



**State of Washington
Pension Funding Council**

**June 30, 2009
Actuarial Valuation Audit**

Produced by **Cheiron**

May 2011

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June 1, 2011

Pension Funding Council
State of Washington
Department of Retirement Systems
PO Box 48380
Olympia, WA 98504-8380

Cheiron is pleased to present the results of our actuarial audit of the June 30, 2009 actuarial valuation performed by the Office of the State Actuary (OSA) for the Pension Funding Council (PFC). We direct your attention to the summary section of our report which highlights the key findings of our review. The balance of the report provides details in support of these findings along with supplemental data, background information and discussion of the process taken in the evaluation of the work performed by the OSA.

In performing this audit, Cheiron used actuarial assumptions and methods as specified in statute and, when not specified in statute, recommended by the OSA and adopted by the PFC. Assumptions have not been reviewed as part of the audit.

The results of this audit report reflect a full replication of the June 30, 2009 actuarial valuation for the following Washington State retirement plans:

- Teachers' Retirement System Plan 1 (TRS 1)
- Teachers' Retirement System Plan 2/3 (TRS 2/3)
- Public Employees' Retirement System Plan 1 (PERS 1)
- Public Employees' Retirement System Plan 2/3 (PERS 2/3)
- School Employees' Retirement System Plan 2/3 (SERS 2/3)
- Public Safety Employees' Retirement System Plan 2 (PSERS 2)
- Washington State Patrol Retirement System Plans 1 and 2 (WSPRS 1/2)
- Law Enforcement Officers' and Fire Fighters' Retirement System Plan 1 (LEOFF 1)

In preparing our report, we relied, without audit, on information (some oral and some written) supplied by the Department of Retirement Systems (DRS) and the OSA. This information includes, but is not limited to, plan provisions, employee census data and financial information, a detailed description of all information provided for this audit is provided in the body of our report.

While the data was not explicitly audited, we did compare the raw census data to the census data used in the actuarial valuation. Our report includes commentary on the results of this comparison.

We would like to take this opportunity to thank the members of DRS staff and the OSA for their assistance in providing the data and addressing our questions during this audit process.



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We hereby certify that, to the best of our knowledge, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board, and that as Members of the American Academy of Actuaries, we meet the Qualification Standards to render the opinion contained in this report.

Sincerely,
Cheiron



William R. Hallmark, ASA, FCA, EA, MAAA
Consulting Actuary



Kenneth A. Kent, FSA, FCA, EA, MAAA
Principal Consulting Actuary

EXECUTIVE SUMMARY

Cheiron performed an audit of the June 30, 2009 actuarial valuation of the following Washington State retirement plans:

- Teachers' Retirement System Plan 1 (TRS 1)
- Teachers' Retirement System Plan 2/3 (TRS 2/3)
- Public Employees' Retirement System Plan 1 (PERS 1)
- Public Employees' Retirement System Plan 2/3 (PERS 2/3)
- School Employees' Retirement System Plan 2/3 (SERS 2/3)
- Public Safety Employees' Retirement System Plan 2 (PSERS 2)
- Washington State Patrol Retirement System Plans 1 and 2 (WSPRS 1/2)
- Law Enforcement Officers' and Fire Fighters' Retirement System Plan 1 (LEOFF 1)

In developing our findings, we focused on the accuracy of the calculations and the extent to which the assumptions and methods serve to meet the intent and objectives described in statute. RCW 41.45.010 establishes the intent or goals of the funding process as follows:

- Fully fund PERS 2/3, TRS 2/3, SERS 2/3, PSERS 2 and LEOFF 2 as provided by law;
- Fully amortize the unfunded actuarial liability in PERS 1 and TRS 1 within a rolling 10-year period using methods and assumptions that balance:
 - increased benefit security,
 - decreased contribution rate volatility, and
 - affordability of pension contribution rates;
- Establish long-term employer contribution rates which will remain a relatively predictable proportion of the future state budgets; and
- Fund, to the extent feasible, all benefits for plan 2 and 3 members over the working lives of those members so that the cost of those benefits are paid by the taxpayers who receive the benefit of those members' service.

Our key findings and recommendations are summarized below. In the sections that follow we present the details that explain and support these findings and recommendations.

Key Findings and Recommendations

The principal findings from our actuarial audit are as follows:

1. We found no material difference in the review of the data, the calculation of plan liabilities and normal costs, or in the calculation of contribution rates.

The details in support of our findings are summarized in the balance of this report.

2. The Council and OSA should consider disclosing the plan's funded status in the valuation report on an Entry Age Normal basis instead of a Projected Unit Credit basis.

EXECUTIVE SUMMARY

The Aggregate method, which is the primary method used to determine contribution rates, does not produce a funded status. Consequently, the funded status has historically been calculated under the Projected Unit Credit method. However, GASB now requires plans that use the Aggregate Method to disclose funded status using Entry Age Normal. Rather than disclose one funded status in the valuation reports and a different funded status in the financial reports, we suggest converting the funded status reported in the valuation report to the Entry Age Normal method.

3. The Council should consider legislation to eliminate the membership growth assumption that is used to calculate the amortization of the unfunded liabilities for PERS 1, TRS 1, and LEOFF 1.

Use of a membership growth assumption to calculate amortization schedules as a level percent of payroll defers amortization payments further into the future and is inconsistent with traditional actuarial practice.

4. The precise calculation of the minimum contribution rate intended by the statute needs to be clarified.

Minimum contribution rate equals 80% of the Entry Age Normal Cost (EANC) however we see the potential for three optional interpretations of how those rates are broken down between member and employer minimums. These optional interpretations as we have identified them are:

Option 1 -- Member minimum equals 50% of 80% of the Plan 2 EANC. Employer minimum equals 50% of 80% of Plan 2 EANC plus 80% of Plan 3 EANC.

Option 2 -- Member and employer minimums are the single rate that is expected to produce 80% of the Plan 2/3 combined EANC given the actual breakdown of Plan 2 and Plan 3 enrollment.

Option 3 -- Same as Option 2, but assume 2/3 of employees elect Plan 2 - doesn't necessarily produce an expected contribution equal to 80% of the combined EANC.

5. The Council and OSA should consider using actual plan enrollment instead of assumed enrollment in minimum contribution calculations.

Because the contribution rates are determined in advance of the fiscal year applicable, the actual data is available for application. By using the actual data, workforce and pay rate policies to manage general budget constraints get reflected more immediately versus delaying the impact to a subsequent fiscal year.

6. The Council and the OSA should consider adding an adjustment to the 10-year rolling amortization to account for the delay between the valuation date and the implementation of contribution rates.

EXECUTIVE SUMMARY

In theory, the amortization period is determined based on the expectation that payments will commence in the year the amortization amount was determined. When this amount is determined two years before the fiscal year of payment, an adjustment to account for the delay should be considered.

Additional Findings

The following additional findings, while they may require some technical correction to the valuation, do not have a material impact on the valuation results.

- The actuarial gain or loss due to investment return is calculated on assets excluding payables and receivables. Typical practice would include payables and receivables in the market value of assets; however, the difference this year is very minor.
- Payroll growth for LEOFF 1 is 4.0%, but for LEOFF 2, it is 4.5%. Given this difference, it is not clear how the amortization of a LEOFF 1 unfunded liability should be calculated so that it is a level percent of expected future payroll for LEOFF 1 and LEOFF 2. We note that both of these assumptions are prescribed by statute.
- The description in the valuation report of how the base mortality table was projected was not accurate. It should be replaced with the description in the experience study report which represents an accurate description of the table used in the cost and liability determination.
- The assumption for the commencement of benefits for vested terminated members was not disclosed in the valuation report.
- Assumptions for LEOFF 1 probability of having dependent children, occupational disease for firefighters (LEOFF 2), and WSPRS disabled life mortality were not disclosed in the valuation report.
- For WSPRS, there was no description in the valuation report of the survivor benefit for someone who became disabled.
- The valuation uses PERS 1 factors instead of TRS 1 factors for the J&S reduction for TRS 1 death benefits.

ACTUARIAL VALUATION AUDIT PROCESS

Cheiron was retained by the Pension Funding Council (PFC) and the LEOFF Plan 2 Retirement Board to conduct an actuarial audit replicating the 2009 actuarial valuations performed by the Office of the State Actuary. The audits were completed over a two month period commencing the last week of May.

With an independent replication, the PFC can be assured that the OSA's results are reasonable and accurate. In addition, other aspects of the valuation process are reviewed and our independent opinions provided help to ensure that valuation and funding issues have been addressed and additional expert perspectives have been considered.

Our audit process includes the following:

- **Review of the census data used.** There are typical and anticipated adjustments made to the raw data in preparing the valuation that impact the final results. That treatment should be consistent and rational, and explicitly defined in the valuation reporting. By comparing summary statistics from the raw data to the final data used by the OSA in the valuation, we can highlight differences in the underlying processed data and the likely impact on cost.
- **Replication of the liability and calculation of contribution rates.** By separately programming our valuation system for the same benefits, using the same census data, actuarial cost methods and assumption as reported in the 2009 valuation, we can compare and contrast the results developed by the OSA. This provides an explicit check of the "black-box" valuation process.
- **Comparison of recent retirees.** As an additional check on the calculation of liabilities, we compare the benefits anticipated by the OSA in its valuation to the actual benefits received by some recent retirees. This check verifies that the plan is being valued in a manner consistent with the actual operation of the plan.
- **Deterministic projections.** To test the effectiveness of the actuarial funding method in providing a systematic and smooth pattern of contributions to fund the plan, we build our interactive projection model, *P-scan*. With *P-scan* we explore different potential economic scenarios to illustrate how the actuarial funding method behaves prospectively when stressed.

The audit process is conducted in accordance with generally accepted actuarial principles and methods. The balance of our report presents our detailed findings.

STATE OF WASHINGTON PENSION FUNDING COUNCIL
JUNE 30, 2009 ACTUARIAL VALUATION AUDIT

DATA REVIEW

As part of the valuation process the actuary takes the *raw data* from DRS, applies default minimums and maximums, and performs reasonability tests. These tests look for missing or inconsistent data elements and result in subsequent questions and data file adjustments. In addition there are often certain data elements that require adjustment before the valuation is run. The result of these changes either in correcting the file or adding fields together results in what is often referred to as the *cleaned data file* which represents the input information for valuation processing.

We received copies of both the raw data that the OSA received from DRS and the cleaned data file that the OSA used for the valuation. We applied the default minimums and maximums to the active data file and compared key statistics between the files. The tables below summarize the results.

	Active Members				Ratio of Clean / Raw
	Raw Data	Apply Defaults	Clean Data	Effect of Defaults	
PERS 1					
Count	10,354	10,354	10,354	0.0%	0.0%
Total Salaries (millions)	\$ 573.1	\$ 580.3	\$ 580.2	1.3%	1.2%
Average Age	59.47	59.47	59.47	0.0%	0.0%
Average Service	23.10	23.10	23.10	0.0%	0.0%
Average Salary	\$ 55,353	\$ 56,049	\$ 56,034	1.3%	1.2%
PERS 2					
Count	121,800	121,800	121,800	0.0%	0.0%
Total Salaries (millions)	\$ 6,477.3	\$ 6,713.6	\$ 6,723.9	3.6%	3.8%
Average Age	47.14	47.14	47.13	0.0%	0.0%
Average Service	11.14	11.14	11.15	0.0%	0.1%
Average Salary	\$ 53,179	\$ 55,120	\$ 55,204	3.6%	3.8%
PERS 3					
Count	27,081	27,081	27,081	0.0%	0.0%
Total Salaries (millions)	\$ 1,322.4	\$ 1,406.8	\$ 1,408.4	6.4%	6.5%
Average Age	42.37	42.37	42.37	0.0%	0.0%
Average Service	7.71	7.71	7.72	0.0%	0.1%
Average Salary	\$ 48,830	\$ 51,947	\$ 52,006	6.4%	6.5%

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JUNE 30, 2009 ACTUARIAL VALUATION AUDIT

DATA REVIEW

	Active Members				Ratio of Clean / Raw
	Raw Data	Apply Defaults	Clean Data	Effect of Defaults	
SERS 2					
Count	20,197	20,197	20,197	0.0%	0.0%
Total Salaries (millions)	\$ 557.6	\$ 594.2	\$ 567.0	6.6%	1.7%
Average Age	50.57	50.57	50.57	0.0%	0.0%
Average Service	10.88	10.88	10.88	0.0%	0.0%
Average Salary	\$ 27,609	\$ 29,421	\$ 28,072	6.6%	1.7%
SERS 3					
Count	32,277	32,277	32,277	0.0%	0.0%
Total Salaries (millions)	\$ 891.5	\$ 932.2	\$ 899.5	4.6%	0.9%
Average Age	48.75	48.75	48.75	0.0%	0.0%
Average Service	8.85	8.85	8.85	0.0%	0.0%
Average Salary	\$ 27,621	\$ 28,882	\$ 27,869	4.6%	0.9%
PSERS 2					
Count	4,340	4,340	4,340	0.0%	0.0%
Total Salaries (millions)	\$ 211.2	\$ 222.6	\$ 223.4	5.4%	5.8%
Average Age	37.60	37.60	37.61	0.0%	0.0%
Average Service	2.03	2.03	2.03	0.0%	0.0%
Average Salary	\$ 48,653	\$ 51,284	\$ 51,476	5.4%	5.8%
TRS 1					
Count	5,204	5,204	5,204	0.0%	0.0%
Total Salaries (millions)	\$ 382.6	\$ 388.0	\$ 388.8	1.4%	1.6%
Average Age	60.03	60.03	60.03	0.0%	0.0%
Average Service	27.40	27.40	27.40	0.0%	0.0%
Average Salary	\$ 73,517	\$ 74,562	\$ 74,707	1.4%	1.6%
TRS 2					
Count	9,174	9,174	9,174	0.0%	0.0%
Total Salaries (millions)	\$ 559.4	\$ 589.9	\$ 589.3	5.5%	5.4%
Average Age	47.84	47.84	47.83	0.0%	0.0%
Average Service	12.06	12.06	12.06	0.0%	0.0%
Average Salary	\$ 60,976	\$ 64,306	\$ 64,239	5.5%	5.4%
TRS 3					
Count	53,010	53,010	53,010	0.0%	0.0%
Total Salaries (millions)	\$ 3,261.4	\$ 3,370.2	\$ 3,367.9	3.3%	3.3%
Average Age	44.00	44.00	44.00	0.0%	0.0%
Average Service	11.31	11.31	11.31	0.0%	0.0%
Average Salary	\$ 61,524	\$ 63,577	\$ 63,534	3.3%	3.3%

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JUNE 30, 2009 ACTUARIAL VALUATION AUDIT

DATA REVIEW

	Active Members				Ratio of Clean / Raw
	Raw Data	Apply Defaults	Clean Data	Effect of Defaults	
WSPRS 1/2					
Count	264	264	264	0.0%	0.0%
Total Salaries (millions)	\$ 16.2	\$ 16.5	\$ 16.5	2.2%	2.2%
Average Age	30.88	30.88	30.84	0.0%	-0.1%
Average Service	3.84	3.84	3.84	0.0%	0.0%
Average Salary	\$ 61,250	\$ 62,583	\$ 62,583	2.2%	2.2%
LEOFF 1					
Count	356	356	356	0.0%	0.0%
Total Salaries (millions)	\$ 33.3	\$ 33.3	\$ 33.3	0.1%	0.1%
Average Age	58.63	58.63	58.62	0.0%	0.0%
Average Service	34.48	34.48	34.48	0.0%	0.0%
Average Salary	\$ 93,542	\$ 93,679	\$ 93,679	0.1%	0.1%
LEOFF 2					
Count	16,951	16,951	16,951	0.0%	0.0%
Total Salaries (millions)	\$ 1,417.0	\$ 1,442.0	\$ 1,442.5	1.8%	1.8%
Average Age	41.60	41.60	41.59	0.0%	0.0%
Average Service	12.69	12.69	12.69	0.0%	0.0%
Average Salary	\$ 83,591	\$ 85,066	\$ 85,097	1.8%	1.8%

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DATA REVIEW

		Retired Members		
		Count	Average Age	Average Benefit
PERS 1	Raw Data	46,619	73.27	\$ 1,769
	Clean Data	46,619	73.27	\$ 1,772
	Ratio	0.0%	0.0%	0.1%
PERS 2/3	Raw Data	17,578	71.40	\$ 955
	Clean Data	17,578	71.40	\$ 956
	Ratio	0.0%	0.0%	0.1%
SERS 2/3	Raw Data	4,208	68.29	\$ 536
	Clean Data	4,208	68.29	\$ 536
	Ratio	0.0%	0.0%	0.0%
PSERS 2	Raw Data	1	67.00	\$ 54
	Clean Data	1	67.47	\$ 54
	Ratio	0.0%	0.7%	0.0%
WSPRS 1/2	Raw Data	708	65.41	\$ 3,733
	Clean Data	708	65.42	\$ 3,740
	Ratio	0.0%	0.0%	0.2%
TRS 1	Raw Data	32,653	71.59	\$ 1,929
	Clean Data	32,653	71.60	\$ 1,931
	Ratio	0.0%	0.0%	0.1%
TRS 2/3	Raw Data	3,540	68.43	\$ 1,042
	Clean Data	3,540	68.44	\$ 1,042
	Ratio	0.0%	0.0%	0.0%
LEOFF 1	Raw Data	2,735	67.37	\$ 4,012
	Clean Data	2,735	69.10	\$ 3,984
	Ratio	0.0%	2.6%	-0.7%
LEOFF 2	Raw Data	1,128	58.58	\$ 2,389
	Clean Data	1,128	59.78	\$ 2,340
	Ratio	0.0%	2.0%	-2.0%

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DATA REVIEW

	<u>Disabled Members</u>		
	Count	Average Age	Average Benefit
PERS 1	1,459	69.36	\$ 817
	1,459	69.36	\$ 817
	0.0%	0.0%	0.0%
PERS 2/3	1,699	64.49	\$ 397
	1,699	64.49	\$ 397
	0.0%	0.0%	0.0%
SERS 2/3	249	62.59	\$ 274
	249	62.59	\$ 274
	0.0%	0.0%	0.0%
PSERS 2	1	59.00	\$ 201
	1	58.76	\$ 201
	0.0%	-0.4%	0.0%
WSPRS 1/2	-	-	\$ -
	53	65.90	\$ 5
	100.0%	100.0%	100.0%
TRS 1	715	70.14	\$ 1,259
	713	70.14	\$ 1,259
	-0.3%	0.0%	0.0%
TRS 2/3	144	62.12	\$ 455
	144	62.13	\$ 455
	0.0%	0.0%	0.0%
LEOFF 1	3,937	65.57	\$ 3,220
	3,937	67.07	\$ 3,218
	0.0%	2.3%	-0.1%
LEOFF 2	171	54.12	\$ 2,021
	171	55.13	\$ 2,021
	0.0%	1.9%	0.0%

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		Beneficiaries		
		Count	Average Age	Average Benefit
PERS 1	Raw Data	6,069	78.71	\$ 939
	Clean Data	6,069	78.71	\$ 939
	Ratio	0.0%	0.0%	0.0%
PERS 2/3	Raw Data	1,433	68.50	\$ 557
	Clean Data	1,433	68.50	\$ 557
	Ratio	0.0%	0.0%	0.0%
SERS 2/3	Raw Data	172	64.10	\$ 361
	Clean Data	172	64.09	\$ 361
	Ratio	0.0%	0.0%	0.0%
PSERS 2	Raw Data	-	-	\$ -
	Clean Data	-	-	\$ -
	Ratio	0.0%	0.0%	0.0%
WSPRS 1/2	Raw Data	126	72.24	\$ 1,891
	Clean Data	126	72.25	\$ 1,892
	Ratio	0.0%	0.0%	0.0%
TRS 1	Raw Data	2,666	77.57	\$ 1,161
	Clean Data	2,666	77.57	\$ 1,161
	Ratio	0.0%	0.0%	0.0%
TRS 2/3	Raw Data	211	62.96	\$ 520
	Clean Data	211	62.93	\$ 520
	Ratio	0.0%	0.0%	0.0%
LEOFF 1	Raw Data	1,415	74.72	\$ 3,165
	Clean Data	1,415	74.72	\$ 3,165
	Ratio	0.0%	0.0%	0.0%
LEOFF 2	Raw Data	68	54.81	\$ 1,713
	Clean Data	68	54.99	\$ 1,713
	Ratio	0.0%	0.3%	0.0%

None of the differences are significant.

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REPLICATION OF LIABILITIES

After collecting the census data and actuarial assumptions from the OSA, we programmed our valuation system based on our understanding of the plan provisions. We collected sample lives from the OSA to verify their programming and compare it to ours. The present value of future benefits and present value of future salaries are the foundation for developing the aggregate normal cost. The tables below show the comparison of our independent calculations of these values to those of the OSA. All of the differences are well within a reasonable range (defined as a minimum being within 5.0% for small plans and within 3.0% for large retirement systems) for an actuarial audit.

	Present Value of Future Benefits		
	OSA	Cheiron	Ratio
PERS 1			
Active Members	\$ 2,945.6	\$ 2,936.4	99.7%
Inactive Members	11,269.4	11,345.2	100.7%
Total	\$ 14,215.0	\$ 14,281.6	100.5%
PERS 2/3			
Active Members	\$ 20,434.9	\$ 20,359.1	99.6%
Inactive Members	4,038.0	4,067.5	100.7%
Total	\$ 24,472.9	\$ 24,426.6	99.8%
SERS 2/3			
Active Members	\$ 2,645.7	\$ 2,630.3	99.4%
Inactive Members	613.7	614.1	100.1%
Total	\$ 3,259.5	\$ 3,244.4	99.5%
PSERS 2			
Active Members	\$ 385.7	\$ 383.6	99.4%
Inactive Members	2.0	2.0	100.0%
Total	\$ 387.8	\$ 385.6	99.4%
WSPRS 1/2			
Active Members	\$ 467.4	\$ 468.0	100.1%
Inactive Members	473.7	473.0	99.9%
Total	\$ 941.1	\$ 941.0	100.0%

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	Present Value of Future Benefits		
	OSA	Cheiron	Ratio
TRS 1			
Active Members	\$ 2,133.8	\$ 2,134.1	100.0%
Inactive Members	8,821.7	8,885.3	100.7%
Total	\$ 10,955.6	\$ 11,019.4	100.6%
TRS 2/3			
Active Members	\$ 7,629.2	\$ 7,827.4	102.6%
Inactive Members	1,032.2	1,034.4	100.2%
Total	\$ 8,661.4	\$ 8,861.8	102.3%
LEOFF 1			
Active Members	\$ 351.2	\$ 347.4	98.9%
Inactive Members	4,149.8	4,061.6	97.9%
Total	\$ 4,501.0	\$ 4,409.0	98.0%
LEOFF 2			
Active Members	\$ 6,670.7	\$ 6,651.9	99.7%
Inactive Members	678.6	682.2	100.5%
Total	\$ 7,349.3	\$ 7,334.1	99.8%
Grand Total			
Active Members	\$ 43,664.3	\$ 43,738.2	100.2%
Inactive Members	31,079.2	31,165.3	100.3%
Total	\$ 74,743.5	\$ 74,903.5	100.2%

	Present Value of Future Salaries		
	OSA	Cheiron	Ratio
PERS 1	\$ 2,162.0	\$ 2,161.7	100.0%
PERS 2/3	73,847.3	74,384.9	100.7%
SERS 2/3	11,883.4	12,019.8	101.1%
PSERS 2	2,503.9	2,493.6	99.6%
WSPRS 1/2	836.9	836.9	100.0%
TRS 1	1,164.9	1,164.9	100.0%
TRS 2/3	42,798.6	42,896.2	100.2%
LEOFF 1	90.4	90.4	100.0%
LEOFF 2	17,298.5	17,298.7	100.0%
Grand Total	\$ 152,585.9	\$ 153,347.1	100.5%

REPLICATION OF LIABILITIES

Minimum contribution rates for the open plans depend on the entry age normal cost. The table below compares our independent calculation of the entry age normal cost for these plans to the calculation performed by the OSA. The differences are well within a reasonable range for an actuarial audit.

	Entry Age Normal Cost		
	OSA	Cheiron	Ratio
PERS 2/3	\$ 710.2	\$ 707.4	99.6%
SERS 2/3	\$ 101.9	\$ 100.2	98.3%
PSERS 2	\$ 22.2	\$ 22.2	99.9%
WSPRS 1/2	\$ 15.6	\$ 15.4	98.7%
TRS 2/3	\$ 256.7	\$ 263.5	102.6%
LEOFF 2	\$ 235.5	\$ 236.5	100.4%

Funded Status

Funded status is typically defined as the ratio of the actuarial asset value over actuarial liability. The aggregate method, which is the primary method used to determine contribution rates, does not produce a funded status. A plan’s funded status is useful to understand whether or not a plan is on target to meet its funding objectives, and to compare the relative financial health of different plans. Consequently, it appears that the funded status has been historically calculated using the projected unit credit method.

Recently, however, GASB has required plans that use the aggregate method for funding to disclose their funded status on their financial statements using the entry age normal method. So, now the valuation report discloses the funded status using projected unit credit and the financial statements disclose funded status using entry age normal. In addition, the entry age normal method is used to determine minimum contribution rates, but the projected unit credit method is not used for any other purpose.

We recommend that in order to limit the number of funded status measures and avoid confusion among stakeholders and the users of these reports, the funded status in the valuation report should be calculated using the entry age normal method. As a transition measure, both values could be reported in the valuation report for the years that it are available, or the historical record could be footnoted to indicate when the reporting changed from projected unit credit to entry age normal and the effect of the change.

The table below compares the projected unit credit funded status to the entry age normal funded status as of June 30, 2009 on an aggregate basis.

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REPLICATION OF LIABILITIES

System-wide	Projected Unit Credit	Entry Age Normal
1. Actuarial Value of Assets	\$ 56,991	\$ 56,991
2. Actuarial Liability	\$ 57,456	\$ 61,570
3. Funded Status [1. / 2.]	99.2%	92.6%

REPLICATION OF CONTRIBUTION RATES

Contribution rates for the open Plans are composed of a basic contribution rate subject to a minimum contribution rate, plus, for employers, an amortization of any unfunded liability in the related closed plan. The calculation requires several inputs from the valuation of the open Plans including the Present Value of Future Benefits (PVFB), the Present Value of Future Salaries (PVFS), and the Entry Age Normal Cost (EANC). In addition, it requires inputs from the valuation of the closed Plans. But, before using the liabilities calculated in the valuation, the market value of assets for both open and closed Plans are converted to a smoothed actuarial value of assets.

Development of Actuarial Value of Assets

The market value of assets represents a “snap-shot” value as of the last day of the fiscal year that provides the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace. Because these fluctuations would cause volatility in employer contributions, an actuarial value of assets is developed.

The actuarial value of assets is calculated by spreading recognition of the gain or loss on the investment return over a period from 1 to 8 years depending on how much the actual rate of return deviated from the expected rate of return. The maximum smoothing period of 8 years is reached if the actual return deviates from the expected return by 700 basis points (7.0%) or more. Only one year in the last 8 has been smoothed over less than 8 years.

We replicated the OSA’s calculation of the actuarial value of assets. A comparison of results is shown in the table below.

	Actuarial Value of Assets		
	OSA	Cheiron	Ratio
PERS 1	\$ 9,775.6	\$ 9,777.1	100.0%
PERS 2/3	18260.39	18268.84	100.0%
SERS 2/3	2503.16	2503.28	100.0%
PSERS 2	69.20	69.32	100.2%
WSPRS 1/2	900.35	900.64	100.0%
TRS 1	8146.19	8148.15	100.0%
TRS 2/3	6159.99	6163.95	100.1%
LEOFF 1	5612.12	5613.35	100.0%
LEOFF 2	5564.21	5567.45	100.1%
Grand Total	\$ 56,991.2	\$ 57,012.1	100.0%

The slight difference between the calculations is due to OSA’s use of asset statements from the Washington State Investment Board and our use of asset statements from the Department of Retirement Systems. While the difference is very minor, because the Department of Retirement

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REPLICATION OF CONTRIBUTION RATES

Systems statements are used in the CAFR and include the value of payables and receivables at the beginning and end of the year, we suggest that the OSA consider using those statements for the asset smoothing calculations.

Calculation of Contribution Rates

The basic contribution rate for the open Plans is equal to the Aggregate Normal Cost. Members pay 50% and the employers pay 50% of the total contribution rate. Using the liability and asset information determined by the OSA, the table below illustrates our calculation of the normal contribution rates for the open Plans. These rates match the rates calculated by the OSA.

Development of Aggregate Normal Cost Rate					
	PERS 2/3	SERS 2/3	PSERS 2	WSPRS 1/2	TRS 2/3
Present Value of Future Benefits	\$ 24,472.9	\$ 3,259.5	\$ 387.8	\$ 941.1	\$ 8,661.4
Actuarial Value of Assets	\$ 18,260.4	\$ 2,503.2	\$ 69.2	\$ 900.4	\$ 6,160.0
Gainsharing / Past Disability	\$ 70.4	\$ 99.8		\$ 10.9	\$ 261.9
Unfunded Present Value of Future Benefits	\$ 6,142.1	\$ 656.5	\$ 318.6	\$ 29.8	\$ 2,239.5
Present Value of Future Salaries (2 x Plan 2 + Plan 3)	\$ 133,917.5	\$ 16,327.2	\$ 5,007.7	\$ 1,673.7	\$ 48,298.1
Employee/Employer Aggregate Normal Cost Rate	4.59%	4.02%	6.36%	1.78%	4.64%

Dollar amounts in millions.

In addition to the basic contribution rate, the open Plans are subject to a minimum contribution rate equal to 80% of the entry age normal cost rate. The table below shows the entry age normal cost rate for each of the open Plans.

Plan	Entry Age Normal Costs							
	PERS		SERS		PSERS	WSPRS	TRS	
	2	3	2	3	2	1 / 2	2	3
Employer	4.89%	4.82%	5.07%	5.21%	5.01%	9.40%	5.91%	5.60%
Member	4.89%	0.00%	5.07%	0.00%	5.01%	9.40%	5.91%	0.00%
Total	9.77%	4.82%	10.14%	5.21%	10.02%	18.81%	11.83%	5.60%
Payroll	\$ 6,583.5	\$ 1,386.1	\$ 551.7	\$ 881.2	\$ 221.3	\$ 83.0	\$ 580.8	\$ 3,355.0

For PSERS and WSPRS, the application of the minimum contribution rate is straightforward as all covered employees pay the same rate. Employees and employers each pay a minimum rate of 50% of 80% of the entry age normal cost rate. However, for PERS, SERS, and TRS, the Plan 3 members do not contribute which allows for different interpretations of how the minimum contribution rate is allocated between members and employers. There are two key questions:

1. Should the Plan 3 normal cost rate affect the minimum contribution rate for members in Plan 2?
2. If yes, should the Plan 2/Plan 3 participation rates be based on actual plan participation or assumed plan participation rates?

We considered three optional interpretations, depending on how these questions are answered.

REPLICATION OF CONTRIBUTION RATES

- **Option 1.** The minimum member contribution rate equals 50% of 80% of the Plan 2 entry age normal cost. The minimum employer contribution rate equals 50% of 80% of the Plan 2 entry age normal cost plus 80% of the Plan 3 entry age normal cost. This option ensures that members in Plan 2 pay a minimum contribution rate that is independent of Plan 3, and employers pay the full minimum contribution rate for Plan 3. The total minimum contribution rate is expected to produce a contribution equal to 80% of the entry age normal cost for Plan 2 and Plan 3.
- **Option 2 --** Member and employer minimum contribution rates are each 50% of the single rate that is expected to produce 80% of the Plan 2/3 combined entry age normal cost given the actual breakdown of Plan 2 and Plan 3 enrollment. This option ensures that members and employers pay the same rate and that the total minimum contribution rate is expected to produce a contribution equal to 80% of the entry age normal cost for Plan 2 and Plan 3.
- **Option 3 –** Same as Option 2, but instead of using actual Plan 2 and Plan 3 enrollment, assume 2/3 of employees elect Plan 2. Note that under this option, the total minimum contribution rate is not expected to produce a contribution equal to 80% of the entry age normal cost for Plan 2 and Plan 3.

The table below shows the minimum contribution rates for members and employers calculated under each of these options. Note that there is virtually no difference between the options for PERS, but there are differences for SERS and TRS. Furthermore, the differences work in opposite directions for these two plans. **The OSA uses option 3.**

Option	Minimum Contribution Rates								
	PERS			SERS			TRS		
	1	2	3	1	2	3	1	2	3
Employer	3.90%	3.90%	3.90%	4.12%	4.11%	4.08%	4.52%	4.55%	4.68%
Member	3.91%	3.90%	3.90%	4.06%	4.11%	4.08%	4.73%	4.55%	4.68%

The table below shows the comparison of the basic and minimum contribution rates for each of the plans under each of the options. The minimum contribution rate does not affect the rates for PERS 2/3, but does have a minor impact on SERS 2/3. Depending on the option, the minimum contribution rate has a minor impact on TRS 2/3.

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REPLICATION OF CONTRIBUTION RATES

	<u>Option 1</u>		<u>Option 2</u>		<u>Option 3</u>	
	<u>Member</u>	<u>Employer</u>	<u>Member</u>	<u>Employer</u>	<u>Member</u>	<u>Employer</u>
PERS 2/3						
Basic Contribution Rate	4.59%	4.59%	4.59%	4.59%	4.59%	4.59%
Minimum Contribution Rate	3.91%	3.90%	3.90%	3.90%	3.90%	3.90%
Gainsharing Rate	N/A	0.11%	N/A	0.11%	N/A	0.11%
Final Contribution Rate	4.59%	4.70%	4.59%	4.70%	4.59%	4.70%
SERS 2/3						
Basic Contribution Rate	4.02%	4.02%	4.02%	4.02%	4.02%	4.02%
Minimum Contribution Rate	4.06%	4.12%	4.10%	4.10%	4.08%	4.08%
Gainsharing Rate	N/A	1.00%	N/A	1.00%	N/A	1.00%
Final Contribution Rate	4.06%	5.12%	4.10%	5.10%	4.08%	5.08%
TRS 2/3						
Basic Contribution Rate	8.63%	4.64%	8.63%	4.64%	8.63%	4.64%
Minimum Contribution Rate	4.73%	4.52%	4.54%	4.54%	4.68%	4.68%
Maximum Contribution Rate	4.64%	N/A	4.64%	N/A	4.68%	N/A
Gainsharing Rate	N/A	0.77%	N/A	0.77%	N/A	0.77%
Final Contribution Rate	4.64%	5.41%	4.64%	5.41%	4.68%	5.45%

Amortization Payments Under Different Pay Increase Rate Assumptions

In addition to the open plan contribution rates, the unfunded liability of the closed plans is amortized over a rolling 10-year period as a level percentage of the combined payroll of the closed and related open plans. As shown in the table below, we agree with the OSA's calculation of the PERS 1, TRS 1, and LEOFF 1 contribution rates. However, it should be noted that it is unclear how the LEOFF 1 rate should be calculated when an unfunded liability emerges as the assumed pay increase rate for LEOFF 1 is 4.0% while the pay increase rate for LEOFF 2 is 4.5%.

	PERS 1	TRS 1	LEOFF 1
Present Value of Future Benefits	\$ 14,215.0	\$ 10,955.6	\$ 4,501.0
Actuarial Value of Assets	9,775.6	8,146.2	5,612.1
Present Value of Future Employee Contributions	129.7	69.9	-
Present Value of Future Normal Cost	101.6	63.5	-
Unfunded Liability	\$ 4,208.1	\$ 2,676.0	\$ (1,111.1)
Amortization Factor	8.6091	8.4825	
Salaries	\$ 11,010.2	\$ 4,603.2	
Contribution Rate	4.44%	6.85%	0.00%

Accounting for Amortization Payment Delay

We also note that the amortization rate for the closed plans becomes effective two years after the valuation date. That is, 20% of the amortization period is gone, before the new rate gets implemented. Consideration should be given to an adjustment to this rate to account for the two

REPLICATION OF CONTRIBUTION RATES

year delay. To the extent the minimums and maximums override the calculated rate, this issue is moot.

Use of Membership Growth Assumptions in Unfunded Liability Amortization

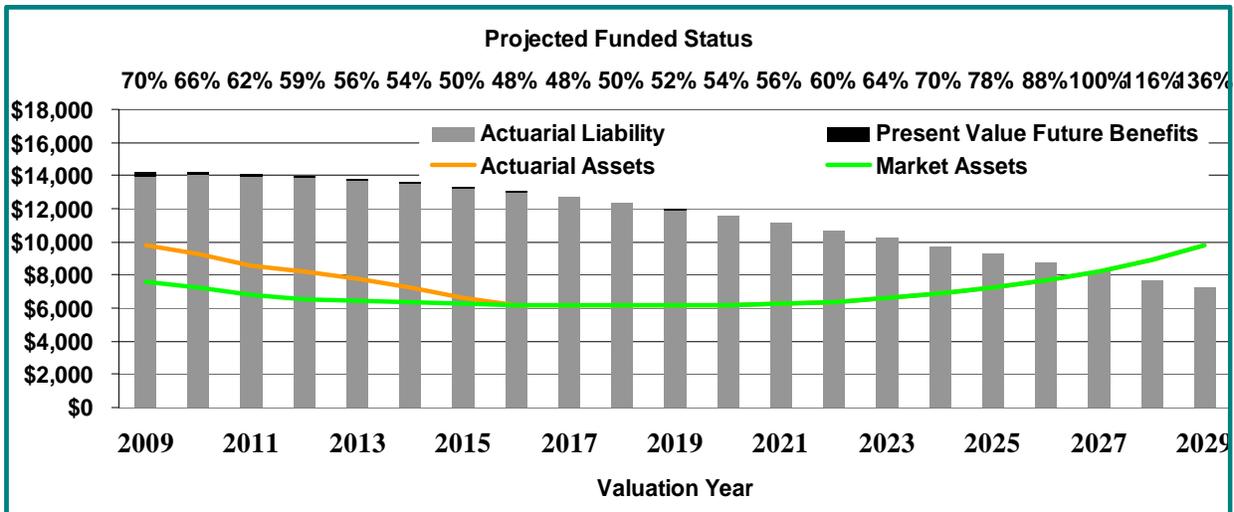
The statute specifies that a membership growth assumption be used in the development of the amortization payment for the closed plan unfunded liabilities. Use of such an assumption is inconsistent with traditional actuarial practice and has the effect of reducing the contribution rate. In effect, contributions are deferred further into the future and there is a risk of not collecting sufficient contributions if this assumption is not met. Legislation should be considered to remove this assumption from the calculation.

DETERMINISTIC PROJECTIONS

Deterministic projections can be used to assess the actuarial method employed and how it behaves prospectively to a variety of economic scenarios in terms of managing the volatility of contribution rates and the funded status of the plan. In the sections below, projections for each of the plans are provided assuming all actuarial assumptions are met.

PERS 1

The graph below shows the actuarial liability (gray bars), the present value of future benefits (black bars), the actuarial value of assets (orange line) and market value of assets (green line). The percentages along the top of the graph show the funded status that would be reported in the CAFR (actuarial value of assets divided by entry age actuarial liability). The graph assumes that all projected contributions are made when due as projected below.

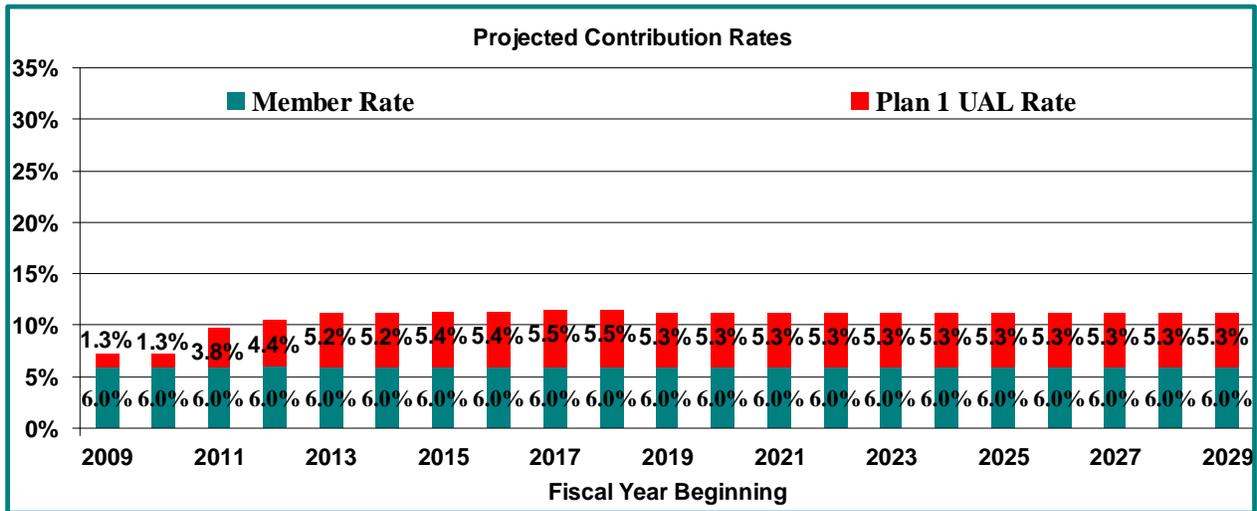


Because PERS 1 is a closed plan with mostly retirees, the difference between the present value of future benefits and the actuarial liability is minimal. As benefits are paid out, the actuarial liability decreases from approximately \$14 billion to approximately \$7 billion by the end of the projection period. The funded status is projected to decline from 70% down to 48% as the recent investment losses are fully recognized and as contribution rates are increased.

The graph below shows the PERS 1 contribution rates with member contribution rates on the bottom (in teal), and Plan 1 contribution rates on top (in red).

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Because the PERS 1 contribution rates are calculated over the payroll of PERS 2/3, SERS 2/3, and PSERS 2, the funded status improves rapidly at the end of the projection period as the minimum contribution rate of 5.25% on the growing payroll (including projected membership growth) is more than sufficient to fund the declining liability. If the minimum rate is not employed overriding the underlying amortization method, the funded status at the end of the projection would be 66% instead of 136%.

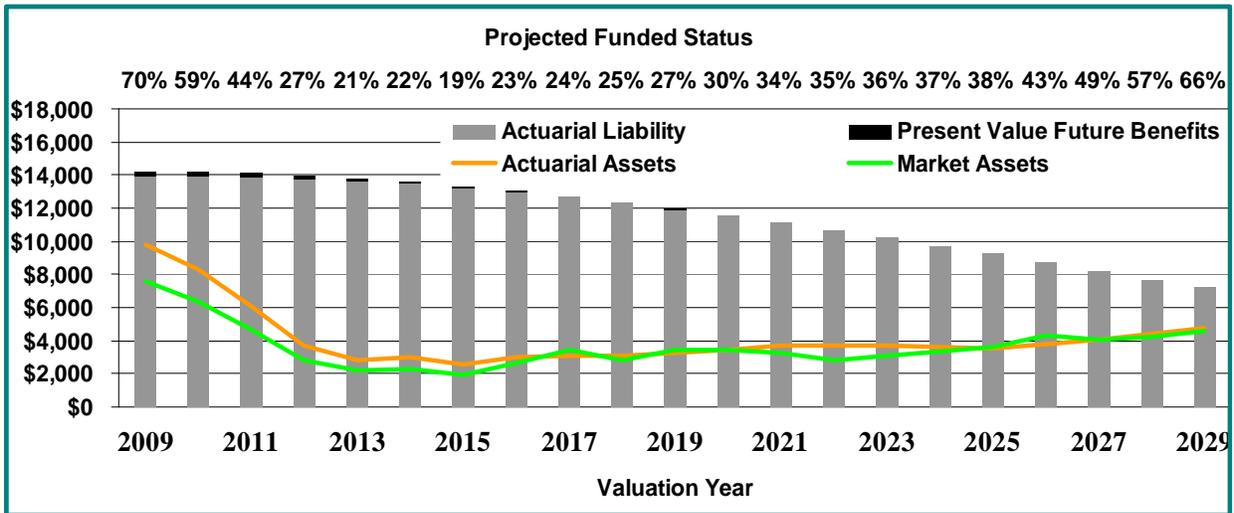
Because there is concern about the funding of the closed plans, we tested the projection of funded status assuming that the investment returns of the Great Depression repeated themselves (as if 2009 returns were the same as 1929 and so on), but assuming all other assumptions are met. Specifically, we assumed the following investment returns for the projection period.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Investment Return	-3.72%	-11.74%	-26.70%	-0.54%	36.50%	4.72%	32.40%	23.12%	-19.92%	21.10%
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Investment Return	1.36%	-4.52%	-5.88%	13.22%	16.66%	13.70%	23.48%	-4.18%	2.50%	4.94%

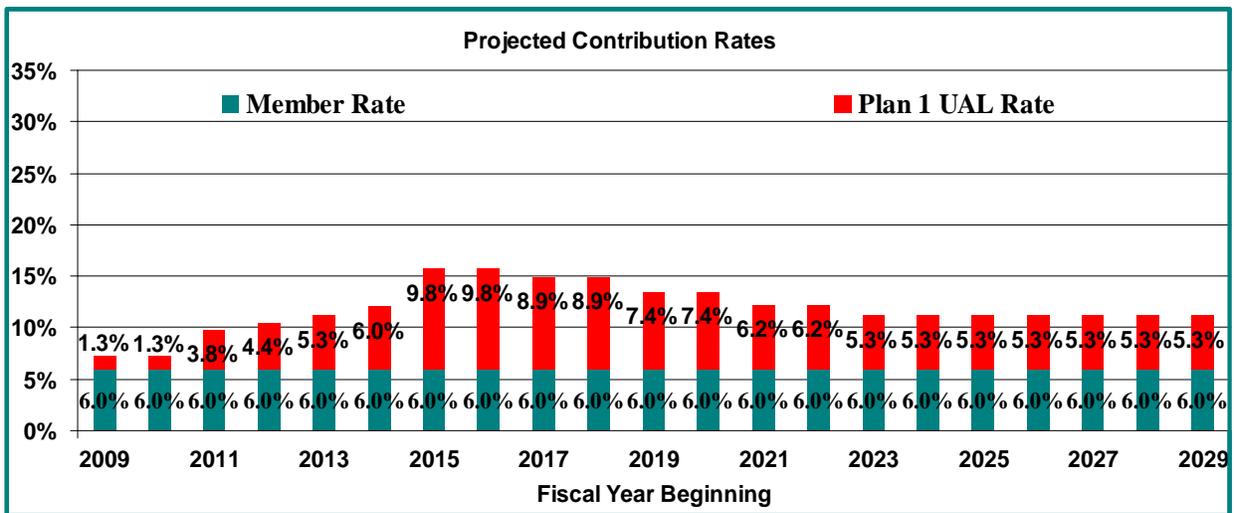
The graph below shows that PERS 1 does not run out of money, but does drop to 19% funded before starting to recover.

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DETERMINISTIC PROJECTIONS



As shown below, under this scenario the PERS 1 UAL contribution rate almost reaches 10% in 2015 before eventually declining to the minimum rate of 5.25% in 2023.

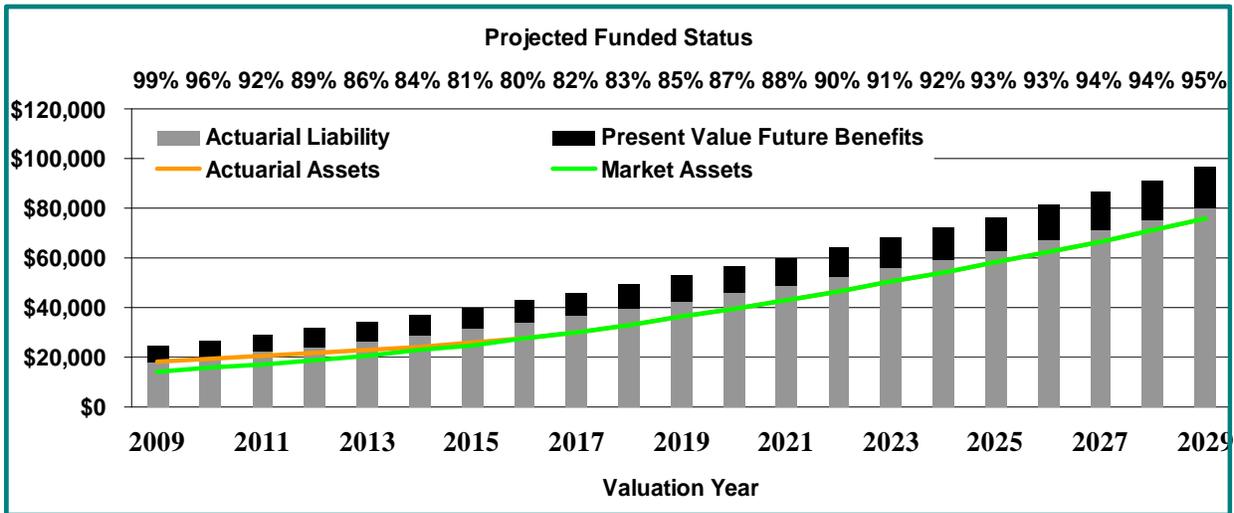


PERS 2/3

The chart below shows the projected growth of liabilities and assets for the PERS 2/3 plan. As noted at the top of the chart, the funded status is projected to decline from 99% to approximately 80% as the recent investment losses are recognized before increasing back to 95% by the end of the projection.

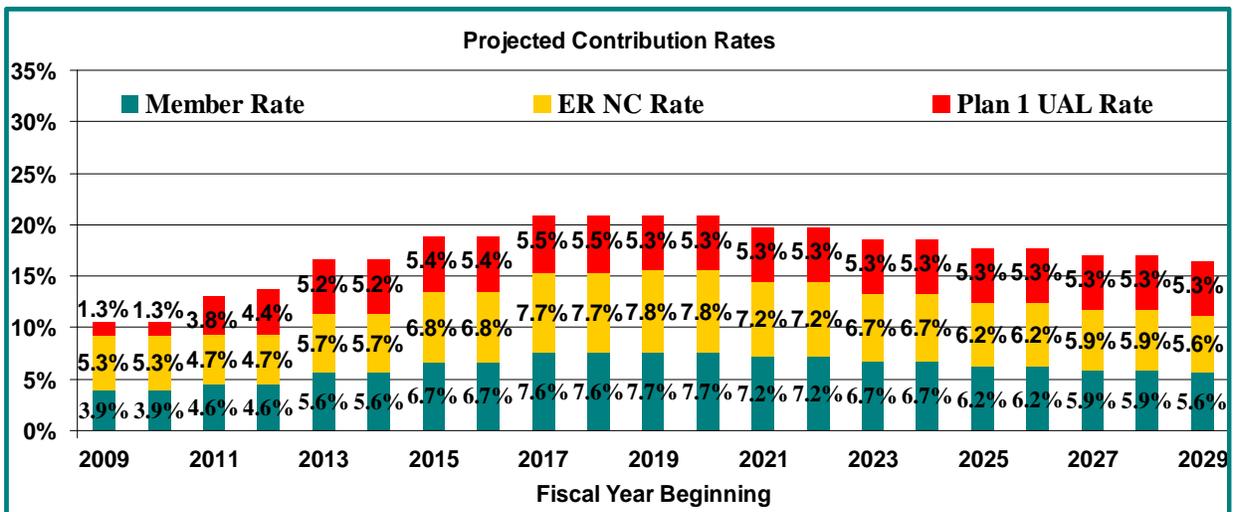
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DETERMINISTIC PROJECTIONS



It is also worth noting that while PERS 1 declines in liability from \$14 billion to \$7 billion over the projection period, the open PERS 2/3 plan is projected to increase in liability from approximately \$18 billion to approximately \$80 billion by the end of the projection.

The graph below shows the contribution rates with member contribution rates on the bottom (in teal), employer Plan 2/3 contribution rates in the middle (the yellow bars), and Plan 1 contribution rates on top (in red).



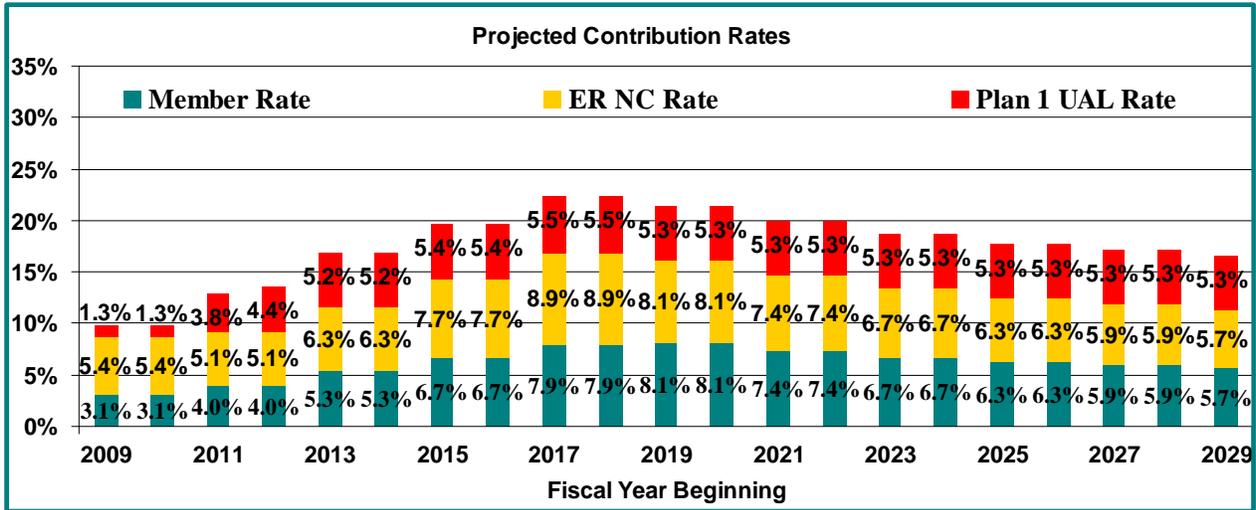
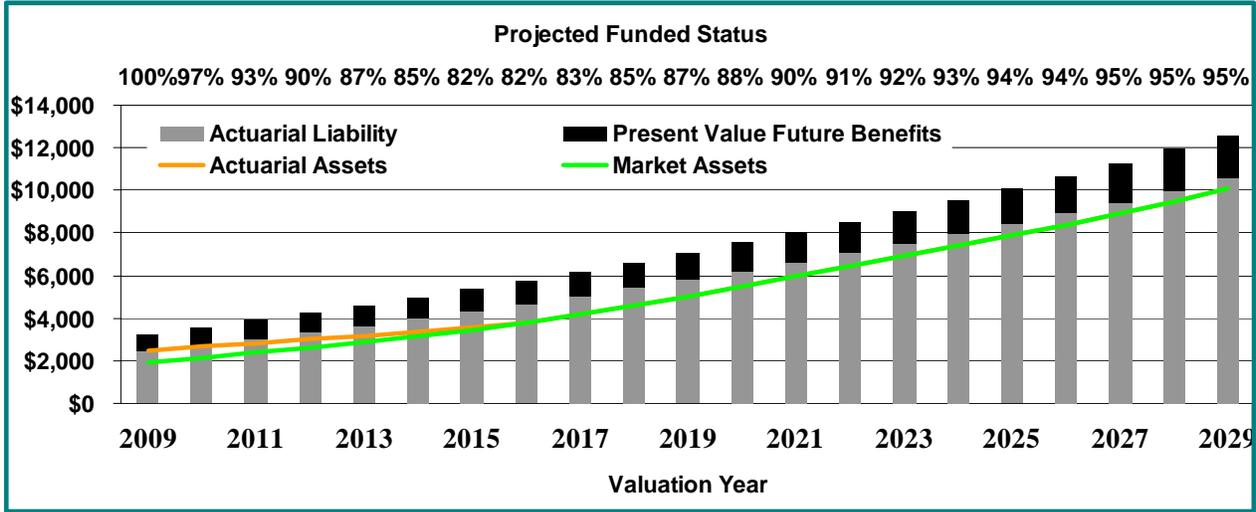
Contribution rates are expected to increase significantly as the recent investment losses are fully recognized. The Plan 1 rate is limited by a maximum rate in the early years of the projection and a minimum rate in the later years of the projection.

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SERS 2/3

The charts for SERS 2/3 shown below illustrate a very similar dynamic to that shown for PERS 2/3, but with a peak contribution rate somewhat higher than PERS 2/3. The Plan 1 UAL rate is, by definition, identical to the rate shown for PERS 2/3.

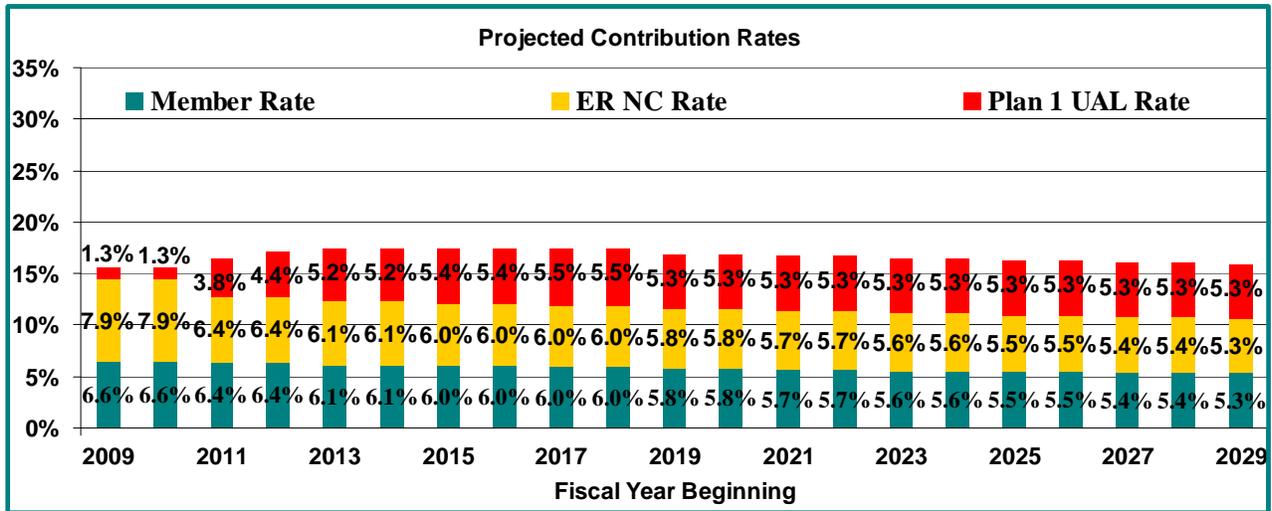
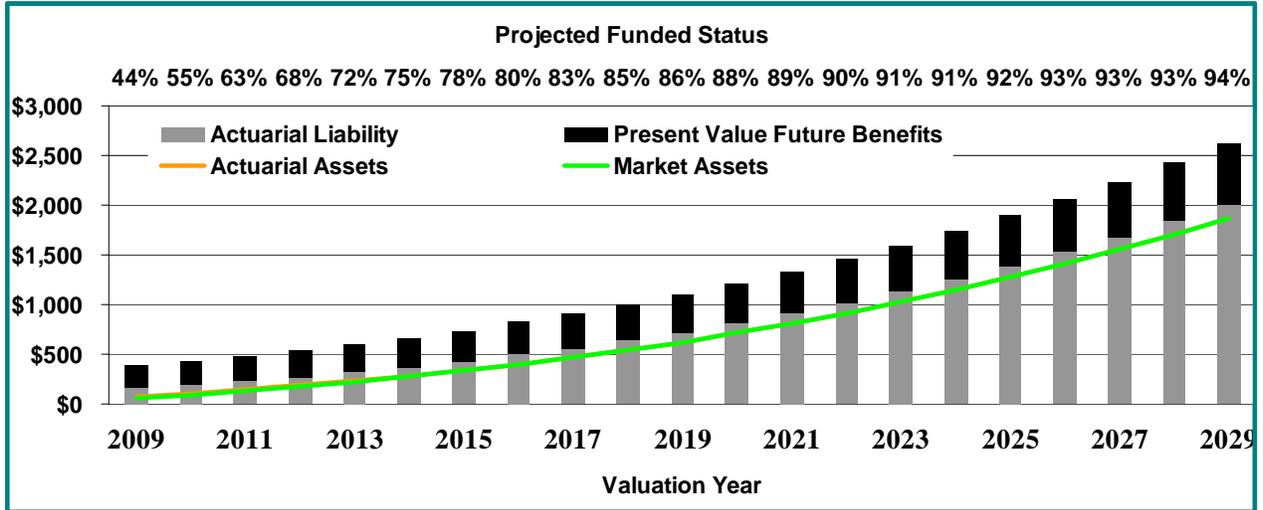


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PSERS 2

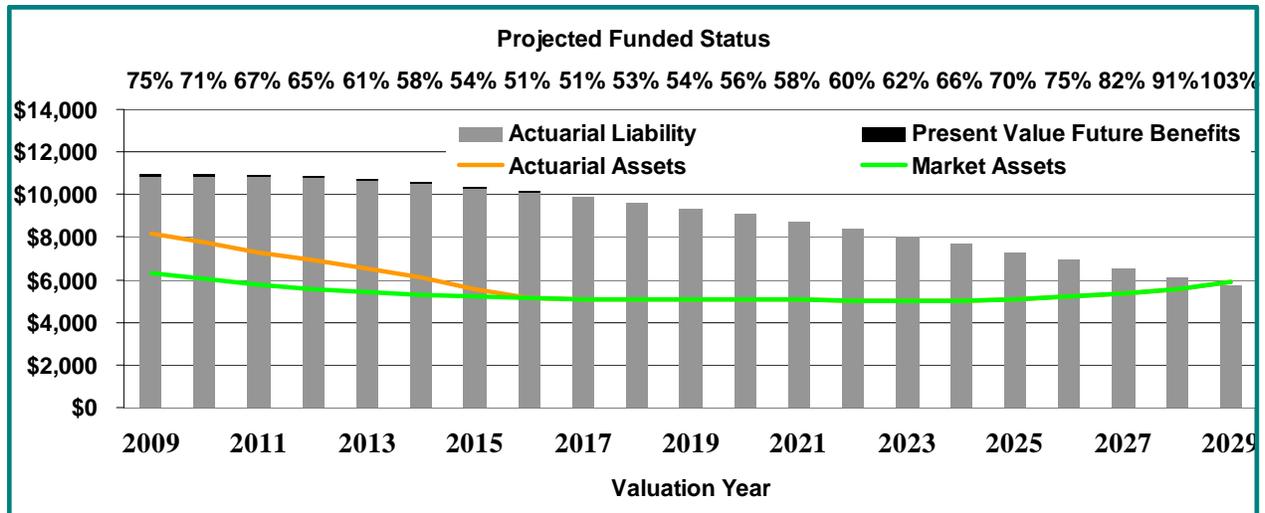
The charts below show that PSERS 2 can expect a different dynamic than PERS 2/3 and SERS 2/3. The Plan 1 UAL rate is, by definition, identical to the rate shown for PERS 2/3 and SERS 2/3, but because PSERS 2 is a relatively new plan, the impact of the investment losses is less severe, and contributions are a much more significant part of the projected growth of the plan.



DETERMINISTIC PROJECTIONS

TRS 1

Because TRS 1 is a closed plan with mostly retirees, the difference between the present value of future benefits and the actuarial liability is minimal. As benefits are paid out, the actuarial liability decreases from approximately \$11 billion to approximately \$6 billion by the end of the projection period. The funded status is projected to decline from 75% down to 51% as the recent investment losses are fully recognized and as contribution rates are increased.

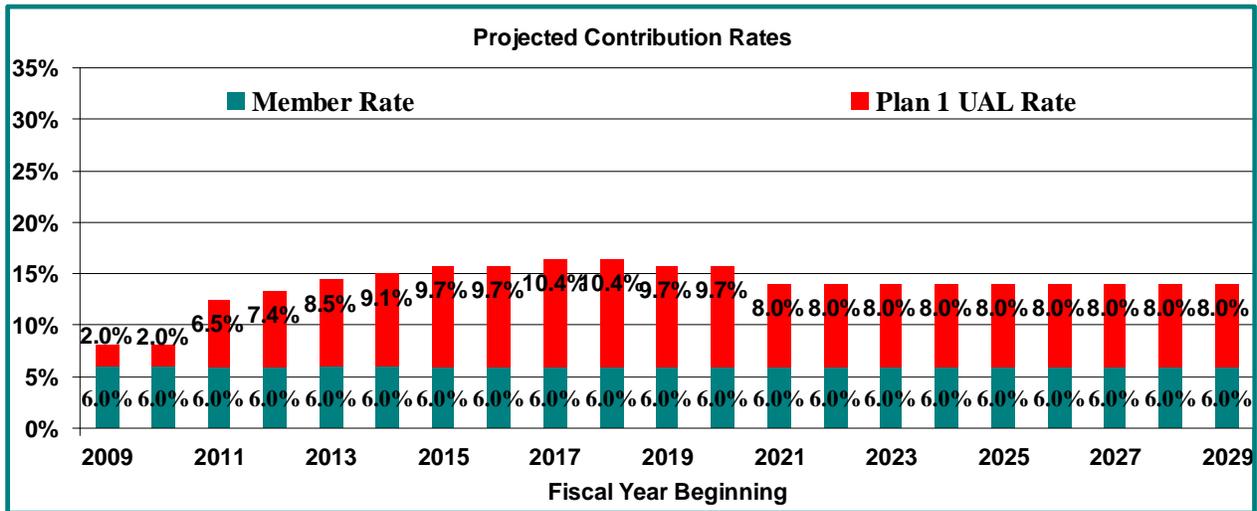


The funded status improves rapidly at the end of the projection period as the minimum contribution rate (8.0%) on the growing combined payroll of TRS 1, 2, and 3 (including projected membership growth) is more than sufficient to fund the declining liability. If the minimum rate is not employed to override the underlying amortization method, the funded status at the end of the projection would be 70% instead of 103%.

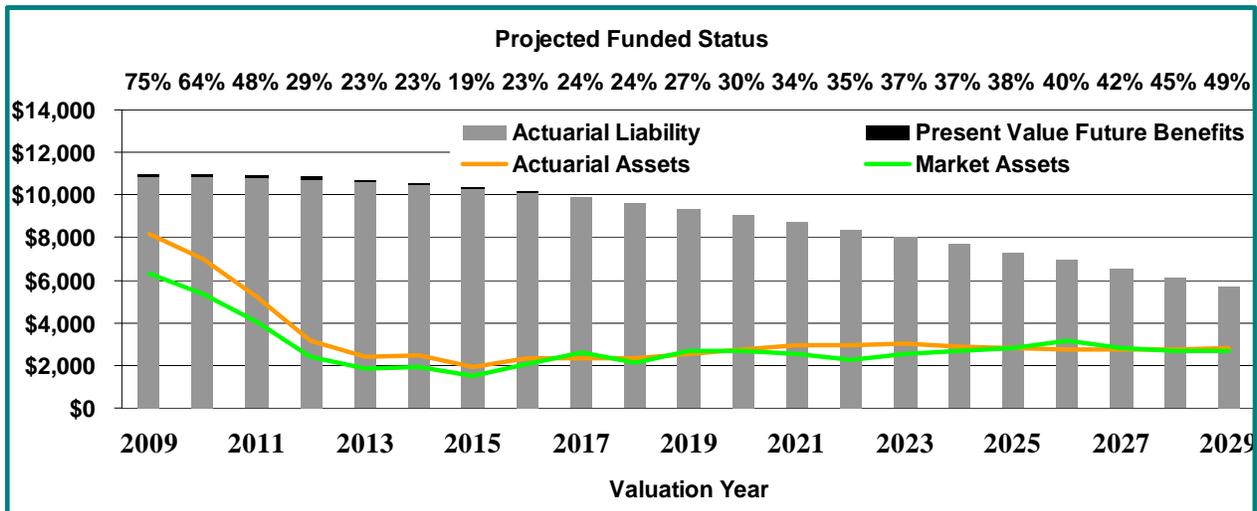
The projected contribution rates for TRS 1 are shown in the chart below.

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DETERMINISTIC PROJECTIONS



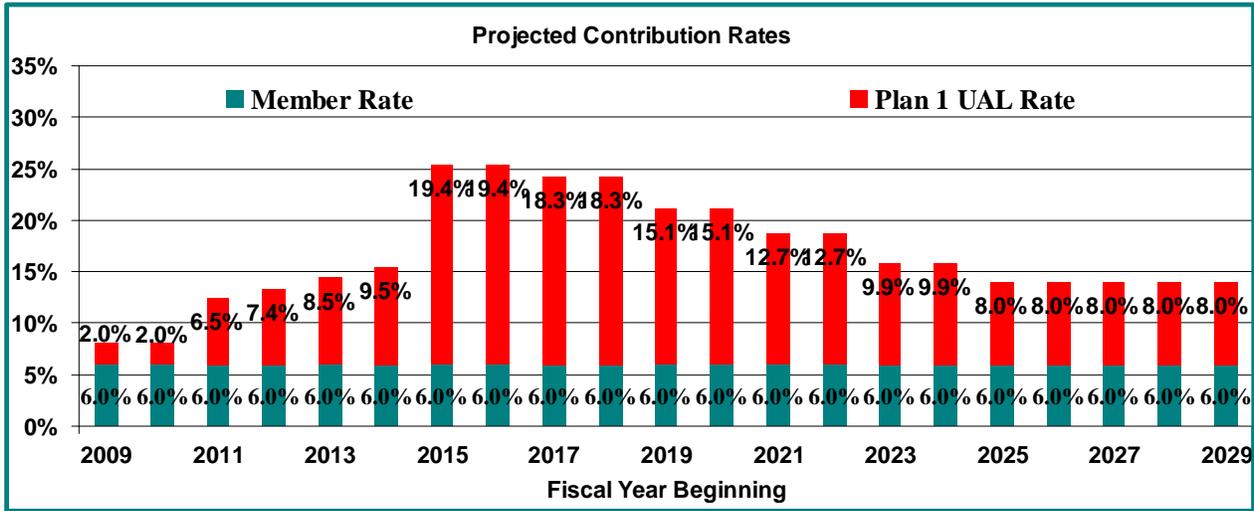
Because there is concern about the funding of the closed plans, we tested the projection of funded status assuming that the investment returns of the Great Depression repeated themselves (as shown above for PERS 1), but assuming all other assumptions are met. The graph below shows that TRS 1 does not run out of money, but does drop to 19% funded before starting to recover.



As shown in the chart below, under this scenario the TRS 1 UAL contribution rate reaches 19% in 2015 before eventually declining to the minimum rate of 8.0% in 2025.

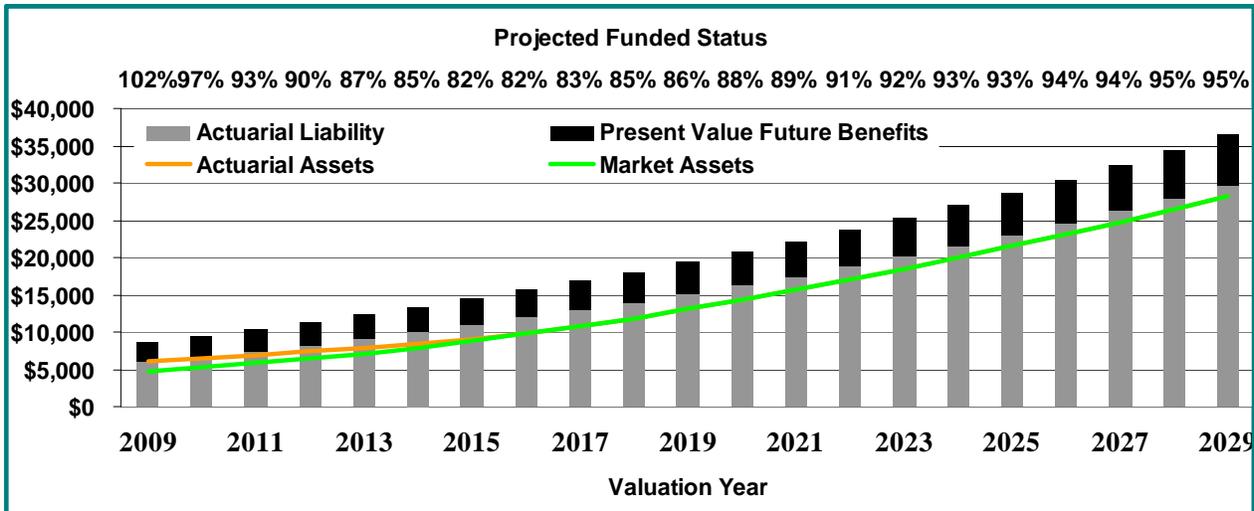
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DETERMINISTIC PROJECTIONS



TRS 2/3

The chart below shows the projected growth of liabilities and assets for the TRS 2/3 plan. As noted at the top of the chart, the funded status is projected to decline from 102% to approximately 82% as the recent investment losses are recognized before increasing back to 95% by the end of the projection.

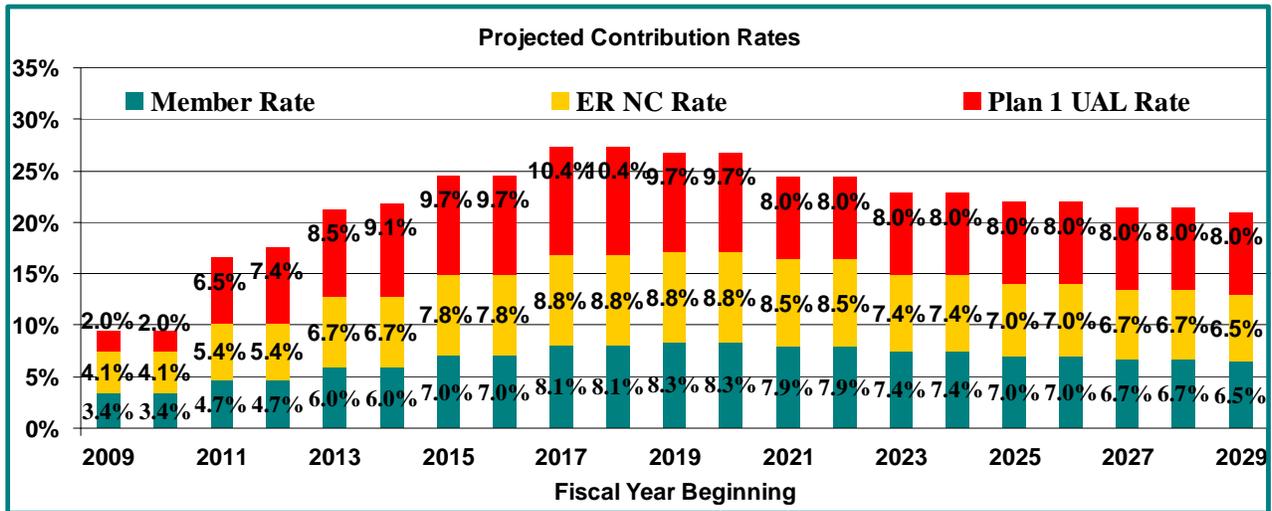


It is also worth noting that while TRS 1 declines in liability from \$11 billion to \$6 billion over the projection period, the open TRS 2/3 plan is projected to increase in liability from approximately \$6 billion to approximately \$30 billion by the end of the projection.

The graph below shows the contribution rates with member contribution rates on the bottom, employer Plan 2/3 contribution rates in the middle, and Plan 1 contribution rates on top.

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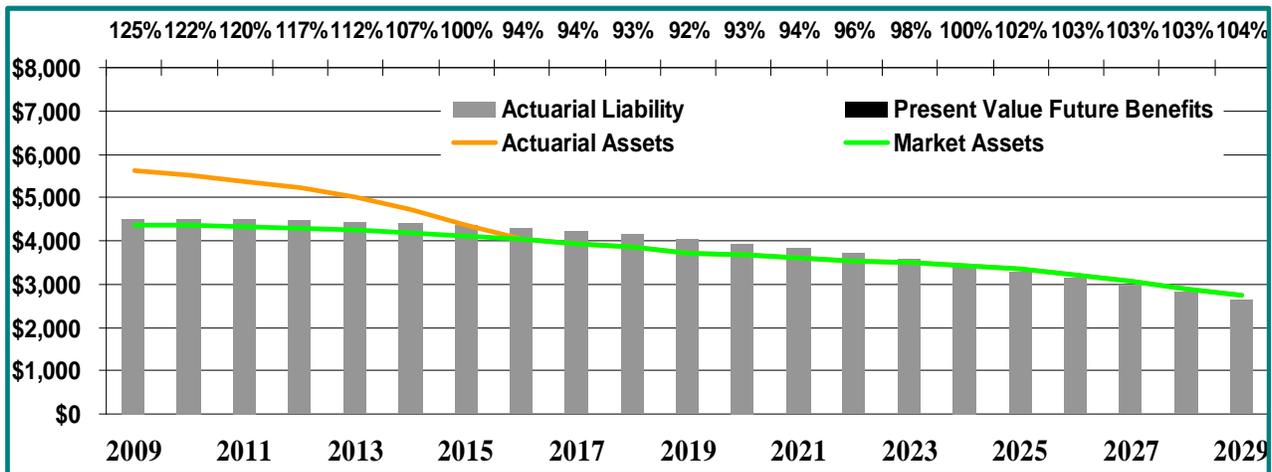
DETERMINISTIC PROJECTIONS



Contribution rates are expected to increase significantly as the recent investment losses are fully recognized. The Plan 1 rate is limited by a maximum rate in the early years of the projection and a minimum rate in the later years of the projection.

LEOFF 1

LEOFF 1 is currently more than 100% funded, so there is no contribution rate. However, based on the market value of assets, the plan is not fully funded. As the recent investment losses become fully recognized, it is likely that a LEOFF 1 contribution will be required.



**APPENDIX A
BASIS FOR REPORT**

Plan Provisions

A detailed description of the plan provisions on which this replication is based can be found in the appropriate member handbook on the Washington State Department of Retirement Systems' website at the following URL: <http://www.drs.wa.gov/member/>. There is a separate handbook for each system and plan number.

Actuarial Assumptions and Methods

The actuarial methods and assumptions are the same as those described in the OSA's June 30, 2009 actuarial valuation report which can be found on their website under historical valuations of the Washington Retirement Systems at the following URL: http://osa.leg.wa.gov/Actuarial_Services/Publications/HistVals.htm.

In addition, the following assumptions were used:

- Deferred retirement age for vested terminated members
 - LEOFF 2: Age 53
 - PERS 1, TRS 1, PSERS, and WSPRS: Age 60
 - PERS 2/3, TRS 2/3, and SERS 2/3: Age 65
- Salary factor for WSPRS disability survivor benefit
 - Male: 1.4
 - Female: 1.6
- LEOFF 1 Dependent Children – Sample probabilities of having dependent children are shown below. If there are dependent children, we assume two dependent children and duration of payments of 5 years.
 - Age 40 0.3377
 - Age 50 0.1927
 - Age 60 0.0477
 - Age 70 0.0129
 - Age 80 0.0039
- Occupational Disease for Firefighters
 - Percentage of deaths that are duty-related
 - Ages 20-49 14.7415%
 - Ages 50+ 27.3934%
 - Firefighter percentage of LEOFF 43%
 - Average length of service
 - Disability 16.26
 - Termination 14.06
 - Retirement 27.42

**APPENDIX B
GLOSSARY OF TERMS**

1. Actuarial Assumptions

Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, investment income and salary increases. Demographic assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

2. Actuarial Gain (Loss)

The difference between actual experience and actuarial assumption anticipated experience during the period between two actuarial valuation dates, as determined in accordance with a particular actuarial funding method.

3. Actuarial Liability

The Actuarial Liability is the difference between the present value of all future system benefits and the present value of total future normal costs. The Actuarial Liability represents the budgeted cost for benefits attributed to service prior to the valuation date by the Actuarial Funding Method. It is also referred to by some actuaries as the “accrued liability” or “actuarial accrued liability”.

4. Actuarial Present Value

The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest, and by probabilities of payment.

5. Actuarial Value of Assets

The Actuarial Value of Assets equals the Market Value of Assets adjusted according to the smoothing method adopted by the Plan. The smoothing method is intended to smooth out the short-term volatility of investment returns in order to stabilize contribution rates and the funded status reported under GASB 25 and 27.

6. Entry Age Normal Actuarial Funding Method

A mathematical budgeting procedure that allocates the cost of an individual’s retirement plan benefits as a level percentage of pay over his or her working career.

**APPENDIX B
GLOSSARY OF TERMS**

7. Funded Status

The Actuarial Value of Assets divided by the Actuarial Liability. The Funded Status represents the percentage of assets in the Plan compared to the budgeted amount under the Actuarial Funding Method. The Funded Status can also be calculated using the Market Value of Assets.

8. Governmental Accounting Standards Board

The Governmental Accounting Standards Board (GASB) defines the accounting and financial reporting requirements for governmental entities. GASB Statement No. 25 defines the plan accounting and financial reporting for governmental pension plans, and GASB Statement No. 27 defines the employer accounting and financial reporting for participating in a governmental pension plan.

9. Market Value of Assets

The fair value of the Plan's assets assuming that all holdings are liquidated on the measurement date.

10. Normal Cost

The actuarial present value of retirement system benefits allocated to the current year by the actuarial funding method.

11. Present Value of Future Benefits

The estimated amount of assets needed today to pay for all benefits promised in the future to current members of the Plan assuming all Actuarial Assumptions are met.

12. Present Value of Future Normal Costs

The Actuarial Present Value of retirement system benefits allocated to future years of service by the Actuarial Funding Method.

13. Projected Unit Credit Actuarial Funding Method

A mathematical budgeting procedure that allocates an individual's projected retirement plan benefits over his or her working career in proportion to service.

14. P-scan

Cheiron's proprietary modeling software used to project pension plan assets, liabilities, funded status, contribution rates, etc. under a variety of economic scenarios.

**APPENDIX B
GLOSSARY OF TERMS**

15. Unfunded Actuarial Liability (UAL)

The difference between Actuarial Liability and the Actuarial Value of Assets. The UAL represents the shortfall of assets in the plan compared to the budgeted amount under the Actuarial Funding Method. The UAL can also be calculated using the Market Value of Assets.