there are situations where the policy parameters developed herein may require additional analysis to establish the appropriate parameters for each such situation⁶. It is up to the actuary to apply professional judgment to the particulars of the situation and recommend the most appropriate policies for that situation, including considerations of materiality.

Our approach begins with identifying the policy objectives of such a funding policy, and then evaluating the structure and parameters for each of the particular policy elements in a manner consistent with those objectives, as well as with current and emerging actuarial science and governing actuarial standards of practice.

This white paper is intended as advice to actuaries and retirement boards⁷ in the setting of funding policy. While the analysis is somewhat restrictive in the categorization of practices, this guidance is not intended to supplant or replace the applicable Actuarial Standards of Practice (ASOPs). Like all opinions of the CCA PPC, this guidance is nonbinding and advisory only. Furthermore, it is not intended as a basis for litigation, and should not be referenced in a litigation context.

Given the wide range of such policies currently in practice in the U.S., this development also acknowledges that plan sponsors and retirement boards may require some level of policy flexibility

⁵ In particular, the LCAM developed here incorporates the widely prevalent practice of managing asset volatility directly through the use of an asset smoothing policy element. Some practitioners are developing direct contribution rate smoothing techniques as an alternative to asset smoothing. The CCA PPC is considering development of a separate white paper on direct smoothing as an alternative to asset smoothing.

⁶ For example, plans that are closed to new entrants may require additional analyses and forecasts to determine whether the policy parameters herein provide for adequate funding.

⁷ Here “retirement boards” is meant to refer generally to whatever governing bodies have authority to set funding policy for public sector plans.

to reflect both their specific policy objectives and their individual circumstances. To accommodate that need for reasonable flexibility and yet also provide substantive guidance, this development evaluates various policy element structures and parameters or ranges according to the following categories:

- LCAM Model practices (i.e., practices most consistent with the LCAM developed herein)
- Acceptable practices
- Acceptable practices, with conditions
- Non-recommended practices
- Unacceptable practices.

These categories are best understood in the context of the different elements that comprise an actuarial funding policy and the various policy alternatives for each of those policy elements. They are intended to assist in the evaluation of specific policy elements and parameters relative to the general policy objectives stated herein, and are developed separately for each of the three principal policy elements discussed in this white paper (cost methods, asset smoothing methods and amortization policy). They are not intended as a grading or scoring mechanism for a system's overall actuarial funding policy.

Generally, throughout this discussion, "model practices" means those practices most consistent with general policy objectives and the LCAM as developed here based on those policy objectives⁸. Acceptable practices are generally those that while not fully consistent with the LCAM as developed here, are well established in practice and typically do not require additional analysis to demonstrate their consistency with the general policy objectives. Practices that are acceptable with conditions may be acceptable in some circumstances, on the basis of additional analysis to show consistency with the general policy objectives or to address risks or concerns associated with the practices. Systems that adopt practices that under this

model analysis are not recommended should consider doing so with the understanding that they reflect policy objectives different from those on which this LCAM is based or should consider the policy concerns identified herein.

This evaluation of practice elements and parameters was developed in relation to the LCAM and its general policy objectives, based on experience with the many independent public plans sponsored by states, counties, cities and other local public employers in the US, and is intended to have general applicability to such plans. However, for some plans, special circumstances or situations may apply. The specific applicability of the results developed here should be evaluated by their governing boards based on the advice of their actuaries.

Note that while the selection of actuarial assumptions is an essential part of actuarial policy for a public sector pension plan, the selection of actuarial assumptions is outside the scope of this discussion. For example, a pension plan should perform a comprehensive review of both economic and demographic assumptions on a regular basis as part of its actuarial policies. Another important consideration in determining a plan's funding requirements is the plan's investment policy and related investment portfolio risks. While actuarial assumptions, plan investments and even benefit design are all elements that affect funding requirements, they are beyond the scope of this paper.

This white paper is also not intended to address the measurement of liabilities for purposes other than funding, e.g., settlement obligations or other market-consistent measures⁹.

Finally note that some retirement systems have features that may require funding policy provisions and analyses that are not specifically addressed herein. One example is systems with "gain sharing" provisions whereby favorable investment experience is used as the basis for increasing member benefits and/or reducing employer and/or member contributions. The policies developed here should not be interpreted as being adequate to address these plan features without additional analysis specific to those features.

⁸ Some commentators have interpreted "model practices" as synonymous with "best practices." That is not the intent of this categorization of practices. Given their circumstances retirement boards may find that other practices, particularly those categorized and acceptable or acceptable with conditions, are considered both appropriate and reasonably consistent with the policy objectives stated herein.

⁹ See footnote 4

Transition Policies

In order to avoid undue disruption to a sponsor's budget, it may not be feasible to adopt policies consistent with this white paper without some sort of transition from current policies. For example, a plan using longer than model amortization periods could adopt model periods for future unfunded liabilities while continuing the current (declining) periods for the current unfunded liabilities. Such transition policies should be developed with the advice of the actuary in a manner consistent with the principles developed herein. We have included in our discussion transition policies appropriate to each of the principal policy elements.

General Policy Objectives

The following are policy objectives that apply generally to all elements of the funding policy. Objectives specific to each principal policy element are identified in the discussion of that policy element.

1. The principal goal of a funding policy is that future contributions and current plan assets should be sufficient to provide for all benefits expected to be paid to members and their beneficiaries when due.
2. The funding policy should seek a reasonable allocation of the cost of benefits and the required funding to the years of service (i.e. demographic matching). This includes the goal that annual contributions should, to the extent reasonably possible, maintain a close relationship to the both the expected cost of each year of service and to variations around that expected cost.
3. The funding policy should seek to manage and control future contribution volatility (i.e., have costs emerge as a level percentage of payroll) to the extent reasonably possible, consistent with other policy goals.
4. The funding policy should support the general public policy goals of accountability and transparency. While these terms can be difficult to define in general, here the meaning includes that each element of the funding policy should be clear both as to intent and effect, and that each should allow an assessment of whether, how and when the plan sponsor is expected to meet the funding requirements of the plan.
5. The funding policy should take into consideration the nature of public sector pension plans and their governance. These governance issues include (1) agency risk issues associated with the desire of interested parties (agents) to influence the cost calculations in directions viewed as consistent with their particular interests, and (2) the need for a sustained budgeting commitment from plan sponsors.

Policy objective 1 means that contributions should include the cost of current service plus a series of amortization payments or credits to fully fund or recognize any unfunded or overfunded past service costs (note that the latter is often described as "Surplus").

Policy objectives 2 and 3 reflect two aspects of the general policy objective of interperiod equity (IPE). The "demographic matching" goal of policy objective 2 promotes intergenerational IPE, which seeks to have each generation of taxpayers incur the cost of benefits for the employees who provide services

GENERAL POLICY OBJECTIVES

to those taxpayers, rather than deferring those costs to future taxpayers. The “volatility management” goal of policy objective 3 promotes period-to-period IPE, which seeks to have the cost incurred by taxpayers in any period compare equitably to the cost for just before and after.

These two aspects of IPE will tend to move funding policy in opposite directions. Thus the combined effect of policy objectives 2 and 3 is to seek an appropriate balance between intergenerational and period-to-period IPE, that is, between demographic matching and volatility management.

Policy objective 3 (and the resulting objective of balancing policy objectives 2 and 3) depends on the presumed ongoing status of the public sector plan and its sponsors. The level of volatility management appropriate to a funding policy may be less for plans where this presumption does not apply, e.g., plans that are closed to new entrants.

Policy objective 4 will generally favor policies that allow a clear identification and understanding of the distinct role of each policy component in managing both the expected cost of current service and any unexpected variations in those costs, as measured by any unfunded or overfunded past service costs. Such policies can enhance the credibility and objectivity of the cost calculations, which is also supportive of policy objective 5.

Policy objective 5 seeks to enhance a retirement board’s ability to resist and defend against efforts to influence the determination of plan costs in a manner or direction inconsistent with the other policy objectives. This favors policies based on a cost model where the parameters are set in reference to factors that affect costs rather than the particular cost result. This separation between the selection of model parameters and the resulting costs enhances the objectivity of the cost results. As a result, any attempt to influence those results must address the objective parameters rather than the cost result itself.

A common example of agency risk is that, because plan sponsors may be more aware of and responsive to the interests of current versus future taxpayers, there

may be incentives to defer necessary contributions to future periods. This may be countered by avoiding policy changes that selectively reduce contributions.

For plans with an ongoing service cost for active members, policy objective 5 also reflects a policy objective to avoid encumbering for other uses the budgetary resources necessary to support that ongoing service cost. This introduces an asymmetry between funding policies for unfunded liabilities versus surpluses, which is discussed in the policy development for surplus amortization.

Note that the model funding policies developed here are substantially driven by these policy objectives. In some situations other plan features or policies (e.g., investment policy, reserving requirements, and plan maturity) may also be a consideration in setting funding policy. Such considerations are not addressed in this analysis.

Principal Elements of Actuarial Funding Policy

The type of comprehensive actuarial funding policy developed here is made up of three components:

1. An **actuarial cost method**, which allocates the total present value of future benefits to each year (Normal Cost) including all past years (Actuarial Accrued Liability or AAL).
2. An **asset smoothing method**, which reduces the effect of short term market volatility while still tracking the overall movement of the market value of plan assets.
3. An **amortization policy**, which determines the length of time and the structure of the increase or decrease in contributions required to systematically (1) fund any Unfunded Actuarial Accrued Liability or UAAL, or (2) recognize any Surplus, i.e., any assets in excess of the AAL.

An actuarial funding policy can also include some form of "direct rate smoothing" in addition to both asset smoothing and UAAL/Surplus amortization. Two types of this form of direct rate smoothing policies were evaluated for this development:

1. Phase-in of certain extraordinary changes in contribution rates, e.g., phasing-in the effect of assumption changes element over a three year period.
2. Contribution "collar" where contribution rate changes are limited to a specified amount or percentage from year to year.

As noted earlier, it is also possible to use direct contribution rate smoothing techniques as an *alternative* to asset smoothing, rather than in addition to asset smoothing. While that approach is outside the scope of this discussion, the CCA PPC is considering development of a separate white paper on direct rate smoothing as an alternative to asset smoothing.

Actuarial Cost Method

The Actuarial Cost Method allocates the total present value of future benefits to each year (Normal Cost) including all past years (Actuarial Accrued Liability¹ or AAL).

Specific policy objectives and considerations

1. Each participant's benefit should be funded under a reasonable allocation method by the expected retirement date(s), assuming all assumptions are met.
2. Pay-related benefit costs should reflect anticipated pay at anticipated decrement.
3. The expected cost of each year of service (generally known as the Normal Cost or service cost) for each active member should be reasonably related to the expected cost of that member's benefit.
4. The member's Normal Cost should emerge as a level percentage of member compensation².
5. No gains or losses should occur if all assumptions are met, except for:
 - a. Investment gains and losses deferred under an asset smoothing method consistent with these model practices, or
 - b. Contribution losses or gains due to a routine lag between the actuarial valuation date and the date that any new contributions rates are implemented, or
 - c. Contribution losses or gains due to the phase-in of a contribution increase or decrease.
6. The cost method should allow for a comparison between plan assets and the accumulated value of past Normal Costs for current participants, generally known as the Actuarial Accrued Liability (AAL).

¹ Here "liability" indicates that this is a measure of the accrued (normal) cost while "actuarial" distinguishes this from other possible measures of liability: legal, accounting, etc.

² This objective applies most clearly to benefits (like, for example, most public pension benefits) that are determined and budgeted for as a percentage of individual and aggregate salary, respectively. For benefits that are not pay related it may be appropriate to modify this objective and the resulting policies accordingly.

Discussion

1. Any actuarial cost model for retirement benefits begins with construction of a series or array of Normal Costs that, if funded each year, under certain stability conditions will be sufficient to fund all projected benefits for current active members. The following considerations serve to specify the cost model developed here.
 - a. The usual stability conditions are that the current benefit structures and actuarial assumptions have always been in effect, the benefit structures will remain in effect, and future experience will match the actuarial assumptions. Special considerations apply if in the past the benefit structure has been changed for current active members changing the benefits for members with service after some fixed date.
 - b. Consistent with Cost Method policy objective #3 and with the general policy objective of transparency, the Normal Cost for each member is based on the benefit structure for that member. This means that a separate Normal Cost array is developed for each tier of benefits within a plan. This argues against Ultimate Entry Age, where Normal Cost is based on an open tier of benefits even for members not in that open tier.
 - c. Consistent with Cost Method policy objective #4, the Normal Cost is developed as a level percentage of pay for each member, so that the Normal Cost rate for each member (as a percentage of pay) is designed to be the same for all years of service. This provides for a more stable Normal Cost rate for the benefit tier in case of changing active member demographics. This argues against Projected Unit Credit.
 - d. Also consistent with Cost Method policy objective #4, the Normal Cost for all types of benefits incurred at all ages is developed as a level percentage of the member's career compensation. This argues against funding to decrement. For plans with a DROP (Deferred Retirement Option Program) this also argues for allocating Normal Cost over all years of employment, including those after a member enters a DROP.
 - e. Consistent with Cost Method policy objective #6, the Normal Cost is developed independent of plan assets, and the Actuarial Accrued Liability (and so also the UAAL) is based on the Normal Costs developed for past years. This argues against Aggregate and FIL as model practices.
 - i. These methods should be considered as a fundamentally different approach to the determination and funding of variations from Normal Cost.
 - ii. Plans using these methods should also measure and disclose costs and liabilities under the Entry Age method, similar to the requirements of current accounting standards.
 - f. Historical practice includes the use of a variation of the Entry Age method (an "Aggregated" Entry Age method) where the Normal Cost and AAL are first determined for each member in a tier of benefits under the usual Entry Age method. However, the actual Normal Cost for the tier is then determined as the Normal Cost rate for the tier applied to the compensation for the tier, where the Normal Cost rate for the tier of benefits is determined as the present value of future Normal Costs for all active members in the tier, divided by the present value of compensation for all members in the tier.
 - i. This variation introduces an inconsistency between the Normal Cost that is funded and the Normal Cost on which the AAL is based.
 - ii. This inconsistency can be shown to produce small but systematic gains or losses, generally losses.

ACTUARIAL COST METHOD

2. Consistent with all the above, under the cost model developed here the Normal Cost rate would change only when the projected benefits for the tier change either in amounts or in present value.
 - a. The Normal Cost rate (both in total and by member) will vary from valuation to valuation due to demographic experience and assumption changes.
 - b. The Normal Cost rate will not change when an individual member reaches an age or service where, under the consistent benefit structure for the member's tier, the member's benefit eligibility or accrual rate changes. This is because that event was anticipated in the projected benefits for the tier, so that the projected benefits are substantially unaffected by such predictable changes in eligibility or benefit accrual.
 - c. Similarly the Normal Cost rate for a member should be unaffected by the closing of the member's tier and the creation of a new tier for future hires, as discussed under item 1.b above.
 - d. However, if the benefit structure of a continuing, open tier is changed for members with service after some fixed date, then the Normal Cost rate should change to reflect the unanticipated change in projected benefits for members in the tier³. This calls for an extension or variation of the Entry Age method in order to value this type of benefit change.
 - i. There are two methods in practice to adjust the Normal Cost rate for this type of plan change. While a detailed analysis of these two variations is beyond the scope of this discussion, our summary conclusions are:
 - A. The "replacement life" Entry Age method would base the Normal Cost on the new benefit structure as though it had always been in place, thereby producing a consistent Normal Cost rate for all members in the tier. This has the advantages of a change in Normal Cost (both individual and total) more consistent with what would be expected for a change in future benefit accruals, a stable future Normal Cost rate for the tier and a relatively smaller (compared to the alternative) change in Actuarial Accrued Liability. Its disadvantages are that it may be more complicated to explain and to implement.
 - B. The "averaged" Entry Age method would base each member's Normal Cost on the new projected benefit for that member, thereby producing a different Normal Cost rate for different members in the tier, based generally on their service at the time of the change in benefit structure. The advantages and disadvantages are essentially the reverse of those for the replacement life version of Entry Age. The change in Normal Cost is less than what would be expected for a change in future benefit accruals, the future Normal Cost rate for the tier will be unstable (as it eventually reaches the same rate as under the replacement life variation) and there is a relatively larger (compared to the alternative) change in Actuarial Accrued Liability. Its advantages are that it may be less complicated to explain and to implement (where the latter may depend on the valuation software used).
3. While not recommended for funding, the Normal Cost under the Ultimate Entry Age method discussed above may nonetheless be useful when a new open tier is adopted for future hires. The combined normal cost rate for the open and closed tiers (as determined under the LCAM Entry Age method) will change over time as members of the closed tier are replaced by members in the new tier. This will result in an increasing or decreasing

³ Note that, as of this writing, for public sector pension plans this is relatively uncommon because of legal protections that are understood to apply both to accrued benefits and to future benefit accruals for current members.

ACTUARIAL COST METHOD

combined normal cost rate (depending on whether the new tier has higher or lower benefits), consistent with the transition of the workforce over time to the new benefit level. However, the Ultimate Entry Age method Normal Cost for the combined tiers will reflect the expected long term Normal Cost for the entire workforce (unlike the LCAM Normal Cost which reflects only the recent hires in the new tier). For that reason, Normal Cost under Ultimate Entry Age may be useful for projecting longer-term costs or for evaluating a fixed contribution rate.

Practices

Based on the above discussion, and consistent with the policy objectives, actuarial cost methods and parameters are categorized as follows:

LCAM Model Practices

- Entry Age cost method with level percentage of pay Normal Cost.
 - Normal Costs are level even if benefit accrual or eligibility changes with age or service.
 - All types and incidences of benefits are funded over a single measure of expected future service⁴.
 - The Normal Cost for a tier of benefits is the sum of the individually determined Normal Costs for all members in that tier.
 - Exception: for plans with benefits unrelated to compensation the Entry Age method with level dollar Normal Cost may be more appropriate.
- For multiple tiers:
 - Normal Cost is based on each member's benefit.
- For benefit formula or structure changes within a tier (generally after a fixed date):

- Normal Cost is based on current benefit structure (replacement life Entry Age⁵).

Acceptable Practices

- Aggregate cost method: Plans using the Aggregate method should disclose costs and liabilities determined under the Entry Age method.
 - Calculate Normal Cost and UAAL under Entry Age method.
 - Determine single amortization period for the Entry Age UAAL that, combined with the Entry Age Normal Cost, is equivalent to Aggregate method Normal Cost.
- Frozen Initial Liability cost method: This method should disclose costs and liabilities under the Entry Age method.
 - Calculate Normal Cost and UAAL under Entry Age method.
 - Deduct the FIL amortization bases from the Entry Age UAAL.
 - Determine single amortization period for the remaining Entry Age UAAL that, combined with the Entry Age Normal Cost, is equivalent to FIL method Normal Cost.
- Funding to Decrement Entry Age method, where each type and incidence of benefit is funded to each age at decrement.
 - This method may be appropriate for some plan designs or for plans closed to new entrants⁶.
- For benefit formula or structure changes within a tier (generally after a fixed date):

⁴ Under the LCAM model practice, Normal Cost is allocated over service that continues until the member is no longer working. For active members in or expected to enter a DROP (Deferred Retirement Option Program) this includes service through the expected end of the DROP period. This is not the method adopted by GASB in Statements 67 and 68, where service cost is allocated only through the beginning of the DROP period. The GASB method for DROPs is categorized as an Acceptable Practice for funding.

⁵ Note that this is not the method used in GASB's Statements 67 and 68. The GASB method is categorized as an Acceptable Practice.

⁶ For example, a Plan that provides very valuable early career-benefits (such as heavily subsidized early retirement or disability benefits) may prefer to have the higher early-career Normal Costs associated with the Funding to Decrement Entry Age method.

ACTUARIAL COST METHOD

- Normal Cost is based on each member's composite projected benefit (averaged Entry Age⁷).

Acceptable Practices, with Conditions

- Projected Unit Credit cost method.
- Entry Age method variation ("Aggregated" Entry Age method) where the Normal Cost for a tier of benefits is determined as the Normal Cost rate for the tier applied to the compensation for the tier, and where the Normal Cost rate for the tier of benefits is determined as the present value of future Normal Costs for all active members in the tier, divided by the present value of compensation for all members in the tier.
- Aggregate or Frozen Initial Liability methods without the disclosures of costs and liabilities determined under the Entry Age method discussed above.

Non-recommended Practices

- Normal Cost based on open tier of benefits even for members not in that open tier (Ultimate Entry Age).
 - Ultimate Entry Age Normal Cost may be useful to illustrate the longer-term Normal Cost for combined tiers or to evaluate fixed contribution rates.

Unacceptable Practices

- Traditional (non-Projected) Unit Credit cost method for plans with pay-related benefits as the primary benefit.
- Note that while this white paper does not address policy issues related to pay-as-you-go funding or terminal funding, such practices would be unacceptable if the policy intent is to fund the members' benefits during the members' working careers.

Transition Policies

- There are no transition policies that apply to funding methods. For substantial method changes (e.g., changing from Projected Unit Credit to Entry Age) special amortization periods could apply. These are discussed in the section on Amortization Policy.

⁷ Note that this is the version of the Entry Age method required for financial reporting under GASB Statements 67 and 68 for plans with benefit formula or structure changes within a tier.

Asset Smoothing Methods

An asset smoothing method reduces the effect of short term market volatility while still tracking the overall movement of the market value of plan assets.

Specific policy objectives and considerations

1. The funding policy should specify all components of asset smoothing method:
 - a. Amount of return subject to deferred recognition (smoothing).
 - b. The smoothing period or periods.
 - c. The range constraints on smoothed value (market value corridor), if any.
 - d. The method of recognizing deferred amounts: fixed or rolling smoothing periods.
2. The asset smoothing method should be unbiased relative to market.
 - a. The same smoothing period should be used for gains and for losses.
 - b. Any market value corridor should be symmetrical around market value.
3. The asset smoothing method should not be selectively reset at market value only when market value is greater than actuarial value.
 - a. Bases may be combined but solely to reduce future, non-level recognition of relatively small net unrecognized past gains and losses (i.e., when the smoothed and market values are already relatively close together).
4. The asset smoothing method should be unbiased relative to realized vs unrealized gain loss.
 - a. Base deferrals on total return gain/loss relative to assumed earnings rate.
5. The asset smoothing method should incorporate the ASOP 44 concepts of:
 - a. Likely to return to market in a reasonable period and likely to stay within a reasonable range of market, or
 - b. Sufficiently short period to return to market or sufficiently narrow range around market.
6. The policy parameters should reflect empirical experience from historical market volatility.
7. The asset smoothing method should support the policy goal of

ASSET SMOOTHING METHODS

demographic matching (the intergenerational aspect of interperiod equity) described in general policy objective 2. This leads to a preference for smoothing methods that provide for full recognition of deferred gains and losses in the UAAL by some date certain.

- a. Note that this objective is also consistent with the accountability and transparency goals described in general policy objective 4.

Discussion

1. Longer smoothing periods generally reduce contribution volatility. A discussion of smoothing periods could include the following considerations:
 - a. To the extent that smoothing periods are considered as being tied to economic or market cycles, those cycles may be believed to be longer or shorter than in past years.
 - b. If markets are more volatile, then longer smoothing would be needed even if only to maintain former levels of contribution stability.
 - c. Better funded plans, more mature plans and higher benefit plans (i.e., plans with a higher "volatility index") have inherently more volatile contribution rates, so may justify longer smoothing.
 - d. Sponsors may be more sensitive to contribution volatility.
2. However, ASOP 44 implies that longer smoothing periods call for narrower market value corridors.
 - a. In effect, the corridor imposes a demographic matching style constraint on the use of longer smoothing periods which otherwise would obtain greater volatility management.
3. The model interpretation is that five year smoothing is "sufficiently short" under ASOP 44.
 - a. This reflects long and consistent industry practice, as well as GASB Statement 68.
 - b. This implies that five year smoothing with no market value corridor is ASOP compliant.
 - c. It still may be useful to have a market value corridor as part of the asset smoothing policy.
 - i. This avoids having to introduce the corridor structure in reaction to some future discussion of longer smoothing periods.
4. Consider the extensive data available on the impact of smoothing periods and market value corridors after large market downturn (such as occurred in 2008).
 - a. The smoothing method manages the transition from periods of lower cost to periods of higher cost.
 - i. The level of those higher costs is determined primarily by size of the market loss and UAAL amortization period, not the asset smoothing policy.
 - b. The smoothing period determines length of the transition period.
 - c. The market value corridor determines cost pattern during the transition.
 - i. A wide corridor or no corridor produces a straight line transition.
 - ii. "Hitting the corridor" accelerates the cost increases or decreases in early years of transition.
 - A. In effect the corridor inhibits the smoothing method after years of large losses (or gains).
 - iii. There are various possible policy justifications for such an accelerated transition.
 - A. Market timing: get more contributions in while the market is down.
 - B. Cash flow management: low market values may impair plan liquidity.
 - C. Employer solvency: if the employer eventually is going to default on making contributions, then get as much contribution income as possible before that happens.
 - D. Employer preference: employers may prefer to have the higher costs in their rates as soon as possible.

ASSET SMOOTHING METHODS

- iv. Following the 2008 market decline, these justifications were generally not found to be compelling.
 - A. The normal lag in implementing new contributions rates defeats iii. A and B.
 - B. Employers are presumed solvent and if not, accelerating contributions would make things worse.
 - C. Many employers clearly preferred more time to absorb the contribution increases.
- v. Absent these considerations, 2008 experience argues for permitting a wide corridor with a five year smoothing period, based on the fact that five year smoothing produced actuarial value to market value ratios that exceeded 140%.
 - A. Projections in early 2009 actually showed these ratios could have been as high as 150% if markets had not recovered some before the June 30, 2009 valuations.
- 5. Other industry indicators for market corridor selection with long smoothing periods
 - a. CalPERS 2005 policy: 15 year rolling smoothing with 20% corridor.
- 6. Structural issue: Fixed, separate smoothing periods vs. a single, rolling smoothing period
 - a. Fixed, separate smoothing periods for each year of market gain or loss insure that all deferred gains and losses are included in the UAAL (and so in the contribution rates) by a known date. This is consistent with accountability and with demographic matching.
 - b. A single rolling smoothing period avoids "tail volatility" where contributions are volatile not only when gains and losses first occur but also when (under a layered approach) each year's gain or loss is fully recognized.
 - i. Rolling smoothing is consistent with volatility management but substantially extends the recognition period for deferred investment gains and losses.
 - A. This will extend the time when the actuarial value of assets is consistently above or below the market value of assets.
 - B. That argues for narrower corridors than are appropriate for fixed (layered) smoothing periods.
 - ii. In effect, rolling smoothing recognized a fixed percentage of deferred investment gains and losses each year.
 - A. For example, 5 year rolling amortization recognizes 20% of the deferred amount.
 - B. Base corridors on this deferral recognition percentage.
 - c. With fixed, separate smoothing periods, tail volatility due to alternating periods of market gains and losses can be controlled by limited active management of the separate deferral amounts.
 - i. One such adjustment involves combining the separate deferral amounts when the net deferral amount is relatively small (i.e., the smoothed and market values are very close together) but the recognition pattern of that net deferral is markedly non-level.
 - A. The net deferral amount is unchanged as of the date of the adjustment.
 - B. The period over which the net deferral amount is fully recognized is unchanged as of the date of the adjustment.
 - ii. Other uses of active management of the deferral amounts may add complexity to the application of the policy and may reduce transparency.
 - iii. Restarts of fixed, separate smoothing periods should not be used:
 - A. Too frequently, as this would produce a de facto rolling smoothing period, or

ASSET SMOOTHING METHODS

- B. To selectively restart smoothing at market value only when market value is greater than smoothed value. This would violate General Policy Objective 5, since it would selectively change the policy only when the effect is to reduce contributions.

Practices

Based on the above discussion, and consistent with the policy objectives, asset smoothing methods and parameters are categorized as follows:

LCAM Model Practices

- Deferrals based on total return gain/loss relative to assumed earnings rate.
- Deferrals recognized in smoothed value over fixed smoothing periods not less than 3 years.
- Maximum market value corridors for various smoothing periods:
 - 5 or fewer years, 50%/150% corridor.
 - 7 years, 60%/140% corridor.
- Combine smoothing periods or restart smoothing only to manage tail volatility.
 - Appropriate when the net deferral amount is relatively small (i.e., the actuarial and market values are very close together).
 - The net deferral amount is unchanged as of the date of the adjustment.
 - The period over which the net deferral amount is fully recognized is unchanged as of the date of the adjustment.
 - Avoid using frequent restart of smoothing to achieve de facto rolling smoothing.
 - Avoid restarting smoothing only accelerate recognition of deferred gains, i.e., only when market value is greater than actuarial value.
- Additional analysis, such as solvency projections, is likely to be appropriate for closed plans.

Acceptable Practices

- Maximum market value corridors for various smoothing periods:

- 10 years, 70%/130% corridor.
- Five year (or shorter) smoothing with no corridor (including use of market value of assets without smoothing).
- Rolling smoothing periods with the following maximum market value corridors for various smoothing periods:
 - Express rolling smoothing period as a percentage recognition of deferred amount and set corridor at that same percentage. For example:
 - 3 year rolling smoothing means 33% recognition, with a 33% corridor.
 - 4 year rolling smoothing means 25% recognition, with a 25% corridor.
 - 5 year rolling smoothing means 20% recognition, with a 20% corridor.
 - 10 year rolling smoothing means 10% recognition, with a 10% corridor.
 - Perform additional analysis including projections of when the actuarial value is expected to return to within some narrow range of market value.

Acceptable Practices, with Conditions

- Maximum market value corridors for various smoothing periods:
 - 15 years, 80%/120% corridor.

Non-recommended Practices

- Longer than 5 year smoothing with no corridor.
- 15 years or shorter smoothing with corridors wider than shown above.

Unacceptable Practices

- Smoothing periods longer than 15 years

Transition Policies

Generally, transition policies for asset smoothing would allow current layered smoothing to continue subject to the appropriate model corridors (as determined by the future smoothing periods, if changed from the past/current layers). Transition from rolling asset smoothing would fix the rolling layer at its current period.

Amortization Policy

An amortization policy determines the length of time and the structure of the increase or decrease in contributions required to systematically (1) fund any Unfunded Actuarial Accrued Liability or UAAL, or (2) recognize any Surplus, i.e., any assets in excess of the AAL.

Specific policy objectives and considerations

1. Variations in contribution requirements from simply funding the Normal Cost will generally arise from gains or losses, method or assumption changes or benefit changes and will emerge as a UAAL or Surplus. As discussed in the general policy objectives, such variations should be funded over periods consistent with an appropriate balance between the policy objectives of demographic matching and volatility management.
2. As with the Normal Cost, the cost for changes in UAAL should emerge as a level percentage of member compensation⁸.
3. The amortization policy should reflect explicit consideration of these different sources of change in UAAL, even if the resulting policy treats different changes in the same way:
 - a. Experience gains and losses.
 - b. Changes in assumptions and methods.
 - c. Benefit or plan changes.
4. The amortization policy should reflect explicit consideration of the level and duration of negative amortization, if any.
 - a. This consideration should not necessarily preclude some negative amortization that may occur under an amortization policy that is otherwise consistent with the policy objectives.
 - b. Amortization periods developed in consideration of negative amortization (along with other policy goals) may be relevant for level dollar amortization (where negative amortization does not occur).
5. The amortization policy should support the general policy objectives of

⁸ As with the Normal Cost, this amortization policy objective applies most clearly to benefits (like, for example, most public pension benefits) that are determined and budgeted for as a percentage of individual and aggregate salary, respectively. For benefits that are not pay related, or when costs are budgeted on a basis other than compensation it may be appropriate to modify this objective and the resulting policies accordingly.

AMORTIZATION POLICY

accountability and transparency. This leads to a preference for:

- a. Amortization policies that reflect a history of the sources and treatment of UAAL.
 - b. Amortization policies that provide for a full amortization date for UAAL.
 - i. Note that this objective is also consistent with the demographic matching aspect of general policy objective 2.
6. The amortization of Surplus requires special consideration, consistent with general policy objective 5 (nature of public plan governance).
- a. Amortization of Surplus should be considered as part of a broader discussion of Surplus management techniques, including:
 - i. Excluding some level of Surplus from amortization.
 - ii. "Derisking" some portion of plan liabilities by changing asset allocation.

Discussion

1. The policy objectives lead to a general preference for level percentage of pay amortization.
 - a. Consistent with policy objectives and with the Normal Cost under the Model Actuarial Cost Method.
 - b. This discussion of amortization periods presumes level percentage amortization. Level dollar amortization is discussed separately as an alternative to level percentage amortization.
2. The policy objectives lead to a general preference for multiple, fixed amortization layers.
 - a. Fixed period amortization is clearly better for accountability, since UAAL is funded as of a date certain.
 - b. Single layer, fixed period amortization is not a stable policy, since period would have to be restarted when remaining period gets too short.
3. For gains and losses, balancing demographic matching and volatility control leads to an ideal amortization period range of 15 to 20 years.
 - a. Lesson learned from the 1990s is that less than 15 years gives too little "volatility control", especially for gains.
 - i. Short amortization of gains led to partial contribution holidays (contributions less than Normal Cost) and even full contribution holidays (no contribution required).
 - ii. This is inconsistent with general policy objective 5, in that it led to insufficient budgeting for ongoing pension costs and to pressure for benefit increases.
 - b. Longer than 20 years becomes difficult to reconcile with demographic matching, the intergenerational aspect of interperiod equity described in general policy objective 2.
 - i. 20 years is substantially longer than either average future service for actives or average life expectancy for retirees.
 - c. Periods longer than 20 years also entail negative amortization (which starts at around 16 to 18 years for many current combinations of assumptions)⁹.
 - i. Here negative amortization is an indicator for not enough demographic matching but based on economic rather than demographic assumptions.

⁹ Note that for emerging lower investment return and salary increase assumptions even twenty year amortization may entail no negative amortization.

AMORTIZATION POLICY

- ii. Consider observed consistency between the period of onset of negative amortization and the periods related to member demographics.
- iii. As discussed later in this section, negative amortization is a much greater concern when using open or rolling amortization periods.
- d. Two case studies — CalPERS and GASB:
 - i. CalPERS 2005 analysis focused on volatility management. Resulting funding policy uses exceptionally long periods for gain and loss amortization (as well as for asset smoothing.)
 - ii. GASB Statements 67 and 68 focus on demographic matching. Resulting expensing policy uses very short recognition periods. (This is cited for comparison only, as the GASB statements govern financial reporting and not funding.)
 - iii. Our general policy objectives indicate a balance between these two extremes.
- 4. For assumption changes, while the amortization periods could be the same, a case can be made for longer amortization than for gain/loss, since liabilities are remeasured to anticipate multiple years of future gains or losses.
 - a. A similar or even stronger case for longer periods could be made for changing cost method (such as from Projected Unit Credit to Entry Age), or for the initial liability for a newly funded plan.
 - b. However longer than 25 years entails substantial (arguably too much) negative amortization.
- 5. For plan amendments that increase liabilities, volatility management is not an issue, only demographic matching.
 - a. Use actual remaining active future service or retiree life expectancy.
 - b. Could use up to 15 years as an approximation for actives.
- i. Any period that would entail negative amortization is inconsistent with general policy goals 2 (demographic matching) and 5 (nature of public plan governance).
- c. Could use up to 10 years as an approximation for inactives.
 - i. Particularly for retiree benefit increases, amortization period should control for negative cash flow where additional amortization payments are less than additional benefit payments.
- d. For Early Retirement Incentive Programs use a period corresponding to the period of economic savings to the employer.
 - i. Shorter than other plan amendments, typically no more than five years¹⁰
- e. For benefit improvements with accelerated payments (e.g. one time “13th check” or other lump sum payments) amortization may not be appropriate as any amortization will result in negative cash flows.
- 6. Plan amendments that reduce liabilities require separate considerations so as to avoid taking credit for the reduction over periods shorter than the remaining amortization of the original liabilities.
 - a. Reductions in liability due to such benefit reductions should not be amortized more rapidly than the pre-existing unfunded liabilities, as measured by the average or the longest current amortization period.
 - b. Benefit “restorations¹¹” should similarly be amortized on a basis consistent with the pre-existing unfunded liabilities or with the “credit” amortization base established when the benefits were reduced.
- 7. For Surplus, similar to short amortization of

10 For example, a Government Finance Officers Association (GFOA) 2004 recommended practice states that “the incremental costs of an early retirement incentive program should be amortized over a short-term payback period, such as three to five years. This payback period should match the period in which the savings are realized.”

11 A benefit restoration occurs when a previous benefit reduction has been fully or partially restored for a group of members who were subject to the earlier benefit reduction.

AMORTIZATION POLICY

- gains, the lesson from the 1990s is that short amortization of surplus leads to partial or full contribution holidays (contributions less than Normal Cost, or even zero).
- a. This is inconsistent with general policy objective 5, and led to insufficient budgeting for ongoing pension costs and to pressure for benefit increases.
 - b. General consensus is that this is not good public policy.
 - i. See for example Recommendation 7 by California's 2007 Public Employee Post-Employment Benefits Commission, and also CalPERS 2005 funding policy.
 - c. Because of both the ongoing nature of the Normal Cost and the nature of public plan governance, amortization of UAAL and Surplus should not be symmetrical.
 - i. It may be appropriate to amortize surplus over a period longer than would be acceptable for UAAL.
 - ii. Such an asymmetric policy would reduce the magnitude and/or likelihood of partial or full contribution holidays.
 - iii. One approach would be to disregard the Surplus and always contribute at least the Normal Cost. However if Surplus becomes sufficiently large then some form of Surplus management may be called for.
 - d. Note that long amortization of Surplus does not preclude other approaches to Surplus management that are beyond the scope of this discussion, including:
 - i. Treating some level of Surplus as a non-valuation asset.
 - ii. Changing asset allocation to reflect Surplus condition.
8. Separate Surplus related issue: When plan first goes into Surplus, should existing UAAL amortization layers be maintain or eliminated?
- a. Could maintain amortization layers and have minimum contribution of Normal Cost less 30 year amortization of Surplus.
 - b. However, maintaining layers can result in net amortization charge even though overall plan is in Surplus.
 - c. Alternative is to restart amortization of initial surplus, and any successive Surpluses.
 - i. In effect, this is 30 year rolling amortization of current and future Surpluses.
 - ii. Restart amortization layers when plan next has a UAAL.
9. Level dollar amortization is fundamentally different from level percent of pay amortization.
- a. No level dollar amortization period is exactly equivalent to a level percent period.
 - b. Level dollar is generally faster amortization than level percent of pay, so longer periods may be reasonable.
 - c. Plan and/or sponsor circumstances could determine appropriateness of level dollar method.
 - i. Level dollar would be appropriate for plans where benefits are not pay related and could be appropriate if the plan is closed to new entrants.
 - ii. Level dollar could be appropriate for sponsors and plans that are particularly averse to future cost increases, e.g., utilities setting rates for current rate payers.
 - iii. Level dollar could be appropriate for sponsors and plans that want an extra measure of conservatism or protection against low or no future payroll growth.
 - iv. Level dollar could be useful as a step in developing amortization payments in proportion to some basis other than payroll.
10. Multiple, fixed period layers vs. single, rolling period layer for gains and losses.
- a. Multiple, fixed amortization periods for each year's gain or loss ensures that all gains and losses are funded by a known date. This is consistent with accountability and with demographic matching.

AMORTIZATION POLICY

- b. A single rolling smoothing period avoids tail volatility where contributions are volatile not only when gains and losses occur but also when each year's gain or loss is fully amortized. This is consistent with volatility management.
 - c. With fixed, separate smoothing periods, tail volatility can be controlled by limited active management of the amortization layers, including combining consecutive gain and loss layers as necessary to reduce tail volatility.
 - i. As with asset smoothing, active management should be used to manage the pattern of future UAAL funding and not to accomplish a short-term manipulation of contributions.
 - ii. In particular the net remaining amortization period should be relatively unaffected by any combination of offsetting UAAL amortization layers.
 - iii. The use of active management of the amortization layers may add complexity to the application of the policy and may reduce transparency.
11. Plans with layered amortization of an unfunded liability should consider actions to achieve a minimum net amortization charge that is not less than the payment required under a single 25 year amortization layer. This may be accomplished through active management of the amortization layers or through other means.
12. Rolling amortization periods for a single layer of gains and losses or for the entire UAAL.
- a. Similar to level dollar, acknowledge that rolling amortization is fundamentally different from fixed period amortization.
 - i. Rolling amortization will have a substantial unamortized UAAL at the end of the nominal amortization period.
 - b. Argument can be made for a single, rolling amortization layer for gains and losses if the actuarial valuation assumptions are expected to be unbiased so that there is an equal likelihood of future gains and losses that will offset each other.
 - i. Such rolling amortization also requires that there are no systematic sources of future actuarial losses from plan design features, such as a subsidized service purchase option.
 - ii. Extraordinarily large gains or losses that are not reasonably expected to be offset by future losses or gains should be isolated from the single rolling gain/loss amortization layer and amortized over separate, fixed periods.
 - iii. Plans with a significant single rolling gain/loss amortization layer should affirmatively show that policy objectives will be achieved, without substantial violation of intergenerational equity.
- c. This argument is substantially weaker for rolling amortization for assumption changes (especially if consistently in a single direction, such as mortality assumption adjustments or recent changes in investment earnings assumptions.)
- i. Inconsistent with policy objective of intergenerational equity, as well as accountability and transparency.
 - ii. Similar concerns for rolling amortization of gains and losses in the presence of biased assumptions or other systematic sources of actuarial losses.
- d. It is very difficult to reconcile rolling amortization of plan amendments with intergenerational equity, as well as with accountability and transparency objectives.
- e. Specific exception for rolling, lengthy amortization of Surplus, since as described earlier this helps meet general policy objective 5
13. Rolling amortization and the Aggregate cost method.
- a. The Aggregate cost method produces contribution levels and patterns similar to using the Entry Age method with a single rolling level percent of pay amortization layer for the entire UAAL and a relatively short rolling amortization period.

AMORTIZATION POLICY

- i. Effective rolling amortization period reflects average future service of active members.
- b. However, the Aggregate cost method is fundamentally different from Entry Age (and from Projected Unit Credit) in that Aggregate does not measure an AAL or a UAAL.
 - i. Aggregate combines a high level of tail volatility management (policy objective #3) with high levels of demographic matching and accountability (policy objectives 2 and 4).
 - ii. Aggregate also provides no policy flexibility in the selection of an amortization period (since no UAAL is calculated) which provides protection from some agency risk issues, consistent with policy objective #5.
- c. Retirement boards desirous of the high level of tail volatility management and computational simplicity associated with rolling amortization of the entire Entry Age UAAL should consider adopting the Aggregate cost method.
 - i. If a UAAL is measured (as under the Entry Age or Projected Unit Credit cost methods) then, as discussed above, the policy objectives indicate layered amortization with the possible exception of a single rolling amortization layer for gains and losses.

Practices

Based on the above discussion, and consistent with the policy objectives, amortization methods and parameters are categorized as follows:

LCAM Model Practices

- Layered fixed period amortization by source of UAAL
- Level percent of pay amortization
- Amortization periods

Source	Period
Active Plan Amendments ¹²	Lesser of active demographics ¹³ , or 15 years
Inactive Plan Amendments	Lesser of inactive demographics ¹³ , or 10 years
Experience Gain/Loss	15 to 20 years
Assumption or Method Changes ¹⁴	15 to 25 years
Early Retirement Incentives	5 years or less

- 30 year amortization of surplus (for plans with ongoing Normal Cost and/or plan expenses)
 - Eliminate all prior UAAL layers upon going into Surplus
- Combine gain/loss (and other) layers or restart amortization only to avoid tail volatility.
 - Combining layers should result in substantially the same current amortization payment.
 - Avoid using restart of amortization to achieve de facto rolling amortization.
 - Restart amortization layers when moving from Surplus to UAAL condition.
- Additional analysis, such as solvency projections, is likely to be appropriate for closed plans.

12 The effect of assumption changes integral to the measurement of the cost of plan amendments (e.g., change in rates of retirement to anticipate the effect of new benefit levels) should be included in the UAAL change associated with the plan amendment.

13 Demographics based periods include remaining active future service or retiree life expectancy. Amortization period should also control for negative cash flow where additional amortization payments are less than additional benefit payments.

14 Method change includes the initial liability for a newly funded plan.

AMORTIZATION POLICY

Acceptable Practices

- Up to 15 years for inactive plan amendments.
- Level dollar fixed period layered amortization by source of UAAL, using the same model amortization periods as above.
 - Ideally, some rationale should be given if used with pay related benefits.

Acceptable Practices, with Conditions

- Up to 25 year layered fixed period amortization by source, for all sources of UAAL.
 - Ideally with some rationale given for using periods outside the model ranges.
- Rolling amortization of a single combined gain/loss layer with an amortization period that does not entail any negative amortization.
 - With model periods for other sources of UAAL.
 - Use separate, fixed period layers for extraordinary gain or loss events.
 - Plans with a significant single rolling gain/loss amortization layer should demonstrate that policy objectives will be achieved.
- Up to 30 year fixed amortization of change in funding method (e.g. from PUC to Entry Age) or initial liability for a newly funded plan (i.e. an existing plan previously funded on a pay-as-you-go basis but not a new plan creating new past service benefits.)
 - Ideally some rationale should be given for using periods outside the model ranges.

Non-recommended Practices

- Fixed period amortization of the entire UAAL as a single combined layer, with periodic reamortization over a new (longer) starting amortization period.
- Layered fixed period amortization by source of UAAL over longer than 25 years (i.e., 26 to 30 years).
- Rolling amortization of a single combined gain/loss layer with an amortization period that does entail any negative amortization, but no longer than 25 years.
 - Same three conditions that apply to Acceptable with Conditions rolling gain/loss amortization.

- Rolling/open amortization of entire UAAL as a single combined layer (exclusive of plan amendments but inclusive of gain/loss, assumption and method changes) even where the amortization period does not entail negative amortization.

Unacceptable Practices

- Layered fixed period amortization by source of UAAL over longer than 30 years.
- Rolling/open amortization over longer than 25 years of a single combined gain/loss layer.
- Rolling/open amortization of entire UAAL as a single combined layer (exclusive of plan amendments) where the amortization period entails negative amortization.
- Rolling/open amortization of entire UAAL as a single combined layer (including plan amendments) even where the amortization period does not entail negative amortization.

Transition Policies

Transition policies are particularly applicable to amortization policy. Generally, transition policies for amortization would allow current fixed period amortization layers (with periods not to exceed 30 years) to continue, with new amortization layers subject to these guidelines. Transition from rolling amortization would fix any rolling layer at its current period, with future liability changes amortized in accordance with these guidelines. During the transition (i.e., as long as the remaining period for the formerly rolling base is longer than model or acceptable periods) any new credit layers (e.g., due to actuarial gains or less conservative assumptions) should be amortized over no longer than that same remaining period.

Direct Rate Smoothing

An actuarial funding policy may include some form of direct rate smoothing, where the contribution rates that result from applying the three principal elements of funding policy (including asset smoothing) are then directly modified.

As noted in the Introduction, some practitioners are developing direct contribution rate smoothing techniques as an alternative to asset smoothing. At this time, there are no widely accepted practices established for this type of direct rate smoothing. This discussion does not address the use of direct rate smoothing techniques as an alternative to asset smoothing. The CCA PPC is considering development of a separate white paper on direct rate smoothing as an alternative to asset smoothing.

The balance of this discussion pertains only to direct rate smoothing when used in conjunction with asset smoothing. Two types of such direct rate smoothing policies that are known to be in current practice were evaluated for this development:

1. Phase-in of certain changes in contribution rates, specifically, phasing-in the effect of assumption changes element over short period, consistent with the frequency of experience analyses.
2. Contribution collar where contribution rate changes are limited to a specified amount or percentage from year to year.

Discussion

1. Contribution rate phase-in can be an effective and reasonable way to address the contribution rate impact of assumption changes.
 - a. Ideally the phase-in period should be no longer than the time period until the next review of assumptions (experience analysis).
 - i. This approach is most appropriate when experience analyses are performed on a regular schedule.
 - ii. For systems with no regular schedule for experience analyses, the phase-in period would ideally be chosen so as to avoid overlapping phase-in periods.

DIRECT RATE SMOOTHING

- a. The plan and its sponsors should be clearly aware of the additional time value of money cost (or savings) of the phase-in, due to the plan receiving less (or more) than the actuarially determined contributions during the phase-in.
 - b. Any ongoing policy to phase-in the effect of assumption changes should be applied symmetrically to both increases and decreases in contribution rates.
 - c. Ongoing policy may be to phase-in only significant cost increases or decreases.
 - d. Note that the phase-in of the contribution rate impact of an assumption change is clearly preferable to phasing in the assumption change itself. While a detailed discussion is outside the scope of this discussion, phasing in an assumption change may be difficult to reconcile with the governing actuarial standards of practice.
2. Contribution collars have the policy drawback that the collar parameters arbitrarily override the contribution results produced by the other funding policy parameters (including asset smoothing), each of which have a well-developed rationale.
 - a. If contribution collars are used they should be supported by analysis and projections to show the effect on future funded status and future policy based contribution requirements (prior to the application of the contribution collar).
 - b. There may also need to be a mechanism to ensure adequate funding following extraordinary actuarial losses.
 3. Using either form of direct rate smoothing for other than assumption changes (i.e., for actuarial experience or plan amendments) appears inconsistent with the development of parameter ranges for the other elements of the funding policy.

Practices

Based on the above discussion, and consistent with the policy objectives, parameters are categorized as follows:

LCAM Model Practices

- None

Acceptable Practices

- For systems that review actuarial assumptions on a regularly scheduled basis, phase-in of the cost impact of assumption changes over a period no longer than the shorter of the time period until the next scheduled review of assumptions (experience analysis) or five years.
 - Phase-in should be accompanied by discussion and illustration of the impact of the phase-in on future contribution rates.
 - Phase-in may be applied only to cost impacts deemed material, but should be applied consistently to both cost increases and decreases.

Acceptable Practices, with Conditions

- For systems that do not review actuarial assumptions on a regularly scheduled basis, phase-in of the cost impact of assumption changes over a period of up to five years.
 - Phase-in of the cost impact of any prior assumption changes must be completed before commencing another phase-in period.
 - Phase-in should be accompanied by discussion and illustration of the impact of the phase-in on future contribution rates.
 - Phase-in may be applied only to cost impacts deemed material, but should be applied consistently to both cost increases and decreases.

Non-recommended Practices

- Phase-in of the cost impact of assumption changes over a period greater than five years.
- Phase-in of the cost impact of actuarial experience, in conjunction with model or acceptable practices for asset smoothing and UAAL amortization.
- Contribution collars in conjunction with model or acceptable practices for asset smoothing and UAAL amortization.
- Phase-in or contribution collars for the cost impact of plan amendments.

Items for Future Discussion

This white paper is intended to address the principal elements of an actuarial funding policy as applicable in most but not all situations. Other issues related to funding policy that may be of varying significance are listed in this section, including some of a more technical nature. These items may be the subjects of future guidance.

Impact of Risk/Employer ability to pay/Level of benefit protection—These are three considerations that could affect the development of an actuarial funding policy. While this white paper notes that these factors should be considered, it does not develop policies or procedures for doing so. This paper also does not address appropriate disclosure items, including disclosures related to risk. These considerations (and interrelationships) are outside of our current scope but are important items for future discussion.

OPEB Plans – As noted earlier, while we believe the general policy objectives developed here apply to OPEB plans as well, application of those policy objectives to OPEB plans may result in different specific funding policies based on plan design, legal status and other features distinctive to OPEB plans. Many of the actuaries who participated in developing this paper work on both pension and OPEB funding. We may address funding policies specific to OPEB plans in a later document. That process would also draw on experts in the design, underwriting and valuation of OPEB plans.

Self Adjusting System—We expect that an increasing number of plans will have self adjusting provisions (in this context we are referring to benefit adjustments). These provisions could impact the selection of funding methods.

Transfers of Service Credit—New entrants (or even current member) are sometimes eligible to transfer service credit for employment prior to plan membership. This generally creates actuarial losses, which is inconsistent with our policy objectives. Later we may discuss whether and how this should be anticipated in the valuation.

Purchase of Service—This can raise the same type of issues as Transfers of Service Credit since unfunded actuarial liabilities often increase when employees purchase service credit.

Actuarially determined contribution as a dollar amount or percentage of pay—Sometimes the contribution requirement is determined prior to the year it is due and shown as a dollar amount or a percentage of payroll. Either can be

used to determine the contribution amount required.

Role for Open/Stochastic Valuations and risk disclosures—Our guidelines are developed in the context of a closed group, deterministic valuation. This is in part due to the belief that such a valuation best achieves our policy objectives. However, there are also advantages associated with other valuation practices.

Lag time between valuation date and fiscal year – Because of the time needed to produce the valuation and to budget for rate changes, the contribution made for a given fiscal year is often based on an earlier valuation date. This will generate contribution gains or losses when rates decrease or increase, respectively. Some systems adjust for these gains or losses in setting the rates but many do not.

