State of Washington
Pension Funding Council

June 30, 2011
Actuarial Valuation Audit

Produced by Cheiron

February 2013

CHEIRON Classic Values, Innovative Advice

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February 19, 2013

Pension Funding Council
State of Washington
Department of Retirement Systems
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Cheiron is pleased to present the results of our actuarial audit of the June 30, 2011 actuarial valuation performed by the Office of the State Actuary (OSA) for the Pension Funding Council (PFC). The purpose of this report is to confirm the independent replication of the June 30, 2011 actuarial valuation results and to report to the PFC any recommendations to improve either the valuation or its related communications. The audit was performed based on the preliminary valuation report, and the OSA has incorporated some of the findings and recommendations in its final report. This report is for the use of the PFC and the OSA. Any other user of this report is not an intended user and is considered a third party.

The Executive Summary of our report highlights the key findings and recommendations of our review. The balance of the report provides details in support of these findings and recommendations along with supplemental data, background information and discussion of the process to audit 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. The appropriateness of the assumptions has not been reviewed as part of the audit.

The results of this audit report reflect a full replication of the June 30, 2011 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, the plan provisions, employee data and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice #23. A detailed description of all information provided for this audit is provided in the body of our report.

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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.

This report was prepared for the Pension Funding Council of the State of Washington for the purpose described herein. This report is not intended to benefit any third party, and Cheiron assumes no duty or liability to any such party.

We hereby certify that, to the best of our knowledge, this report and its contents have 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. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

Sincerely,
Cheiron

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

Kenneth A. Kent, FSA, FCA, EA, MAAA
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EXECUTIVE SUMMARY

Cheiron performed an audit of the June 30, 2011 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)
- Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2)

The audit was based on the preliminary actuarial valuation report, and some of the findings and recommendations in this report have been incorporated into the final actuarial valuation report published by the OSA. In our review, 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.*

Key Finding

The key finding from our actuarial audit is that there is no material difference in our replication of the data, the calculation of liabilities, the calculation of the actuarial value of assets, or the calculation of contribution rates. The table below summarizes some of the key measures for all of the retirement plans combined. Additional detail is provided in the remainder of the report.

Item	OSA	Cheiron	Variance
Present Value of Future Benefits	$ 77,146.3	$ 77,186.7	0.1%
Present Value of Future Salaries	146,596.1	146,996.0	0.3%
Actuarial Value of Assets	60,653.9	60,686.7	0.1%

EXECUTIVE SUMMARY

Technical Findings and Recommendations

The following additional technical findings and recommendations do not have a material impact on the valuation results.

- The PFC and OSA should consider disclosing the plan's funded status in the valuation report on an Entry Age basis instead of a Projected Unit Credit basis. This change would result in the same funded status disclosure in the valuation report as is required to be disclosed for GASB purposes.
- The market value of assets used in the actuarial valuation does not match and is not reconciled with the net assets available for pension benefits reported in the CAFR. They should either match or the valuation report should include a reconciliation of the difference.
- In the calculation of the actuarial value of assets, the beginning-of-year balances are weighted for 364/365ths of a year instead of a full year.
- The entry age normal cost is spread as a level percentage of pay over each decrement instead of over each employee's career resulting in a normal cost rate that decreases once the member is eligible for retirement.
- The entry age used for the entry age normal calculation is the date the member entered any of the plans instead of the date the employee entered the current plan. As a result, the cost of the member's benefit in the current plan is spread over a period of time the member was not in the plan.
- The application of the assumed ratio of survivors selecting an annuity is not entirely correct.
- The special load to increase the ratio of survivors selecting an annuity by 4 percentage points for LEOFF 1 and WSPRS 1 doesn't make sense to us and is not applied exactly as described.
- The refund benefit is understated for certain WSPRS 2 and LEOFF 2 members who suffer a duty death.
- On WSPRS 1, the survivor benefit for an inactive disabled member has a 6% COLA adjustment that doesn't make sense to us.
- On WSPRS 2, the early retirement reduction for a non-duty related death benefit should start at the earlier of age 55 or 25 years of service. It is being applied only based on the number of years from age 55 regardless of the number of years of service.
- LEOFF 2 and WSPRS provide certain health benefits through a 401(h) account. There were a number of issued identified in the valuation of these liabilities.
    - Disabled retiree benefits use a flat trend rate instead of the blended trend rates used in the Other Post Employment Benefit (OPEB) valuation report.
    - For active employees, disability benefits are only increased for trend up to the time of disability.
    - The valuation assumes that all active employees have spouses, but the assumption is stated as 85%.
    - The probability of death for an active employee is based on the age and gender of the employee's spouse instead of the employee.
    - The survivor benefits do not reflect Medicare-eligible premium rates once the survivor reaches age 65.
    - Liabilities for surviving children are not valued.

EXECUTIVE SUMMARY

  - The use of the pension census to value the health liabilities potentially limits the accuracy of the valuation.
  - The fiscal note valuing these health benefits states an assumption that 50% of employers provide retiree medical coverage. The assumption is actually that 50% of plan members are eligible for retiree medical coverage from their employers, and the assumption was based on a 2005 survey. Because this is a significant assumption for the valuation of these benefits, we encourage an updated survey to verify that the assumption is still appropriate.
  - The valuation report should include a description of the OPEB benefits, assumptions, and methods including that they are being funded through a 401(h) account.
- Some methods and assumptions are not disclosed in the preliminary valuation report.

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 2011 actuarial valuations performed by the Office of the State Actuary.

With an independent replication, the PFC can be confident that the OSA's results are reasonable and accurate. In addition, other aspects of the valuation process are reviewed and our independent opinions 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 2011 valuation, we can compare and contrast the results developed by the OSA. This provides an explicit check of the "black-box" nature of the 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 projected benefit under the plan is being valued in a manner consistent with the actual operation and experience.

- **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 and that the funding process is structurally sound.

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

DATA REVIEW

As part of the valuation process the OSA 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 adjustments to the data used in the valuation. In addition there are often certain data elements that require adjustment before the valuation is run.

We received copies of both the raw data that the OSA received from DRS and the final data file that the OSA used for the valuation. We applied the default minimums and maximums provided by the OSA to the active data file and compared key statistics between the files. The tables below summarize the results. The first column summarizes the raw data provided by DRS. The second column summarizes the data after applying the default minimums and maximums to the raw data, and the third column summarizes the final data used by the OSA in the valuation. The fourth and fifth columns show the percentage change due to applying the defaults and in the final OSA data.

	PERS 1, TRS 1, and LEOFF 1				
	Raw Data	Apply OSA Defaults	Final OSA Data	Effect of Defaults	Ratio of Final / Defaults
Active Members					
Minimums					
Entry Age	17	18	17	5.9%	-5.6%
Current Age	23	23	50	0.0%	117.4%
Valuation Salary	$ -	$ 18,000	$ 18,000	-	0.0%
Maximums					
Entry Age	75	75	76	0.0%	1.3%
Current Age	91	91	91	0.0%	0.0%
Service	62.75	50.00	62.75	-20.3%	25.5%
Valuation Salary	$ 291,007	$ 424,027	$ 424,027	45.7%	0.0%
Averages					
Entry Age	35.41	35.41	35.44	0.0%	0.1%
Current Age	61.02	61.02	61.02	0.0%	0.0%
Service	25.58	25.57	25.58	0.0%	0.0%
Valuation Salary	$ 62,257	$ 63,159	$ 63,172	1.4%	0.0%
Vested Terminated Members					
Minimums					
Current Age	45	45	51	0.0%	13.3%
Current Service	5.00	5.00	5.00	0.0%	0.0%
Maximums					
Current Age	80	80	80	0.0%	0.0%
Current Service	45.00	45.00	45.00	0.0%	0.0%
Averages					
Current Age	60.90	60.90	60.89	0.0%	0.0%
Current Service	13.09	13.09	13.09	0.0%	0.0%

DATA REVIEW

	PERS 1, TRS 1, and LEOFF 1				
	Raw Data	Apply OSA Defaults	Final OSA Data	Effect of Defaults	Ratio of Final / Defaults
Service Retirees					
Minimums					
Current Age	51	51	51	0.0%	0.0%
Benefit Amount	$ -	$ 120	$ 91	-	-23.9%
Maximums					
Current Age	107	107	107	0.0%	0.0%
Benefit Amount	$ 222,251	$ 222,251	$ 222,251	0.0%	0.0%
Averages					
Current Age	73.08	73.08	73.08	0.0%	0.0%
Benefit Amount	$ 24,649	$ 24,649	$ 24,685	0.0%	0.1%
Disabled Retirees					
Minimums					
Current Age	53	53	53	0.0%	0.0%
Benefit Amount	$ -	$ 120	$ -	-	-100.0%
Maximums					
Current Age	99	99	99	0.0%	0.0%
Benefit Amount	$ 90,244	$ 90,244	$ 90,244	0.0%	0.0%
Averages					
Current Age	69.42	69.42	69.42	0.0%	0.0%
Benefit Amount	$ 29,846	$ 29,847	$ 29,850	0.0%	0.0%
Beneficiaries					
Minimums					
Current Age	17	20	17	17.6%	-15.0%
Benefit Amount	$ 114	$ 120	$ 114	5.7%	-5.4%
Maximums					
Current Age	105	105	105	0.0%	0.0%
Benefit Amount	$ 117,614	$ 117,614	$ 117,614	0.0%	0.0%
Averages					
Current Age	78.42	78.42	78.42	0.0%	0.0%
Benefit Amount	$ 17,145	$ 17,145	$ 17,145	0.0%	0.0%

DATA REVIEW

	All Other Plans (Excluding LEOFF 2)				
	Raw Data	Apply OSA Defaults	Final OSA Data	Effect of Defaults	Ratio of Final / Defaults
Active Members					
Minimums					
Entry Age	-	18	16	-	-11.1%
Current Age	-	16	16	-	0.0%
Valuation Salary	$ -	$ 12,000	$ 12,000	-	0.0%
Maximums					
Entry Age	85	80	85	-5.9%	6.3%
Current Age	87	87	87	0.0%	0.0%
Service	41.83	41.83	41.83	0.0%	0.0%
Valuation Salary	$ 590,860	$ 500,000	$ 500,000	-15.4%	0.0%
Averages					
Entry Age	35.83	35.83	35.86	0.0%	0.1%
Current Age	47.26	47.26	47.25	0.0%	0.0%
Service	11.39	11.39	11.39	0.0%	0.0%
Valuation Salary	$ 51,169	$ 53,023	$ 53,023	3.6%	0.0%
Vested Terminated Members					
Minimums					
Current Age	25	25	25	0.0%	0.0%
Current Service	2.44	2.44	2.44	0.0%	0.0%
Maximums					
Current Age	89	89	89	0.0%	0.0%
Current Service	33.25	33.25	33.25	0.0%	0.0%
Averages					
Current Age	53.35	53.35	53.34	0.0%	0.0%
Current Service	11.30	11.30	11.30	0.0%	0.0%

DATA REVIEW

	All Other Plans (Excluding LEOFF 2)				
	Raw Data	Apply OSA Defaults	Final OSA Data	Effect of Defaults	Ratio of Final / Defaults
Service Retirees					
Minimums					
Current Age	47	47	47	0.0%	0.0%
Benefit Amount	$ -	$ 120	$ 35	-	-70.6%
Maximums					
Current Age	98	98	98	0.0%	0.0%
Benefit Amount	$ 203,031	$ 203,031	$ 203,031	0.0%	0.0%
Averages					
Current Age	70.41	70.41	70.41	0.0%	0.0%
Benefit Amount	$ 13,285	$ 13,285	$ 13,290	0.0%	0.0%
Disabled Retirees					
Minimums					
Current Age	33	33	33	0.0%	0.0%
Benefit Amount	$ 69	$ 120	$ 69	73.0%	-42.2%
Maximums					
Current Age	89	89	89	0.0%	0.0%
Benefit Amount	$ 33,401	$ 33,401	$ 33,401	0.0%	0.0%
Averages					
Current Age	64.87	64.87	64.86	0.0%	0.0%
Benefit Amount	$ 5,067	$ 5,067	$ 5,067	0.0%	0.0%
Beneficiaries					
Minimums					
Current Age	21	21	21	0.0%	0.0%
Benefit Amount	$ 53	$ 120	$ 53	125.2%	-55.6%
Maximums					
Current Age	97	97	97	0.0%	0.0%
Benefit Amount	$ 74,106	$ 74,106	$ 74,106	0.0%	0.0%
Averages					
Current Age	68.25	68.25	68.24	0.0%	0.0%
Benefit Amount	$ 8,120	$ 8,120	$ 8,120	0.0%	0.0%

None of the differences are significant.

REPLICATION OF LIABILITIES

With the collected 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, of 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	Variance
PERS 1			
Active Members	$ 2,044.6	$ 2,035.8	-0.4%
Inactive Members	10,677.5	10,842.0	1.5%
Total	$ 12,722.2	$ 12,877.9	1.2%
PERS 2/3			
Active Members	$ 21,579.7	$ 21,521.4	-0.3%
Inactive Members	5,756.8	5,721.4	-0.6%
Total	$ 27,336.5	$ 27,242.8	-0.3%
SERS 2/3			
Active Members	$ 2,834.0	$ 2,838.6	0.2%
Inactive Members	862.1	853.2	-1.0%
Total	$ 3,696.0	$ 3,691.8	-0.1%
PSERS 2			
Active Members	$ 448.7	$ 441.9	-1.5%
Inactive Members	6.1	6.1	0.1%
Total	$ 454.8	$ 448.1	-1.5%
WSPRS 1/2			
Active Members	$ 452.5	$ 452.9	0.1%
Inactive Members	541.2	536.3	-0.9%
Total	$ 993.7	$ 989.2	-0.5%

REPLICATION OF LIABILITIES

	Present Value of Future Benefits		
	OSA	Cheiron	Variance
TRS 1			
Active Members	$ 1,378.9	$ 1,379.0	0.0%
Inactive Members	7,934.2	7,761.3	-2.2%
Total	$ 9,313.1	$ 9,140.3	-1.9%
TRS 2/3			
Active Members	$ 8,245.3	$ 8,320.9	0.9%
Inactive Members	1,516.3	1,506.6	-0.6%
Total	$ 9,761.6	$ 9,827.5	0.7%
LEOFF 1			
Active Members	$ 251.7	$ 251.6	0.0%
Inactive Members	3,898.6	3,938.8	1.0%
Total	$ 4,150.3	$ 4,190.4	1.0%
LEOFF 2			
Active Members	$ 7,551.9	$ 7,614.0	0.8%
Inactive Members	1,166.1	1,164.7	-0.1%
Total	$ 8,718.1	$ 8,778.8	0.7%
Grand Total			
Active Members	$ 44,787.4	$ 44,856.3	0.2%
Inactive Members	32,358.9	32,330.4	-0.1%
Total	$ 77,146.3	$ 77,186.7	0.1%

	Present Value of Future Salaries		
Plan	OSA	Cheiron	Variance
PERS 1	$ 1,504.5	$ 1,505.9	0.1%
PERS 2/3	70,721.4	71,020.4	0.4%
SERS 2/3	11,480.1	11,526.0	0.4%
PSERS 2	2,526.2	2,488.2	-1.5%
TRS 1	788.7	788.8	0.0%
TRS 2/3	41,832.6	41,813.6	0.0%
WSPRS 1/2	771.5	773.9	0.3%
LEOFF 1	60.8	60.8	0.0%
LEOFF 2	16,910.3	17,018.5	0.6%
Grand Total	**$ 146,596.1**	**$ 146,996.0**	**0.3%**

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, except for PSERS, well within a reasonable range for an actuarial audit. For PSERS, the difference is discussed later in the report, but it did not affect the contribution rate as the minimum rate was not applicable.

	Entry Age Normal Cost		
	OSA	Cheiron	Variance
PERS 2/3	$ 693.4	$ 705.2	1.7%
SERS 2/3	102.6	104.5	1.9%
PSERS 2	22.9	29.9	30.6%
WSPRS 1/2	14.5	14.7	1.3%
TRS 2/3	262.5	270.5	3.0%
LEOFF 2	257.7	260.7	1.2%

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, the calculation calls for 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 two years 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. The differences are discussed in the technical findings and recommendations of the report, but none are significant.

	Actuarial Value of Assets		
	OSA	Cheiron	Variance
PERS 1	$ 8,883.4	$ 8,889.3	0.1%
PERS 2/3	20,996.7	21,006.9	0.0%
SERS 2/3	2,872.1	2,873.5	0.0%
PSERS 2	140.7	140.7	0.0%
TRS 1	7,485.0	7,489.9	0.1%
TRS 2/3	7,140.6	7,144.1	0.0%
WSPRS 1/2	949.5	950.0	0.1%
LEOFF 1	5,565.3	5,568.6	0.1%
LEOFF 2	6,620.7	6,623.6	0.0%
Grand Total	$ 60,653.9	$ 60,686.7	0.1%

REPLICATION OF CONTRIBUTION RATES

Calculation of Contribution Rates

The basic contribution rate for the open Plans is equal to the Aggregate Normal Cost Rate. Members pay 50% and the employers pay 50% of the total contribution rate. In addition to the basic contribution rate, the open Plans are subject to a minimum contribution rate generally equal to 80% of the entry age normal cost rate.

We replicated the OSA's calculation of contribution rates. A comparison of results is shown in the table below.

	Employer Contribution Rates		
	OSA	**Cheiron**	**Difference**
PERS 1	4.00%	4.17%	0.17%
PERS 2/3	5.03%	4.93%	-0.10%
SERS 2/3	5.64%	5.58%	-0.06%
PSERS 2	6.22%	6.18%	-0.04%
WSPRS 1/2	7.63%	7.70%	0.07%
TRS 1	4.48%	4.03%	-0.45%
TRS 2/3	5.73%	5.86%	0.13%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2	7.57%	7.65%	0.08%

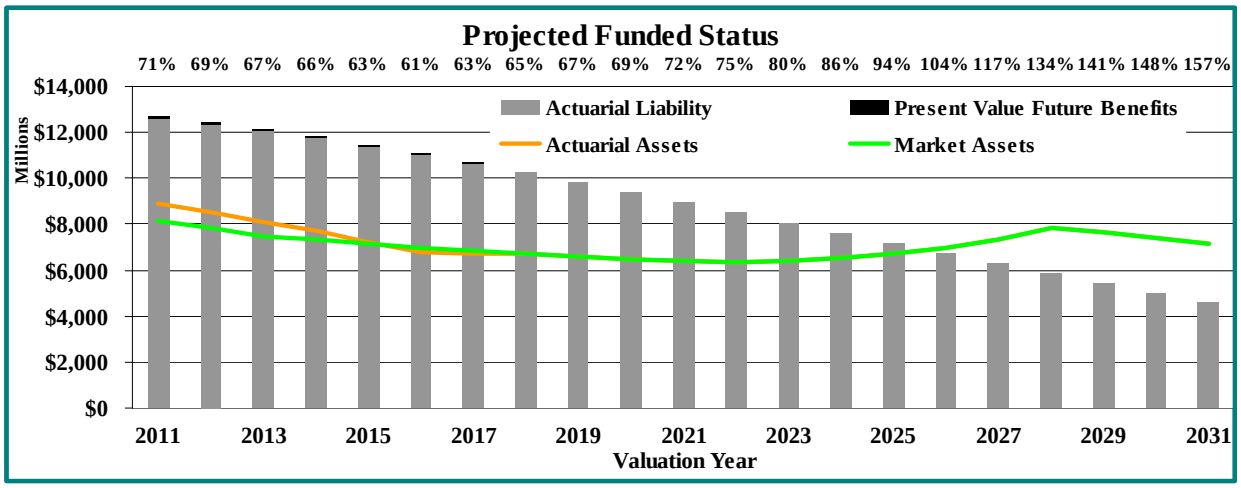
The differences in contribution rates are due to the slight differences in liability measurements as opposed to any difference in the calculation of contribution rates based on those liability measurements. The largest difference (TRS 1 amortization rate) is primarily due to a 1.9% difference in the measurement of the TRS 1 present value of future benefits. We do not view any of these differences as material.

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, including investment returns of 7.9% in each and every year.

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.



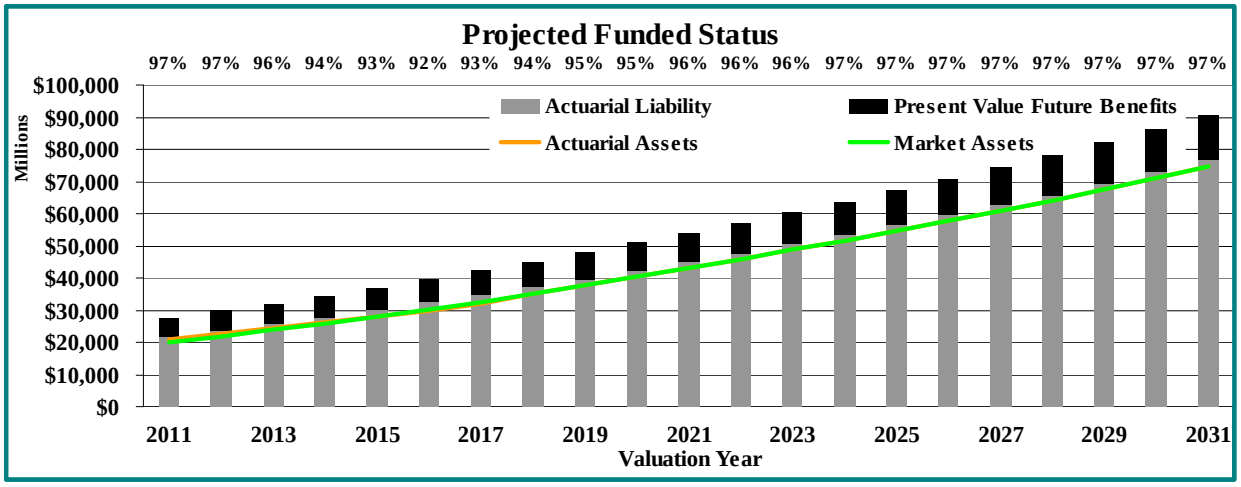
Because PERS 1 is a closed plan with mostly retirees, the difference between the present value of future benefits and the actuarial liability is minimal. As benefits are paid out, the actuarial liability decreases from approximately $13 billion to approximately $5 billion by the end of the projection period. The funded status is projected to decline from 71% down to 61% as the recent investment losses are fully recognized and as contribution rates are increased. Then, funded status is projected to improve, reaching 100% funding in about 2026 and continuing to improve thereafter.

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 on the growing payroll (including projected membership growth) is more than sufficient to fund the declining liability.

DETERMINISTIC PROJECTIONS

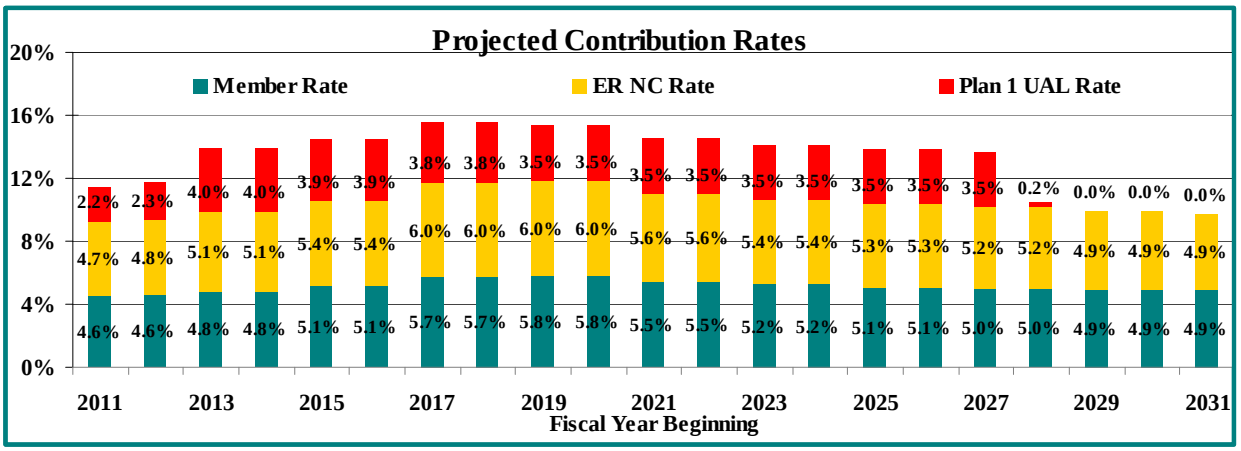
PERS 2/3

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 97% to approximately 92% as the recent investment losses are recognized before increasing back to 97% by the end of the projection.



While PERS 1 declines in liability, as shown earlier, from $13 billion to $5 billion over the projection period, the open PERS 2/3 plan is projected to increase in liability from approximately $22 billion to approximately $80 billion over the same projection period.

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

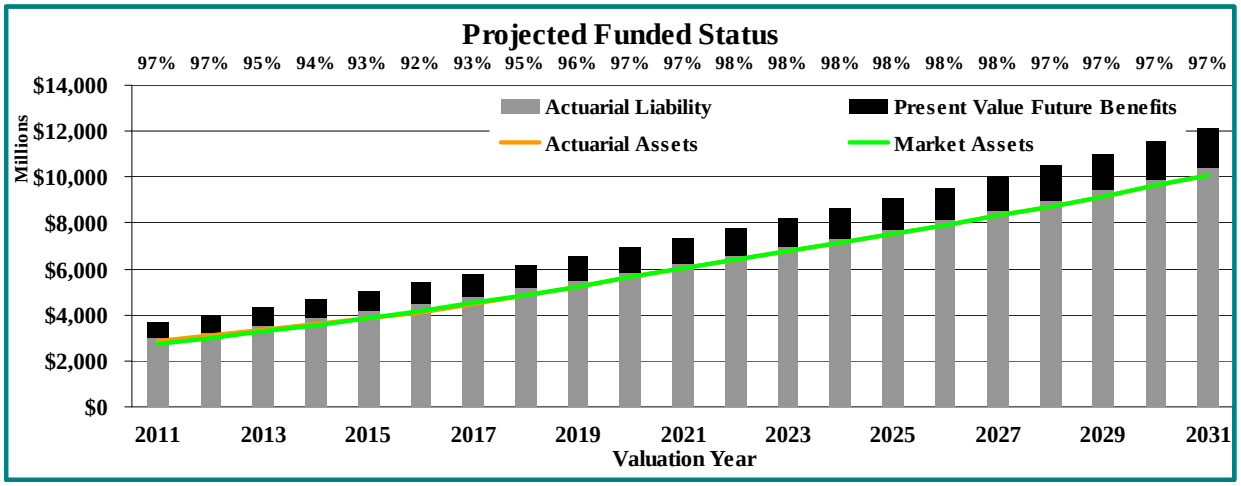


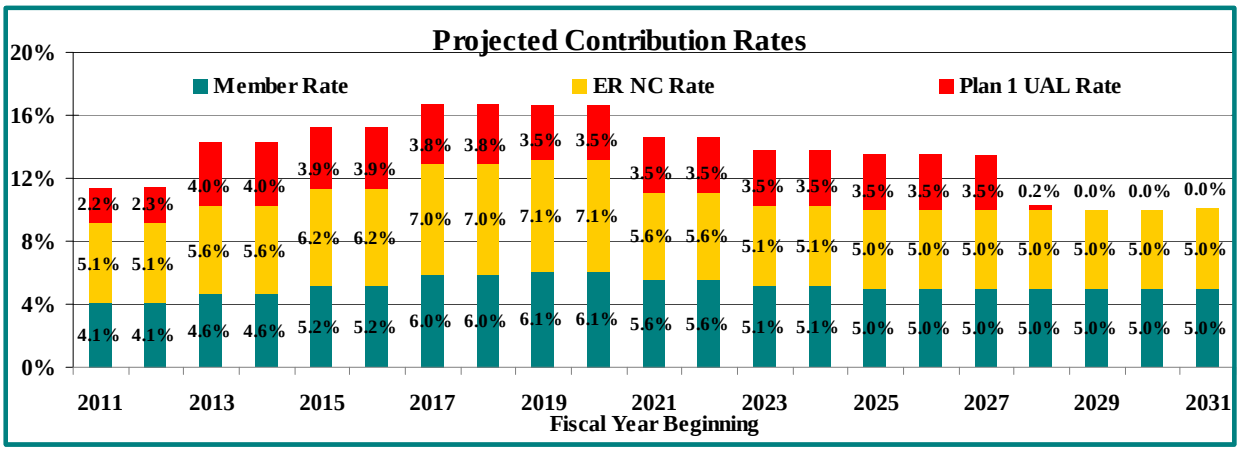
DETERMINISTIC PROJECTIONS

Contribution rates are expected to increase 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.

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.

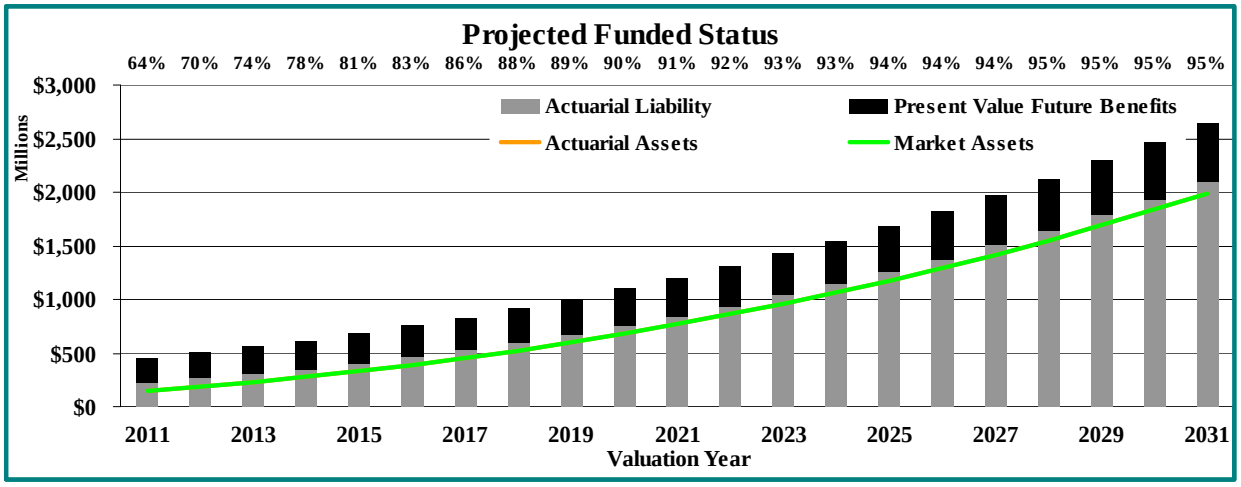


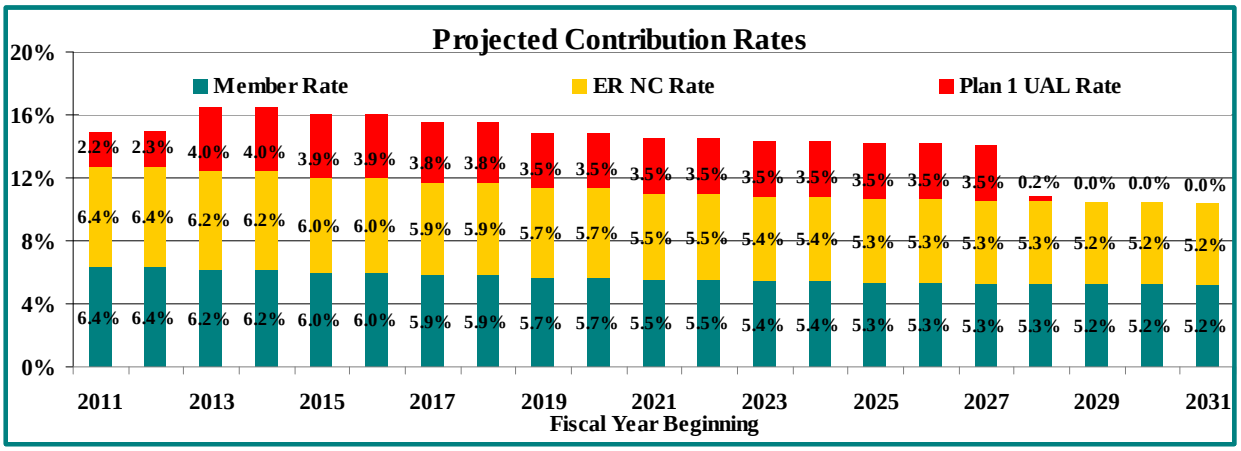


DETERMINISTIC PROJECTIONS

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.

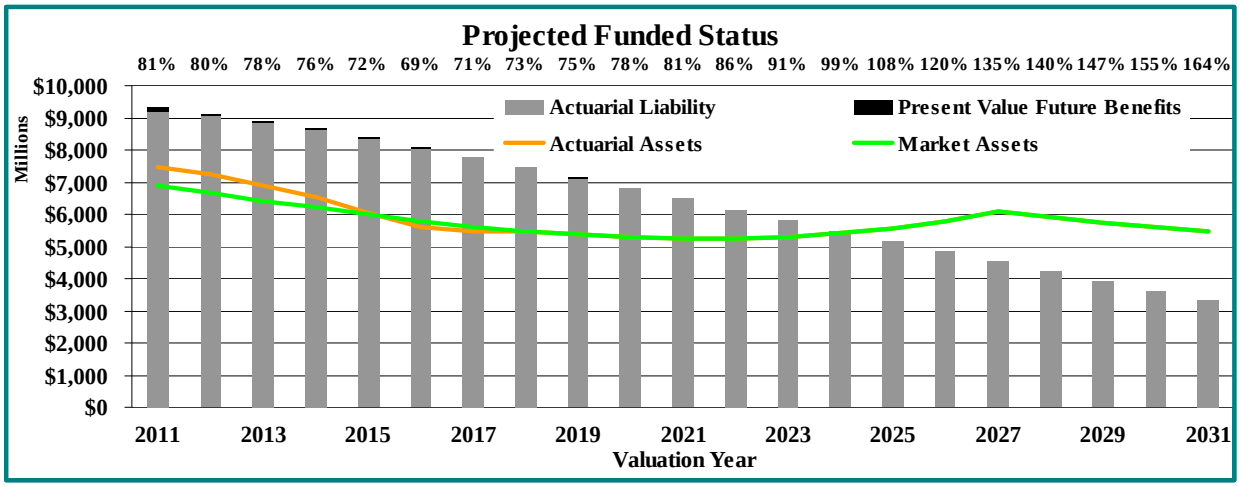




DETERMINISTIC PROJECTIONS

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 $9 billion to approximately $3 billion by the end of the projection period. The funded status is projected to first decline from 81% down to 69% as the recent investment losses are fully recognized and as contribution rates are increased.

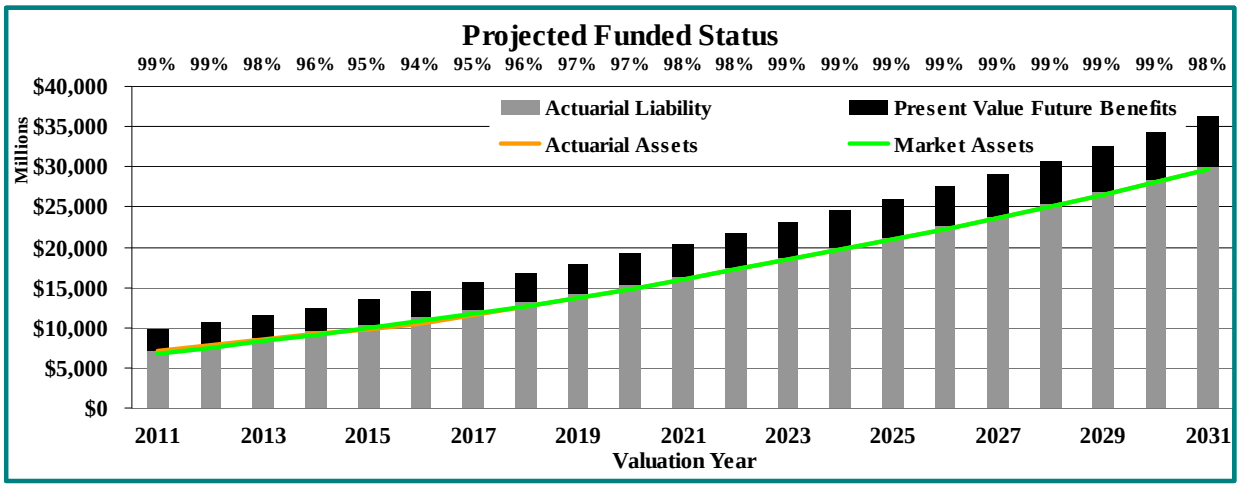


The funded status improves rapidly at the end of the projection period as the minimum contribution rate (5.75%) on the growing combined payroll of TRS 1, 2, and 3 (including projected membership growth) is more than sufficient to fund the declining liability. If the minimum rate is not employed to override the underlying amortization method, the funded status at the end of the projection would be 84% instead of 164%.

TRS 2/3

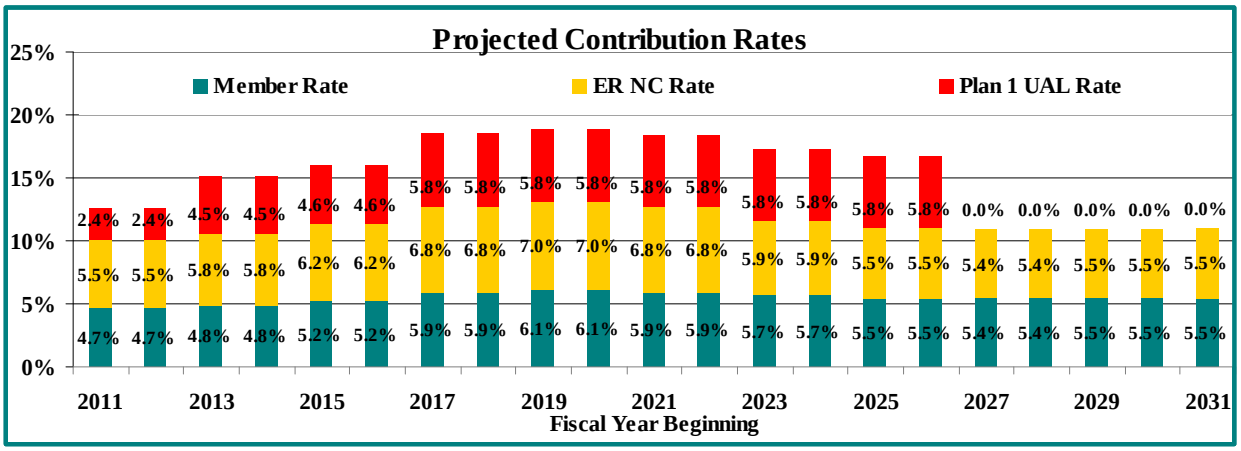
The chart below shows the projected growth of liabilities and assets for the TRS 2/3 plan. As noted at the top of the chart, the funded status is projected to decline from 99% to approximately 94% as the recent investment losses are recognized before increasing back to 98% by the end of the projection.

DETERMINISTIC PROJECTIONS



It is also worth noting that while TRS 1 declines in liability from $9 billion to $3 billion over the projection period, the open TRS 2/3 plan is projected to increase in liability from approximately $7 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.

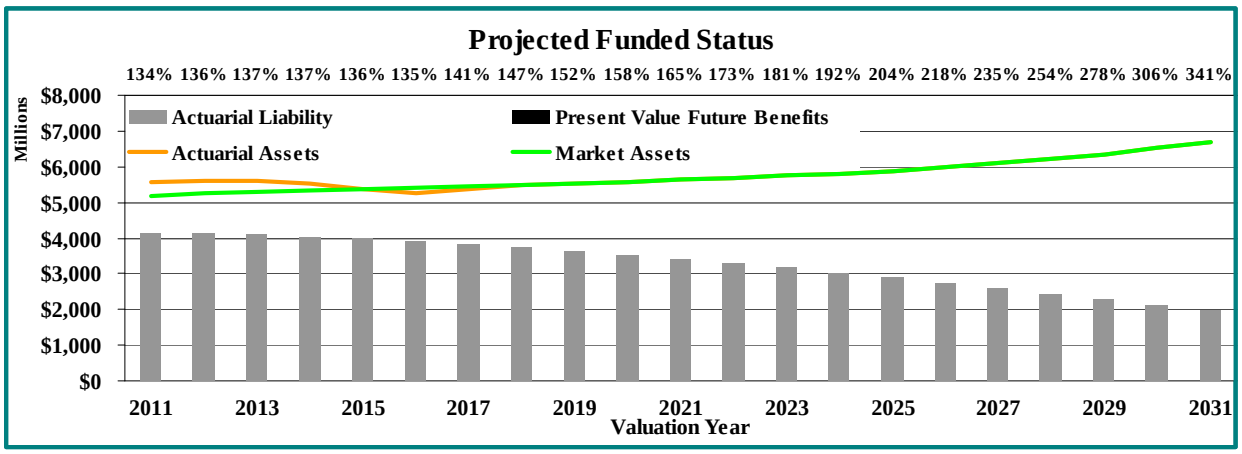


Contribution rates are expected to increase as the recent investment losses are fully recognized. The Plan 1 rate is limited by a maximum rate in the early years of the projection and a minimum rate in the later years of the projection.

DETERMINISTIC PROJECTIONS

LEOFF 1

LEOFF 1 is currently more than 100% funded and is projected to remain fully funded, so there is no contribution rate.



TECHNICAL FINDINGS AND RECOMMENDATIONS

Assets

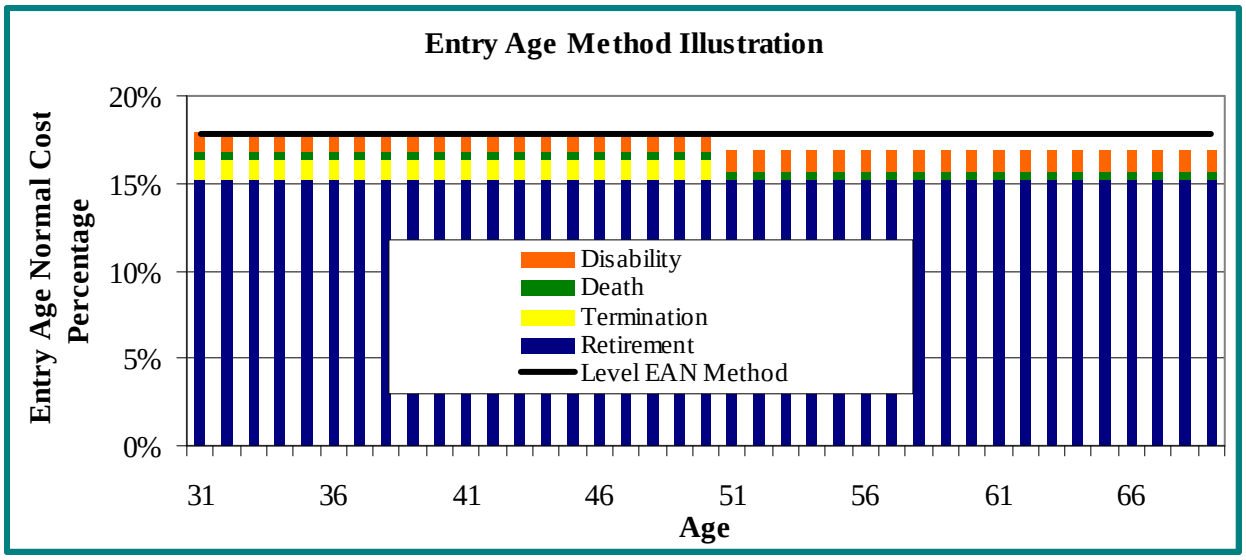
The market value of assets used in the actuarial valuation does not match and is not reconciled with the plan net assets held in trust for pension benefits reported in the CAFR. We understand that the difference is due to operating funds, fixed assets and long-term obligations such as compensated absences. However, our understanding of the reporting under Government Accounting Standards Board Statement No. 25 is that the plan net assets held in trust for pension benefits that is reported in the CAFR should be the amount actually available to pay plan benefits and expenses. If a portion of those assets are committed to another purpose, we understand that the plan should report the full amount of assets in the trust and a liability amount for any obligations for the items described above.

The fact that the CAFR reports a different amount of plan assets than the actuarial valuation may also cause confusion for the users of the CAFR and valuation reports. Consequently, we recommend that the market value of assets in the actuarial valuation report should match the plan net assets reported in the CAFR. If a portion of those assets are dedicated to another purpose, the plan should recognize a liability for that other purpose.

In the calculation of the actuarial value of assets, the beginning-of-year balances are weighted for 364/365ths of a year instead of a full year. This difference changes the expected investment earnings for the year, the calculated actual rate of return for the year, the gain or loss for the year, and the actuarial value of assets. The effect, however, is very minor.

Entry Age Normal Cost

The entry age normal cost as applied by the OSA is spread as a level percentage of pay over each decrement instead of over each employee's career. For example, the cost of termination benefits are spread as a level percentage of pay from plan entry until the member is eligible for retirement, and the cost of retirement benefits are spread as a level percentage of pay from plan entry until the last assumed retirement age. Consequently, for an individual member, the normal cost is one percentage of pay until the member is eligible for retirement and a lower percentage of pay while the member is eligible for retirement. The more traditional interpretation is to have the cost of each benefit spread over the full expected career of an individual member resulting in a constant normal cost rate from entry age until expected decrement/retirement.



We do not have a particular objection to the method used, but we note that the method should be clearly explained in the report. Also, it is not the version of the entry age method adopted by GASB in Statements 67 and 68. The OSA may wish to use the version adopted by GASB to avoid the need to calculate two entry age measurements and to avoid the confusion that could result with two entry age measurements.

The entry age used for the entry age normal calculation is the date the member entered any of the plans instead of the date the employee entered the current plan. For most plans, this difference has a very minor impact on the minimum contribution rate as most members do not transfer from one plan to another. However, for PSERS, this issue has a significant impact on the minimum contribution rate, increasing the entry age normal cost by approximately 30 percent as shown in the section of this report on the replication of liabilities. However, it had no impact in this valuation because the regular contribution rate was greater than the minimum.

Death Benefits

The application of the assumed ratio of survivors selecting an annuity is not entirely correct. The assumption is described as the ratio of survivors of an active or terminated member's death who select annuity payments rather than a lump sum payment. Consequently, we would expect the benefit to be valued as:

Ratio x value of annuity + (1-ratio) x value of lump sum

For plans other than LEOFF 1, the benefit is valued as:

Value of lump sum + ratio x maximum(value of annuity – value of lump sum, 0)

TECHNICAL FINDINGS AND RECOMMENDATIONS

These formulas are equivalent except when the value of the lump sum exceeds the value of the annuity. The formula used by the OSA ensures that the value is always at least equal to the value of the lump sum.

For LEOFF 2, the situation is a little more complex as the lump sum benefit is 1.5 times greater if the member was married or had minor children than if the member was single with no minor children. The higher lump sum is payable only if a member has more than 10 years of service or is eligible to retire or dies in the line of duty. We would expect an additional assumption to value the lump sum separately for those assumed married and those not. However, the OSA modified their formula to value the benefit as follows:

> Value of lump sum x (1.5 x ratio + (1 - ratio)) + ratio x maximum(value of annuity – 1.5 x value of lump sum, 0)

If the value of the lump sum and value of annuity are equal, this formula is equivalent to assuming two-thirds of those electing a lump sum were married or had minor children. However, the formula results in other differences if the lump sum and annuity have different values.

The table below illustrates the differences between the OSA application of the assumption and our application of the assumption for three hypothetical scenarios.

Illustration of Differences in Application of Ratio of Survivors Selecting an Annuity

Illustration	A	B	C
Assumptions			
Annuity Value	$ 200,000	$ 400,000	$ 200,000
Single Lump Sum	200,000	200,000	400,000
Ratio Selecting Annuity	0.4	0.4	0.4
Percent Married	67%	67%	67%
Non-LEOFF Plans			
OSA Value	$ 200,000	$ 280,000	$ 400,000
Cheiron Value	200,000	280,000	320,000
Difference	0	0	80,000
LEOFF Plan 2			
OSA Value	$ 240,000	$ 280,000	$ 480,000
Cheiron Value	240,000	320,000	400,000
Difference	0	(40,000)	80,000

We recommend that the OSA review the application of this assumption or alternatively, the greater of the lump sum or the annuity could be valued which would eliminate the need for all of the assumed ratios of survivors selecting an annuity.

TECHNICAL FINDINGS AND RECOMMENDATIONS

The special load to increase the ratio of survivors selecting an annuity by 4 percentage points for LEOFF 1 and WSPRS 1 doesn't make sense to us and is not applied exactly as described. First, it is not applied in the WSPRS 1 valuation. The stated purpose of using this ratio is to account for the valuation software applying mortality assumptions to potential survivors. The load is applied to refunds as well as annuity benefits. In the case of a refund, the adjustment reduces the percentage assumed to elect a refund rather than providing a load to the annuity. However whether survivors elect a refund or an annuity, they are eligible for immediate benefits so the load is not required.

The refund benefit is understated for certain WSPRS 2 and LEOFF 2 members who suffer a duty death. Members are entitled to 150% of their employee contributions with interest if they elect a refund. However, the refund benefit for these members is only the employee contributions with interest.

On WSPRS 1, the survivor benefit for an inactive disabled member has an adjustment increasing the benefit by 6% which was noted as a COLA adjustment. To our knowledge, there is no special adjustment needed for these members.

On WSPRS 2, there is a reduction in the survivor's benefit if a member should die from a non-duty related incident and the member is not eligible for normal retirement. The reduction should be based on the number of years the member is less than age 55, or if less, the number of years the member's service is less than 25. The reduction is based on the number of years from age 55; regardless of the years of service the member has when they die.

OPEB Valuation

LEOFF 2 and WSPRS provide certain health benefits that are funded through a 401(h) account. There were issues identified in the valuation of these liabilities. Note that our review does not address implicit subsidies between the active, disabled and retiree population benefit costs as these are addressed in the OPEB report.

The table below shows the degree to which we were able to match the OSA's valuation using the OSA's methodology (Matching) and the results after fixing some theoretical and application issues (Cheiron). The issues may be significant in the context of just the 401(h) account, but are not significant in the context of the full valuation, with the impact of the differences ranging from less than 0.001% of the total liabilities for the Matching case and 0.007% for the Cheiron case.

TECHNICAL FINDINGS AND RECOMMENDATIONS

LEOFF Plan 2 and WSPRS Plans 1/2
Reimbursement of Medical Premium - Duty related Disability & Death Benefits ($ in Millions)

	OSA	Matching	*% Change*	Cheiron	*% Change*
Present Value of Future Benefits					
Actives - Death	$ 15.2	$ 15.5	1.8%	$ 13.4	-11.8%
Actives - Disability	13.7	14.0	2.2%	20.9	52.6%
Inactives - Death	8.4	8.4	-0.1%	7.8	-7.5%
Inactives - Disability	1.4	1.3	-2.3%	2.1	52.7%
Total	**$ 38.7**	**$ 39.2**	**1.3%**	**$ 44.2**	**14.2%**
Entry Age Normal Cost					
Actives - Death	1.1	1.1	-0.9%	0.8	-27.0%
Actives - Disability	0.7	0.7	3.4%	1.2	62.1%
Total	**$ 1.8**	**$ 1.8**	**0.0%**	**$ 2.0**	**11.1%**

The issues we identified are as follows:

- Death & Survivor benefits:
  - The stated assumption is that 85% of active employees have spouses, but the OSA valued 100% with spouses. Either the ProVal coding should be changed to match the stated assumption or the stated assumption should be changed to match the ProVal coding.
  - The probability of death for an active employee is based on the age and gender of the employee's spouse instead of the employee.
  - The survivor benefits do not reflect Medicare-eligible premium rates once the survivor reaches age 65. Instead, the survivor benefits continue to use the pre-Medicare premium rates.
  - Liabilities for WSPRS surviving children are not valued.
- Disability Benefits:
  - For actives, the benefit amounts are only trended up to the time of disability. The benefit amounts should continue to increase after the employee becomes disabled at the same rate as used in the OPEB valuation.
  - The trend used in the valuation of benefits for disabled retirees is 3%; however the trend stated in the corresponding assumptions is 5%. Either the assumptions need to be updated to reflect the 3% trend, or the benefits valuation needs to be recalculated using a 5% trend.
- The use of the pension census to value the health liabilities limits the accuracy of the valuation. Assuming the full health census is not available, assumptions should be developed for the percentage of employees with a spouse, percentage of employees with children, and average number of children based on the health census. The assumptions used for pension purposes may be different for health purposes due to the potential for dual health coverage.
- We recommend that the retiree-paid portion of the premium be assumed to increase at the same blended trend rate as is used in the Other Postemployment Benefits (OPEB) valuation report regardless of current status (active or inactive) and reason for benefits (disability or death). The OSA uses a flat trend for disabled retirees currently receiving benefits.

- The fiscal note valuing these health benefits states an assumption that 50% of employers provide retiree medical coverage. The assumption is actually that 50% of plan members are eligible for retiree medical coverage from their employers, and the assumption was based on a 2005 survey. Because this is a significant assumption for the valuation of these benefits, we encourage an updated survey to verify that the assumption is still appropriate.
- The valuation report should include a statement that the OPEB benefits are being funded via a 401(h) account, a description of the OPEB assumptions and methods, and a summary of the OPEB plan provisions.

Methods and Assumptions Not Disclosed in the Preliminary Valuation Report

In a valuation report of this size, there are many assumptions and methods to describe. One advantage of an independent replication is that the assumptions and methods that may not be described in the valuation report may get uncovered. Based on our replication audit, we noticed that the following assumptions and methods were not disclosed in the preliminary valuation report and should be considered for inclusion in the future.

- The assumed retirement age for deferred vested members is not disclosed:

  Current inactives and actives

WSPRS 1/2:	Age 60
LEOFF 1:	Age 50
LEOFF 2:	Age 53 with less than 20 years service
	Age 50 with 20 or more years of service

  PERS, TRS, SERS, PSERS Plan 2/3:
  Age 55 with 30 or more years of service
  Age 65 with less than 30 years of service

- Plan 3 actives only:
  1) If the member has less than 20 years, their assumed retirement age is 65
  2) If the member has 30 or more years of service, they are assumed to retire at age 55 or immediately if they are older than 55 due to the heavily subsidized early retirement factors.
  3) If the member has 20 or more years of service and less than 30, a percentage are assumed to defer their retirement to 65 and receive an increase of 3% per year until age 65. The rest are assumed to retire at 55 or their current age if greater and forego the increases.

- The value of the special lump sum death benefit of $216,622 effective 7/1/2011 is not disclosed for WSPRS 1/2 and LEOFF 1.

- Employee contribution rates used to accumulate account balances are not disclosed.

- Duty death rates that are applied to the special lump sum death benefit are not disclosed.

- For LEOFF 1 - Disabled members may receive an additional benefit of 5 percent of their final average salary for each dependent child. Surviving spouses of members who die in service also receive an additional 5 percent of FAS for each child. Both benefits have a maximum of 10% of FAS. These additional benefits are being valued based on the assumption that the member will receive the maximum additional benefit of 10% of FAS. This assumption along with the assumed probability that a member will have a dependent child is not disclosed.

- For LEOFF 1 and WSPRS 1 - The probability that an active or terminated member will have a qualified survivor who is entitled to survivor annuity benefits upon death after retirement is not explicitly disclosed. The probability is the same as the Ratio of Survivors Selecting Annuities for ages greater than or equal to 62 (plus 4% for WSPRS 1), but is applied at all ages for deaths after retirement.

- For WSPRS 1 - The normal form of benefit provides the survivor with a benefit that is the lesser of 100% of the member's benefit including all COLAs or 50% of FAS with no COLAs. The assumptions that all survivors receive the 50% of FAS benefit (and not the 100% of member's benefit) and that 64% of retirees are married are not disclosed.

- For PERS 1 – For duty disability, the flat $350 benefit is being loaded for military service.

- For PERS 1 – The maximum compensation limit is using an inflation rate of 3.5%, instead of 3%.

Unresolved Issues from Prior Audit

The PFC and OSA should consider disclosing the plan's funded status in the valuation report on an Entry Age basis instead of a Projected Unit Credit basis. As noted in our prior audit, GASB requires the disclosure under the Entry Age basis, and the Projected Unit Credit basis is not used for any other purpose. Disclosing two different funded status numbers creates unnecessary work and may create unnecessary confusion among users of the valuation reports and CAFR.

The minimum contribution rate for PERS 2/3, SERS 2/3 and TRS 2/3 defined in the statute is 80 percent of the entry age normal cost for each system. However, the methodology used by the OSA does not result in a minimum contribution equal to 80 percent of the entry age normal cost. Since these minimum rates do not apply in this valuation, there is no impact. In our prior valuation audit, we described three potential interpretations of the statute including the interpretation used by the OSA. A decision should be made as to the appropriate interpretation.

TECHNICAL FINDINGS AND RECOMMENDATIONS

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. The minimums and maximums tend to control the Tier 1 UAL rates, but Legislation should be considered to remove this assumption from the calculation.

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, 2011 actuarial valuation report which can be found on their website at the following URL: http://osa.leg.wa.gov/Actuarial_Services/Publications/Valuations.htm.

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.