



Utah State Legislature

**Audit of Long-Term Actuarial
Projections Relating to State
Retirement System**

Produced by **Cheiron**

October 2010

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October 12, 2010

The Honorable Daniel R. Liljenquist, Senate Chair
The Honorable Don L. Ipson, House Chair
Retirement and Independent Entities Committee
Utah State Capitol
Salt Lake City, Utah 84114

Dear Sirs:

Cheiron is pleased to present the results of our actuarial audit of the Long-Term Actuarial Projections Relating to the State Retirement System performed by Gabriel Roeder Smith (GRS). We direct your attention to the executive 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 GRS.

In performing this audit, Cheiron used actuarial assumptions and methods as adopted by the Utah Retirement System based upon recommendations by GRS. We reviewed these assumptions as part of this audit based on the most recent experience study report prepared by GRS. Please note that the results of this audit report do not reflect a full replication of the January 1, 2009 actuarial valuation for the Utah Retirement System (URS), but instead reflect a careful review of the valuation results for several sample members of the system and the full replication of contribution rates and long-term projections given the results of the January 1, 2009 actuarial valuation.

In preparing our report, we relied, without audit, on information (some oral and some written) supplied by URS and GRS. 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.

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
Consulting Actuary



Gene Kalwarski, FSA
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Michael Noble, FSA
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EXECUTIVE SUMMARY

Cheiron performed an audit of the long-term actuarial projections relating to the state retirement system. This audit included a review of the January 1, 2009 actuarial valuation, a review of the December 31, 2007 experience study, and a replication of the long-term projections performed by Gabriel Roeder Smith (GRS). 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 agree with the substantive results of the valuation, the assumptions recommended in the experience study, the calculation of contribution rates, and funded status in the long-term projection report.
2. While we generally concur with the analysis of SB 43 and SB 63, we are concerned about what is not covered in the analysis of SB 63. Offering choice between a defined contribution plan and a defined benefit plan with a fixed employer contribution rate may result in an unsustainable structure. If the objective is a plan that costs 10% of payroll, the Legislature may wish to offer just a defined contribution plan, just a variable defined benefit plan, or a choice between the two. See page 32 for a full discussion of this issue.
3. The current funding policy of Utah Retirement System (URS) prevents the contribution rate from declining at all until the System is 110% funded. While URS is likely to adjust this policy if contribution rates are high and the System's funded status approaches 110%, the projections hold contribution rates at a high level until the threshold is achieved. Once the threshold is met, the contribution rate can then drop dramatically. As a result, some scenarios show sustained contribution rates at very high rates when the rates are more likely to decline earlier in the projection. See page 15 for a full discussion of this issue.
4. When the plan becomes overfunded, the GRS projections prevent the contribution rate from dropping below the plan's normal cost, which is the expected long-term cost of the plan. As a result, when plan experience is more favorable than assumed, the projections overstate the cost of the defined benefit plan, particularly when compared to a defined contribution plan. See page 15 for a full discussion of this issue.
5. For long-term projections the committee may wish to evaluate the impact of additional scenarios to those in the Long-Term Actuarial Projections provided by GRS. For example, the impact of changes in population and variable returns may better illustrate the risks faced by the System. In addition, projections isolating the plans for new hires may better illustrate the trade-offs between new plan alternatives. See page 15 for a full discussion of this issue.
6. The amortization method used by URS is within industry norms and GASB standards. However, the use of a "rolling" amortization method, where each year the principal (UAL) is

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re-amortized, combined with the policy of preventing the rate from declining (until the plan is 110% funded) defeats the purpose of having a rolling amortization. We recommend that URS consider alternatives such as layered amortization methods that are more consistent with the funding policy established. See page 11 for a full discussion of this issue.

7. The investment return assumption is based on the expected return for the portfolio. This means that there is a 50% chance of exceeding the assumption and a 50% chance of underperforming the assumption. The URS may want to consider adding a margin of conservatism to this assumption so that the probability of exceeding the cost projections is less than 50%. See page 12 for a full discussion of this issue.

We do not know the full extent of what was presented to the Legislature in order to make an informed decision about future plan designs, and we do not know the specific objectives the Legislature hoped to accomplish. However, findings 2 through 5 together express a concern that the projections did not adequately illustrate the underlying cost dynamics of the choices between continuing the current defined benefit plan, adopting a less generous defined benefit plan for new hires, or adopting a defined contribution plan for new hires. The Legislature may have received some or all of the additional information it needed outside of the projection report.

Additional Findings

1. The actuarial communications appear to meet the Actuarial Standards of Practice, and the signers are appropriately credentialed to render the opinions included.
2. The data used for the valuation by GRS has only small differences from the data sent by URS which is expected for actuarial valuations. See page 5 for more details.
3. We were able to match GRS sample life calculations and contribution rate development for the valuation. See page 7 for more details.
4. GRS uses an estimation of COLA bank which is not fully explained in the valuation, but does not significantly impact results. See page 7 for more details.
5. GRS has some small inconsistencies with service rounding which can, in certain situations, create benefit anomalies, but because they are very limited they do not have a significant impact on results. See page 7 for more details.
6. We generally agree with the economic and demographic assumptions based on the experience study, however we have commented on areas in which changes may need to be considered. See page 10 for more details.
7. The wage inflation assumption of 4.0% is a reasonable assumption, but we note that for the long-term actuarial projections, GRS' projected payroll growth only averages 3.5% over the next 25 years and about 3.0% over the next 10 years. See page 12 for more details.

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8. In the experience study, GRS recommended no changes to retirement rates due to the “spike” in retirements caused by the elimination of some pre-Medicare retiree medical programs and an early retirement incentive program. However, even with the “spike”, the pattern of retirements was less than the assumption. That being the case, with the factors causing the spike in retirements now gone one would expect future retirement experience to be even further below the assumption suggesting some change would be in order. See page 13 for more details.

9. There are three groups for whom we believe higher termination rates should be considered assuming the rates of termination from the last experience study persist to the next experience study. See page 14 for more details.

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ACTUARIAL VALUATION AUDIT PROCESS

Cheiron was retained by the Utah Legislature to conduct an audit replicating the long-term actuarial projections of the Utah Retirement System that were performed by GRS. In addition, as part of the audit Cheiron was retained to review the December 31, 2007 experience study and the January 1, 2009 actuarial valuation for the Utah Retirement System performed by GRS.

With an independent replication of the long-term projections, the Utah Legislature can be assured that there are no significant miscalculations. In addition, other aspects of the valuation process are reviewed and the independent opinions provided help to ensure that all issues have been addressed and all perspectives have been examined.

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 GRS in the valuation, we can highlight differences in the underlying processed data and the likely impact on cost.
- **Review of test cases from the actuarial valuation and replication of the calculation of contribution rates.** By reviewing the details of calculations for a number of individuals representing different situations, we can test whether or not GRS is valuing the benefits of the System properly. While this check is not as robust as a full replication, it will identify any systemic issues in the valuation.
- **Comparison of recent retirees.** As an additional check on the calculation of liabilities, we compare the benefits anticipated by GRS 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.
- **Review of experience study.** We reviewed the actuarial experience study for the 5-year period ending December 31, 2007 to ensure that the assumptions and methods used in the actuarial valuation are reasonable.
- **Projections report.** We replicated the long-term projections produced by GRS under a variety of scenarios using our interactive projection model, *P-scan*. This replication verifies the financial projections on which the Legislature based its decisions, and *P-scan* will also allow the Legislature to test a variety of other scenarios to ensure no surprises remain.

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

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DATA REVIEW

As part of the valuation process the actuary takes the *raw data* from the Utah Retirement System (URS) 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 GRS received from URS and the cleaned data file that GRS used for the valuation. We compared key statistics between the files. The table below summarizes the results.

	Public Employees - Non-Contributory				
	URS Raw Data	GRS Clean Data	Percent Variation	Valuation Report	Percent Variation
Active Members					
Count	73,570	73,584	0.0%	73,581	0.0%
Actives with DOT < Val	133				
Total Salaries (Thousands)	\$ 2,960,360	\$ 2,960,500	0.0%	\$ 2,960,453	0.0%
Averages					
Age	45.3	45.0	-0.7%	45.0	0.0%
Service	10.2	10.2	0.0%	10.2	0.0%
Salary	\$ 40,425	\$ 40,233	-0.5%	\$ 40,234	0.0%
Member Contributions (Thousands)	\$ 437,353	\$ 444,823	1.7%	\$ 444,823	0.0%
Members Receiving Benefits					
Count					
Regular Retirees	24,172	24,172	0.0%	24,172	0.0%
Disabled Retirees	623	622	-0.2%	622	0.0%
Beneficiaries	1,991	1,991	0.0%	1,991	0.0%
Total Annual Benefits (Thousands)	\$ 549,552	\$ 550,026	0.1%	\$ 550,026	0.0%
Average Monthly Benefits	\$ 1,710	\$ 1,711	0.1%	\$ 1,711	0.0%
Inactive Members					
Count					
Disabled	684	685	0.1%	685	0.0%
Vested	25,688	26,204	2.0%	26,434	0.9%

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DATA REVIEW

	Public Employees - Contributory				
	URS Raw Data	GRS Clean Data	Percent Variation	Valuation Report	Percent Variation
Active Members					
Count	1,322	1,322	0.0%	1,322	0.0%
Actives with DOT < Val	8				
Total Salaries (Thousands)	\$ 64,915	\$ 64,931	0.0%	\$ 64,931	0.0%
Averages					
Age	55.4	55.8	0.7%	55.4	-0.7%
Service	26.2	26.4	0.8%	26.4	0.0%
Salary	\$ 49,104	\$ 49,116	0.0%	\$ 49,116	0.0%
Member Contributions (Thousands)	\$ 153,950	\$ 153,995	0.0%	\$ 153,995	0.0%
Members Receiving Benefits					
Count					
Regular Retirees	3,088	3,088	0.0%	3,085	-0.1%
Disabled Retirees	152	152	0.0%	152	0.0%
Beneficiaries	802	802	0.0%	803	0.1%
Total Annual Benefits (Thousands)	\$ 43,414	\$ 43,455	0.1%	\$ 43,455	0.0%
Average Monthly Benefits	\$ 895	\$ 896	0.1%	\$ 896	0.0%
Inactive Members					
Count					
Disabled	48	48	0.0%	48	0.0%
Vested	798	788	-1.3%	796	1.0%
Non-Vested	16	N/A		18	

Findings

1. The number of participants in the URS and GRS files was consistent within each status as was nearly all the demographic information.
2. GRS active counts include a small number of participants who terminated just before the valuation (8 Contributory and 133 Non Contributory) which is not unusual for valuation data.
3. Within the URS data it was unclear how to determine which Non Contributory participants were terminated with a deferred vested benefit. The GRS report count is approximately 3% higher than the apparent number in the URS data

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REVIEW OF TEST CASES

After collecting the census data and actuarial assumptions, we collected sample lives from GRS to verify their programming. The sample life selection includes active employees, retirees, and terminated vested employees in the Contributory Plan and the Non-Contributory Plan. These sample lives were chosen to encompass a variety of age, service, and pay combinations in order to verify the processing of the different benefit components within the plan.

Findings:

1. **Terminated Vested Sample Lives:** We reviewed the projected benefit payment streams for retirement based on the benefit amount provided and the COLA assumption. We also reviewed the eligibility for and amount of any death benefits. We then used the valuation assumptions to calculate the present value of these benefits. No significant discrepancies were found.
2. **Retiree Sample Lives:** We reviewed the projected benefit payment streams for these lives based on the benefit amount provided, the pop-up annuity amount, and the COLA assumption. We then used the valuation assumptions to calculate the present value of these benefits.
 - a. We essentially match on all the items for retirees.
 - b. Retirees who still have a COLA bank are grouped based on date of retirement. A 4% is assumed while the COLA bank is estimated to be available and then immediately dropped down to 3%. This assumption is not disclosed in the valuation report.
3. **Active Sample Lives:** We reviewed the salary and service inputs for the valuation, the eligibility for various benefits, the adjusted decrements associated with these benefits, and the present value of these benefits at a variety of ages.
 - a. The data reports the salary earned in the year prior to the valuation. For the valuation, GRS increases this salary for approximately ½ year of salary scale to estimate the salary expected to be paid in the year of the valuation. When calculating benefits GRS uses final average pay which appropriately values benefits at the mid-year valuation date. See Illustration #1 below.
 - b. We are able to match the Final Average Pays used for calculating benefits.
 - c. Ages and years of service are rounded for one purpose (decrement) but not for others (early retirement reductions). This difference can create an anomaly when eligibility for a benefit requires, for example, a specified number of years of service. In one of the sample lives, the rounded result made a member eligible for an unreduced death benefit (25 years of service), but the unrounded service caused a reduction factor to be applied that reduced the benefit significantly more than it would have been reduced if the member had 24 years of service. See Illustration #2 below.
 - d. We were able match GRS on decrements, service, benefit eligibility, benefit values and liability.

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REVIEW OF TEST CASES

Illustrations:

1. Pay used in valuation

Active Sample Life Pay Check				
Salary Scale that applies to this participant	4.00%			
Age 2009 Valuation	58			
Service 2009 Valuation	32.51			
Calendar Year 2008 W2 Pay	\$ 56,289			Mid-year value since this is a total of monthly paychecks
	Calculated			
Verification of FAC calculation	by Cheiron	GRS Actual	Difference	
2009 Valuation Pay as calculated by GRS	\$ 57,404	\$ 57,393	-0.019%	rolled forward 1/2 year @ 4.00%
2010 Pay for Valuation	\$ 59,700	\$ 59,689	-0.019%	rolled forward 1 year @ 4.00%
2011 Pay for Valuation	\$ 62,088	\$ 62,076	-0.019%	rolled forward 1 year @ 4.00%
FAC used for benefit in 2011 Valuation	\$ 59,731	\$ 59,742	0.019%	3 Year average of Valuation Pays
Benefit Based on GRS FAC	\$ 41,226	\$ 41,232	0.015%	Correct for mid year valuation

2. Rounding Issue

Example of Death Benefit Calculation - Non-Contributory Plan			
Valuation Age	<u>42</u>	<u>43</u>	<u>44</u>
Mid-year Service, Actual	23.75	24.75	25.75
Service used for eligibility (rounded)	24.00	25.00	26.00
Service used in benefit amount (unrounded)	23.75	24.75	25.75
Service used for benefit reduction (unrounded)	23.75	24.75	25.75
Average Compensation	\$49,496	\$51,668	\$53,859
Plan 3 Option Adjustment	0.97	0.96	0.96
Years of Service Reduction (unrounded)	0.6667	1.0000	1.0000
Early Retirement Reduction (unrounded service)	100.0%	18.9%	100.0%
Death Benefit Valued	15,205	4,648	26,630

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SAMPLE BENEFIT CALCULATIONS

In order to verify that the actuarial valuation accurately reflects the way the Defined Benefit Program is administered, we collected sample benefit calculations from URS for members who commenced receiving benefits shortly after January 1, 2009. We compared the actual benefits these members are now receiving to the amount of benefit GRS expected them to receive if the member retired or became disabled shortly after the valuation date.

	Benefit Calculated at Termination	Benefit in Valuation	Difference	Ratio
Sample Life # 1: Non-Contributory Plan				
Monthly Final Average Pay	\$ 7,451.96	\$ 8,508.25	\$ 1,056.29	14.2%
Service	28.00	28.48	0.48	1.7%
Benefit (before optional form)	\$ 4,173.10	\$ 4,845.42	\$ 672.32	16.1%
Sample Life # 2: Non-Contributory Plan				
Monthly Final Average Pay	\$ 4,517.29	\$ 4,602.92	\$ 85.63	1.9%
Service	33.00	32.51	(0.49)	-1.5%
Benefit (before optional form)	\$ 2,981.42	\$ 2,992.67	\$ 11.25	0.4%

Findings:

1. For sample life #1 the value used for the valuation was significantly different (16.1% higher) than the final benefit calculated for the participant at retirement. The difference is due to adjustments to pay used for the final calculation. The valuation calculation looks correct given the pay reported, however, when the final benefit for the participant was calculated, only part of the final year pay was used.
2. For sample life #2 benefit calculation the benefit used for the valuation was within 0.5% of the final benefit calculated for the participant at retirement.
3. We verified that the liabilities within the valuation reasonably matched the benefits calculated upon termination with the exceptions of corrections to data made on the final benefit calculation.

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REVIEW OF EXPERIENCE STUDY

In order to assess the reasonability of current funding methods and assumptions, we reviewed the experience study report prepared by GRS for the five-year period ending December 31, 2007. The funding method and assumptions are used to estimate the liability of the pension plan and to budget contributions over time to fund those liabilities.

Findings:

1. We generally agree with the economic and demographic assumptions based on the experience study, however we have commented on areas in which changes may need to be considered.
2. The amortization method used by URS is within industry norms and GASB standards. However, the use of a “rolling” amortization method, where each year the principal (UAL) is re-amortized, combined with the policy of preventing the rate from declining (until the plan is 110% funded) defeats the purpose of having a rolling amortization. We recommend that URS consider alternatives such as layered amortization methods that are more consistent with the funding policy established.
3. The investment return assumption is based on the expected return for the portfolio. This means that there is a 50% chance of exceeding the assumption and a 50% chance of underperforming the assumption. URS may want to consider adding a margin of conservatism to this assumption so that the probability of exceeding the cost projections is less than 50%.
4. The wage inflation assumption of 4.0% is a reasonable assumption, but we note that for the long-term actuarial projections, GRS’ projected payroll growth only averages 3.5% over the next 25 years and about 3.0% over the next 10 years.
5. In the experience study, GRS recommended no changes to retirement rates due to the “spike” in retirements caused by the elimination of some pre-Medicare retiree medical programs and an early retirement incentive program. However, even with the “spike”, the pattern of retirements was less than the assumption. That being the case, with the factors causing the spike in retirements now gone, one would expect future retirement experience to be even further below the assumption suggesting some change would be in order.
6. There are three groups for whom we believe higher termination rates should be considered assuming the rates of termination from the last experience study persist to the next experience study.

A more detailed discussion of our analysis follows.

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REVIEW OF EXPERIENCE STUDY

Funding method

GRS uses the Entry Age Normal actuarial cost method which allocates the cost of individual benefits as a level percentage of pay over an employee's career. This method is the most common method used in the public sector and is an appropriate way to spread the cost of retirement benefits over an employee's career.

In order to prevent short-term market volatility from causing volatility in contribution rates to the plan, GRS uses a 5-year asset smoothing method. Any investment gains or losses are recognized over a five-year period with gains and losses offsetting each other to dampen the year to year volatility. In addition, to ensure that the smoothed asset value does not stray too far from the market value, GRS imposes a corridor requiring the smoothed value of assets to be within 25% of the market value of assets. Both the five-year asset smoothing and the corridor are common actuarial techniques that support stable and adequate funding of retirement plans. We note that in extreme market situations, the corridor forces a faster adjustment in contribution rates which may present budgetary problems. With a reasonably short smoothing period, some systems use a wider corridor or no corridor to provide time to adjust budgets to the higher contribution rates. In these situations, it is important to monitor a plan's funded status using the market value of assets (in addition to the smoothed value of assets).

URS has adopted a policy, supported by statute, of not permitting a decrease in the contribution rate until the plan is 110% funded. This policy can result in contribution rates being held at a very high level until they drop substantially once the 110% threshold is reached. Most actuarial methods target a funded ratio of 100%, so we applaud the URS for essentially adopting a more conservative target of 110%. However, we would encourage them to explore some modification of this policy to smooth the drop in contribution rates as funding approaches 110%. There are a number of other ways to build conservatism into a funding policy without creating the dynamics of very high contribution rates followed by a precipitous drop in contribution rates.

Gains and losses, including recognized investment gains and losses, benefit changes, assumption changes and other gains and losses, are amortized over a rolling 20-year period (temporarily extended to 25 years) as a level percentage of payroll. Payroll is assumed to increase 4% per year so each year's amortization payment is expected to increase 4% per year resulting in a lower initial payment than in common consumer loans such as mortgages. A rolling period means that instead of the actual payments increasing 4% each year, the unfunded liability is re-amortized each year over a new 20-year period.

The amortization method used by URS is well within industry norms and GASB standards, and is designed to produce stable contribution rates that converge on the normal cost rate. The use of a rolling period means that the unfunded liability will only be completely paid off if future gains offset the current losses. We believe this type of amortization is most appropriate when there is an expectation that gains and losses will balance out over time. This strategy, however, is essentially defeated by the funding policy, described above, of not reducing contribution rates until the plan is 110% funded. We recommend that URS consider alternative amortization

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strategies that are more consistent with the objectives of targeting a 110% funded ratio as well as stability in contribution rates. For example, the plan could set up an amortization based on the difference between assets and 110% of liabilities instead of 100% of liabilities. The amortization period could also be shorter for unfunded liabilities than for surpluses and might ensure that at least interest is paid on any unfunded liability. A full analysis of the advantages and disadvantages of these and other approaches is beyond the scope of this audit, but the intent of these alternatives would be to maintain the conservatism of targeting a higher funded ratio while allowing contribution rates to decline in a stable manner as the target is approached.

Economic Assumptions

The economic assumptions include inflation, wage inflation, merit salary increases, expenses and investment return. In general, the assumptions are reasonable and have been developed in an appropriate manner.

We note, however, that the investment return assumption is based on the median expected return for the portfolio. This means that there is a 50% chance of exceeding the assumption and a 50% chance of underperforming the assumption. We believe URS should consider adding a margin of conservatism to this assumption so that the probability of exceeding the assumption is greater than 50%. For example, if 7.75% is the median expected return, URS could select 7.25% as its assumption. Instead of only a 50% chance of achieving this target, there may now be a 60% chance of achieving the target. In the short-term, contribution rates would be higher than with the 7.75% assumption, but there would be a greater likelihood that contribution rates would go down in the future than that they would go up.

The wage inflation assumption of 4.0% is a reasonable assumption, but we note that for the long-term actuarial projections, GRS' projected payroll growth only averages 3.5% over the next 25 years and about 3.0% over the next 10 years. Since the wage inflation assumption is used both in the projection of salaries for individual members (when combined with the merit scale) and in the amortization of the unfunded liability as a level percent of payroll, URS may want to consider reducing the wage inflation assumption to more closely match expectations of payroll growth over the amortization period while simultaneously adjusting the merit salary scale to maintain the expectations for individual salary increases. If the assumption remains at 4.0%, but payroll growth is less than 4.0%, there will be an upward pressure on contribution rates.

Demographic Assumptions

The demographic assumptions include rates of mortality, disability, termination, and retirement as well as other assumptions such as the probability of refund and marital status. In general, we found the assumptions to be reasonable with a somewhat conservative bias. There were a few assumptions (described below) that we believe should be examined closely in the next experience study to ensure that the conservative bias is not too conservative.

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Retirement Rates

In the experience study, GRS recommended no changes to retirement rates due to the “spike” in retirements caused by the elimination of some pre-Medicare retiree medical programs and an early retirement incentive program. While these changes may distort some of the data by showing higher retirement rates than would be expected in the future, when the current assumption is even higher than the rates experienced, we believe some change would have been in order.

In the experience study, one of the important measures of an assumption is the actual to expected ratio (A/E ratio). For the retirement assumption, this measures the number of actual retirements during the experience study period to the number of expected retirements. An A/E ratio of 100% indicates that the assumption is perfectly accurate while a ratio of less than 100% indicates that the assumption expects more retirements than actually occur. GRS indicated to us that they believe an actual to expected ratio of 90% provides an appropriate margin of conservatism for the subsidized early retirement benefits in URS. Given the “spikes” in retirement experience, however, we expected to see A/E ratios greater than 90% (and probably greater than 100%). The table below shows the A/E ratios for selected groups.

Actual to Expected Ratios for Retirement Experience			
Group	Gender	Age Range	A/E Ratio
State	Male	60 – 64	97.3%
	Male	50 – 59	108.4%
	Female	60 – 64	96.9%
	Female	50 – 59	108.6%
Educators	Male	60 – 64	88.5%
	Male	50 – 59	116.3%
	Female	60 – 64	102.5%
	Female	50 – 59	108.9%
Local	Male	60 – 64	79.9%
	Male	50 – 59	84.8%
	Female	60 – 64	80.3%
	Female	50 – 59	68.7%

Some of the groups show the expected behavior (e.g., State employees and educators). However, the rates of retirement for local employers are significantly below the rates expected even with the special circumstances that were expected to cause more retirements than would be expected in the future. Consequently, we would have expected a reduction in retirement rates to more closely align with the experience. In the next experience study, retirement rates should be studied in detail and adjusted as appropriate.

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 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REVIEW OF EXPERIENCE STUDY

Termination Rates

The rate at which members terminate employment has a significant impact on the cost of the retirement system. Unlike retirement rates, a conservative termination assumption predicts fewer terminations than actually occur resulting in an A/E ratio greater than 100%. The following table summarizes the A/E ratios for selected groups.

Actual to Expected Ratios for Termination Experience			
Group	Gender	<u>A/E Ratios</u>	
		<5 Years Service	5+ Years Service
State	Male	104.4%	106.9%
	Female	109.9%	107.6%
Educators	Male	100.7%	142.3%
	Female	120.0%	104.6%
Local	Male	106.9%	102.1%
	Female	103.0%	110.2%
Public Safety	Old Rates	113.4%	140.3%
	New Rates	101.0%	124.6%

All of the groups shown have an A/E ratio at or above 100%, but there are three groups for whom the A/E ratio is at or above 120%. For these groups, we believe an increase in termination rates should be considered. For Public Safety members with 5 or more years of service, GRS did increase the termination rates reducing the A/E ratio from 140.3% to 124.6% and indicated that they didn't reduce it further because there had been a significant increase in terminations since the prior experience study. This is an appropriate level of caution in reducing the conservatism of the assumption, but if these rates of termination continue in the next experience study, URS should consider further increases to these rates of termination.

UTAH STATE LEGISLATURE
AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

In order to evaluate that the actuarial projections in the Long-Term Actuarial Projections Relating to the State Retirement System performed by Gabriel Roeder Smith we independently modeled the State Retirement System. Using our proprietary P-scan we projected liabilities, assets, and employer costs. We are able to modify the plan being valued and economic expectations to model the scenarios shown in the GRS report.

Findings:

1. The projected funding ratio and costs shown by GRS are reasonable for all the scenarios shown in their report. Our independent projections provide very similar results. We would not expect an exact match in each calculation because we are using different methods than GRS. See the exhibits below for the details of each replication.
2. The current funding policy of URS to prevent the contribution rate from declining until the System is 110% funded has a significant impact on the projections, keeping contribution rates very high until the 110% threshold is met. Once the threshold is met, the contribution rate drops dramatically (e.g., see Exhibit # 5). Most actuarial methods target a 100% funded status, so we applaud URS for being more conservative and targeting 110%. However, actuarial methods typically also allow the contribution rate to decline gradually in most scenarios as the funded ratio approaches the target so that there is a more stable pattern of contributions. Under its funding policy, the URS can make these decisions annually, and we suspect that they would gradually reduce the contribution rate as the funding target is approached. Our concern with the projections is that they leave the impression that high contribution rates would need to be sustained longer than we believe they actually would.
3. Furthermore, the GRS projections only allow the contribution rate to drop to the plan's normal cost which is the expected long-term cost of the benefits. In so doing, the projections show the increased cost of asset losses, but not the reductions in cost of asset gains. The policy, however, appears to be modified in the scenarios with a defined contribution plan so that contribution rates can decrease over time. As a result, when plan experience is more favorable than assumed, the projections overstate the cost of the defined benefit plan, particularly when compared to a defined contribution plan.
4. GRS used some additional assumptions for the projections. We have noted that the payroll growth assumption is based on an assumed new entrant profile that results in growth less than the valuation assumption of 4%. There is nothing necessarily wrong with this assumption, but it does create some minor dynamics that wouldn't be expected from the valuation and may indicate that the valuation assumption should be changed. This essentially builds in a small increase in the UAL contribution rate due to an annual loss on contributions. We used GRS payroll projections for the projections below.
5. Additional scenarios may provide insight into additional risks faced by URS. Variable asset return scenarios, that average the expected rate of return during the period, demonstrate the sensitivity of the System to annual volatility. The size of the work force in the State may

UTAH STATE LEGISLATURE
AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

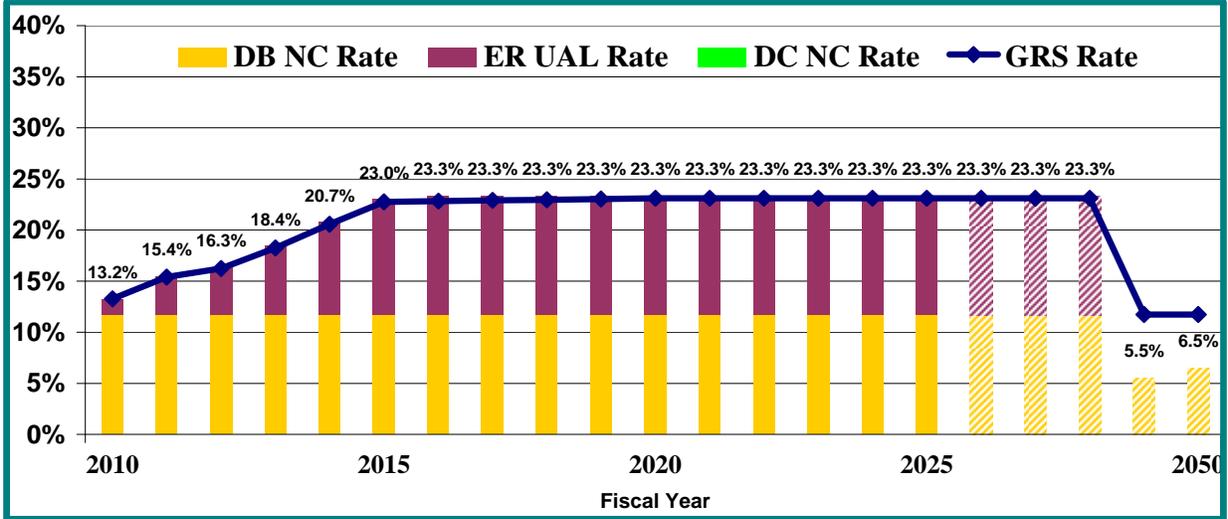
change, either grows or decline and scenarios showing these changes can demonstrate the potential impact on cost within the System.

The following exhibits replicate the exhibits in GRS' Long-Term Actuarial Projections. The bars represent our independent projections of the defined benefit normal cost rate (DB NC Rate), the employer unfunded actuarial liability rate (ER UAL Rate), and employer contributions to a new defined contribution plan (DC NC Rate). The combination of these rates equals the total employer contribution rate shown numerically on top of the stacked bar. The blue line represents GRS' projected employer contribution rate. The hashed bars at the end of the projection indicate where the graph switches from showing rates for every year to every 5 years.

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 1
 Baseline, 7.75% Investment Return Every Year



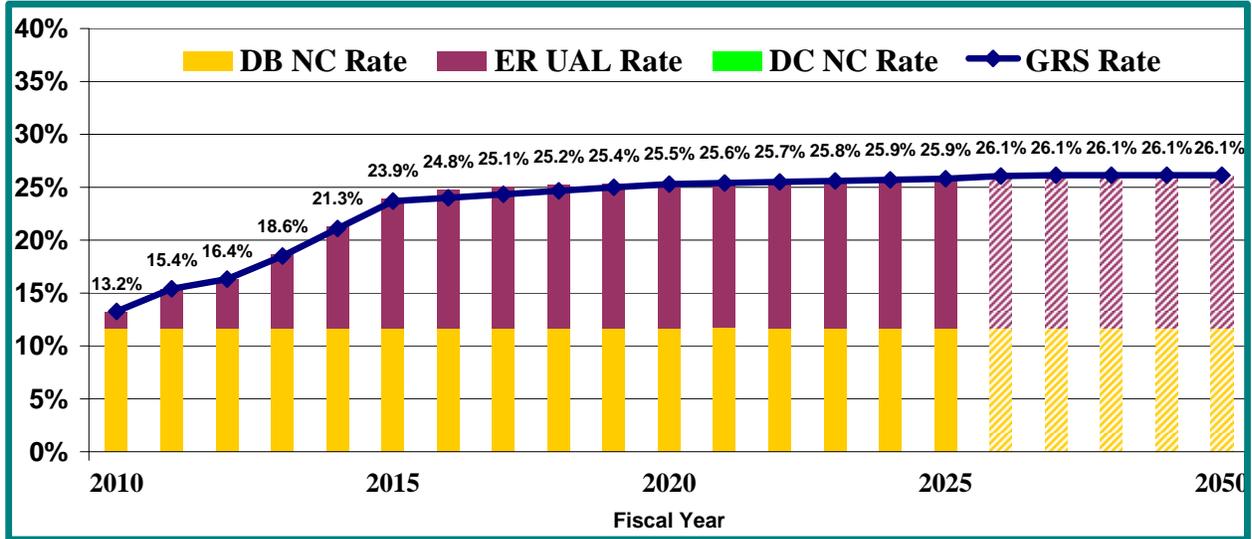
Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	16.23%	16.28%	-0.05%
2013	18.24%	18.39%	-0.15%
2014	20.55%	20.75%	-0.20%
2015	22.75%	22.98%	-0.23%
2020	23.10%	23.33%	-0.23%
2025	23.10%	23.33%	-0.23%
2030	23.10%	23.33%	-0.23%
2035	23.10%	23.33%	-0.23%
2040	23.10%	23.33%	-0.23%
2045	11.72%	5.55%	6.17%
2050	11.72%	6.54%	5.18%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.6%	80.5%	0.1%
2012	75.1%	74.9%	0.2%
2013	70.5%	70.4%	0.1%
2018	75.3%	75.4%	-0.1%
2023	80.6%	80.9%	-0.3%
2028	86.6%	87.1%	-0.5%
2033	93.9%	94.9%	-1.0%
2038	103.3%	104.5%	-1.2%
2043	115.0%	114.1%	0.9%
2048	119.5%	110.8%	8.7%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

**Replication of GRS Exhibit # 2
 6.0% Investment Return Every Year**



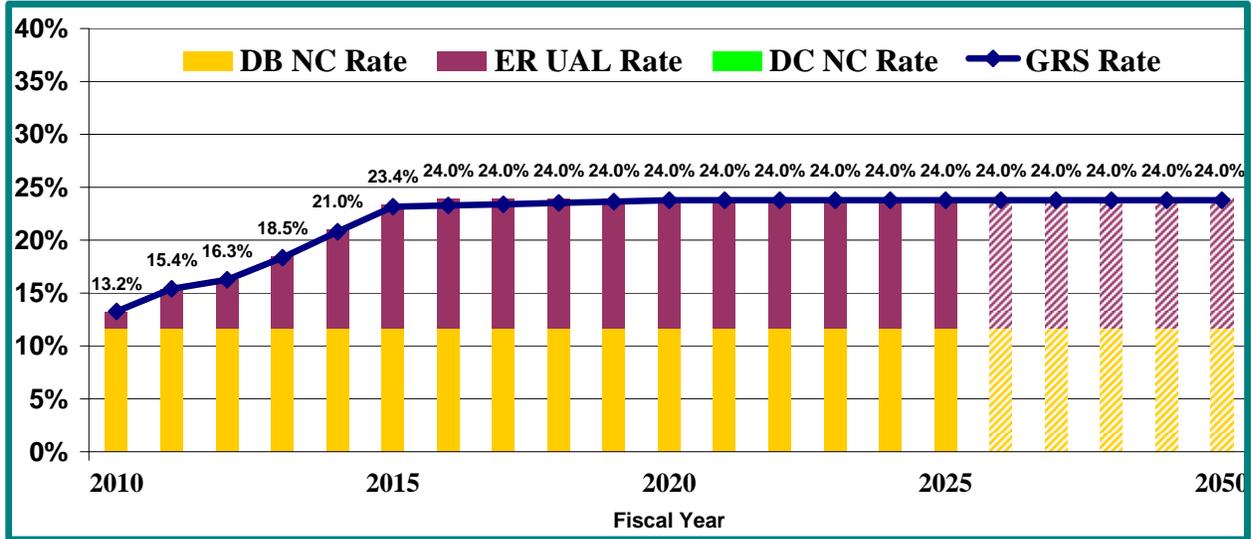
Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	16.30%	16.36%	-0.06%
2013	18.49%	18.65%	-0.16%
2014	21.09%	21.30%	-0.21%
2015	23.68%	23.93%	-0.25%
2020	25.30%	25.49%	-0.19%
2025	25.81%	25.93%	-0.12%
2030	26.06%	26.11%	-0.05%
2035	26.12%	26.13%	-0.01%
2040	26.12%	26.13%	-0.01%
2045	26.12%	26.13%	-0.01%
2050	26.12%	26.13%	-0.01%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.6%	85.6%	0.0%
2011	79.9%	79.7%	0.2%
2012	73.6%	73.4%	0.2%
2013	68.0%	67.9%	0.1%
2018	67.3%	67.4%	-0.1%
2023	66.8%	67.0%	-0.2%
2028	65.8%	66.1%	-0.3%
2033	64.8%	65.6%	-0.8%
2038	64.1%	65.9%	-1.8%
2043	63.8%	67.3%	-3.5%
2048	64.0%	70.0%	-6.0%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

**Replication of GRS Exhibit # 3
 7.0% Investment Return Every Year**



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	16.26%	16.31%	-0.05%
2013	18.34%	18.50%	-0.16%
2014	20.79%	20.98%	-0.19%
2015	23.15%	23.39%	-0.24%
2020	23.76%	23.98%	-0.22%
2025	23.76%	23.98%	-0.22%
2030	23.76%	23.98%	-0.22%
2035	23.76%	23.98%	-0.22%
2040	23.76%	23.98%	-0.22%
2045	23.76%	23.98%	-0.22%
2050	23.76%	23.98%	-0.22%

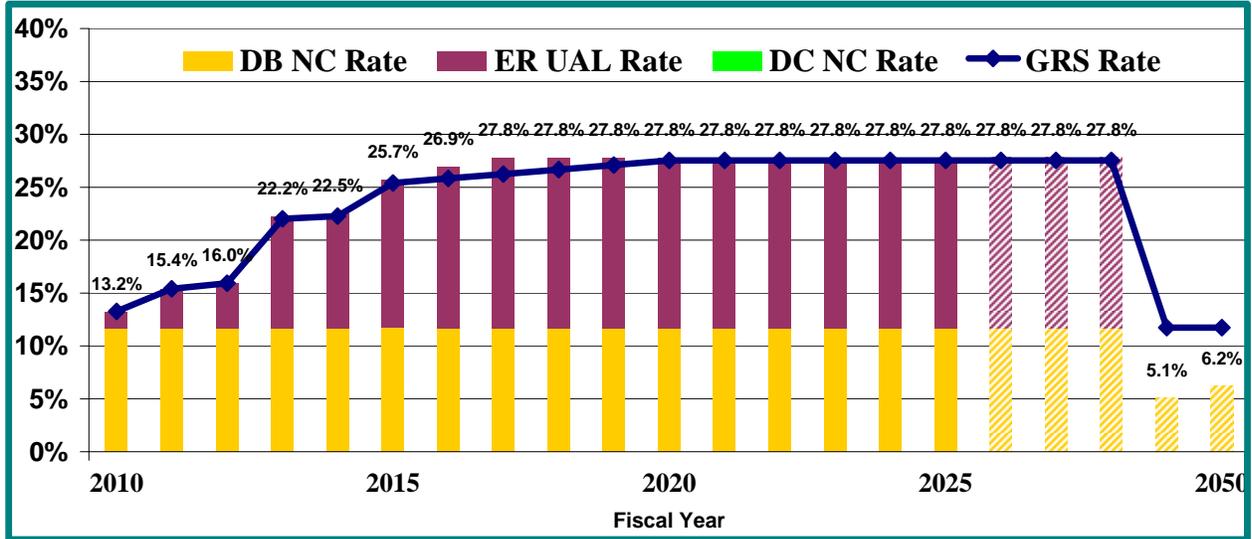
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.7%	85.8%	-0.1%
2011	80.3%	80.1%	0.2%
2012	74.4%	74.3%	0.1%
2013	69.4%	69.3%	0.1%
2018	71.8%	71.8%	0.0%
2023	74.0%	74.2%	-0.2%
2028	76.0%	76.5%	-0.5%
2033	78.4%	79.4%	-1.0%
2038	81.5%	83.4%	-1.9%
2043	85.6%	88.3%	-2.7%
2048	90.8%	93.7%	-2.9%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 4

15% Return for 2009, -20% for 2010, 15% for 2011, 7.75% Thereafter



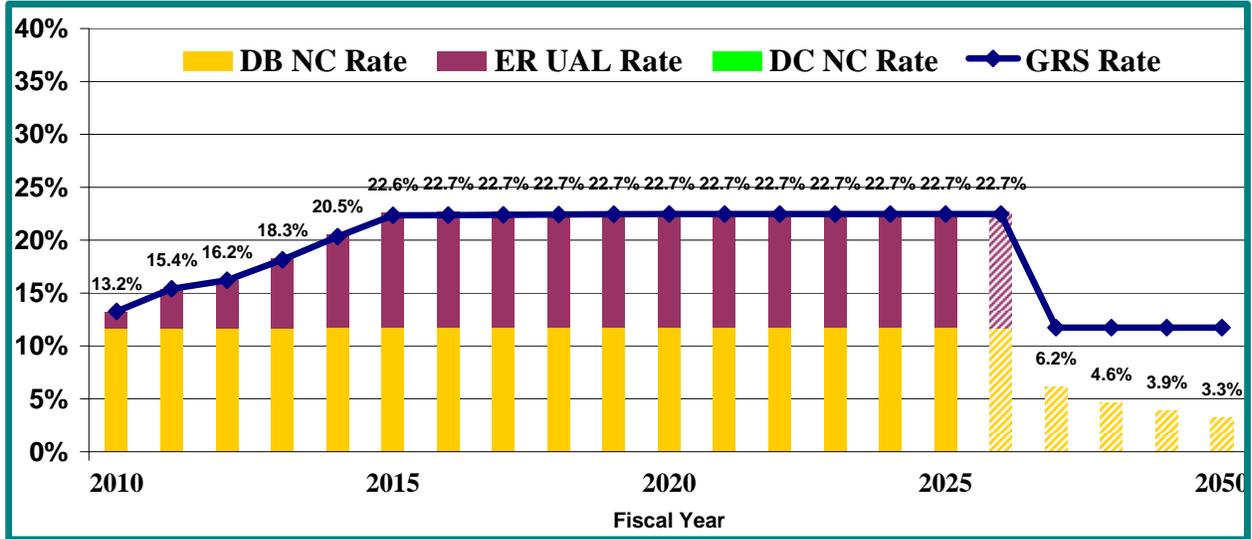
Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	15.93%	15.97%	-0.04%
2013	22.02%	22.25%	-0.23%
2014	22.27%	22.50%	-0.23%
2015	25.39%	25.67%	-0.28%
2020	27.53%	27.82%	-0.29%
2025	27.53%	27.82%	-0.29%
2030	27.53%	27.82%	-0.29%
2035	27.53%	27.82%	-0.29%
2040	27.53%	27.82%	-0.29%
2045	11.72%	5.06%	6.66%
2050	11.72%	6.22%	5.50%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	86.8%	86.8%	0.0%
2011	69.4%	69.2%	0.2%
2012	70.2%	70.1%	0.1%
2013	63.4%	63.3%	0.1%
2018	65.5%	65.5%	0.0%
2023	72.8%	73.1%	-0.3%
2028	80.9%	81.6%	-0.7%
2033	91.1%	92.3%	-1.2%
2038	103.9%	105.5%	-1.6%
2043	118.7%	115.2%	3.5%
2048	122.8%	111.5%	11.3%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

**Replication of GRS Exhibit # 5
 8.5% Investment Return Every Year**



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	16.20%	16.25%	-0.05%
2013	18.13%	18.28%	-0.15%
2014	20.32%	20.51%	-0.19%
2015	22.34%	22.56%	-0.22%
2020	22.47%	22.68%	-0.21%
2025	22.47%	22.68%	-0.21%
2030	22.47%	22.68%	-0.21%
2035	11.72%	6.16%	5.56%
2040	11.72%	4.62%	7.10%
2045	11.72%	3.92%	7.80%
2050	11.72%	3.26%	8.46%

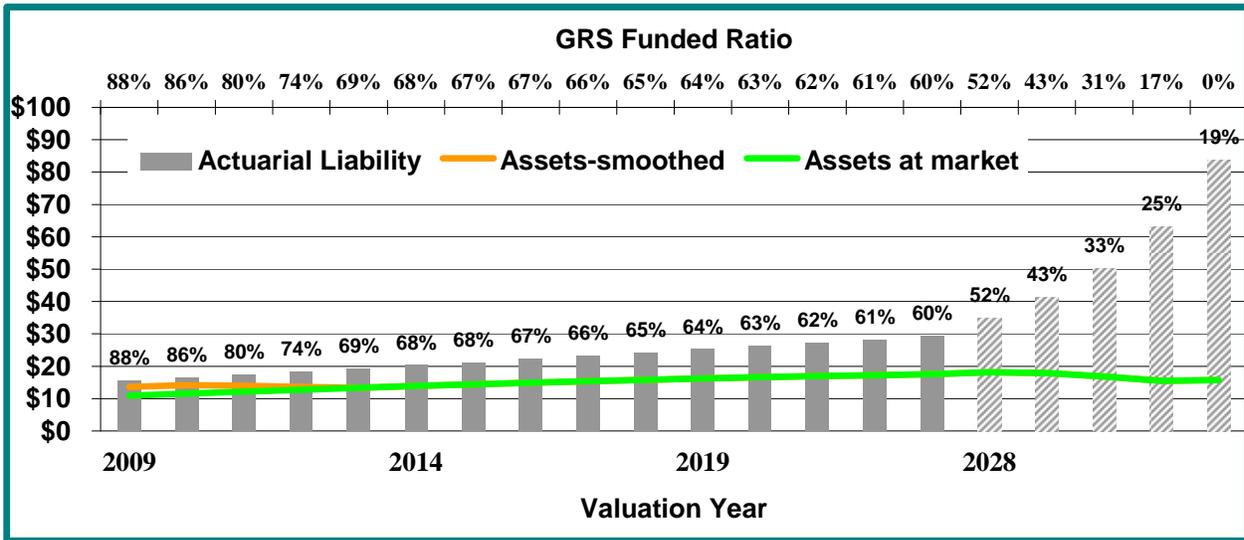
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.9%	86.0%	-0.1%
2011	80.9%	80.8%	0.1%
2012	75.7%	75.6%	0.1%
2013	71.6%	71.5%	0.1%
2018	79.1%	79.1%	0.0%
2023	87.9%	88.1%	-0.2%
2028	98.6%	99.1%	-0.5%
2033	112.4%	113.2%	-0.8%
2038	123.2%	116.8%	6.4%
2043	133.7%	117.8%	15.9%
2048	146.7%	117.7%	29.0%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

For the following exhibits where the contribution rate is frozen for an extended period of time, we show a graph of the funded status instead of the contribution rate. The gray bars represent the actuarial liability; the orange line represents the smoothed value of assets; the green line represents the market value of assets; and the percentages on the gray bars represent the funded status. For comparison, GRS' projection of funded status is shown at the top of the chart.

Replication of GRS Exhibit # 6
 Freeze Contribution, 7.75% Investment Return Every Year



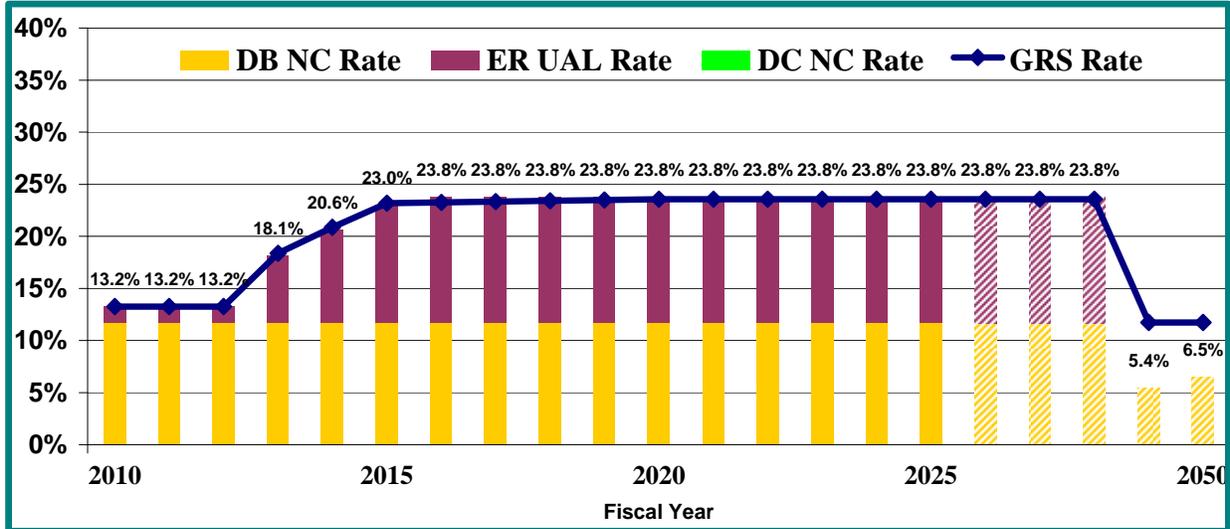
Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	13.25%	13.24%	0.01%
2014	13.25%	13.24%	0.01%
2015	13.25%	13.24%	0.01%
2020	13.25%	13.24%	0.01%
2025	13.25%	13.24%	0.01%
2030	13.25%	13.24%	0.01%
2035	13.25%	13.24%	0.01%
2040	13.25%	13.24%	0.01%
2045	13.25%	13.24%	0.01%
2050	13.25%	13.24%	0.01%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.2%	80.2%	0.0%
2012	74.2%	74.2%	0.0%
2013	68.8%	68.9%	-0.1%
2018	65.4%	65.4%	0.0%
2023	59.9%	59.9%	0.0%
2028	52.3%	52.3%	0.0%
2033	42.6%	43.2%	-0.6%
2038	30.8%	33.5%	-2.7%
2043	16.7%	24.5%	-7.8%
2048	0.0%	18.8%	-18.8%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 6a
 Freeze Contribution Through FY 2012, 7.75% Investment Return Every Year



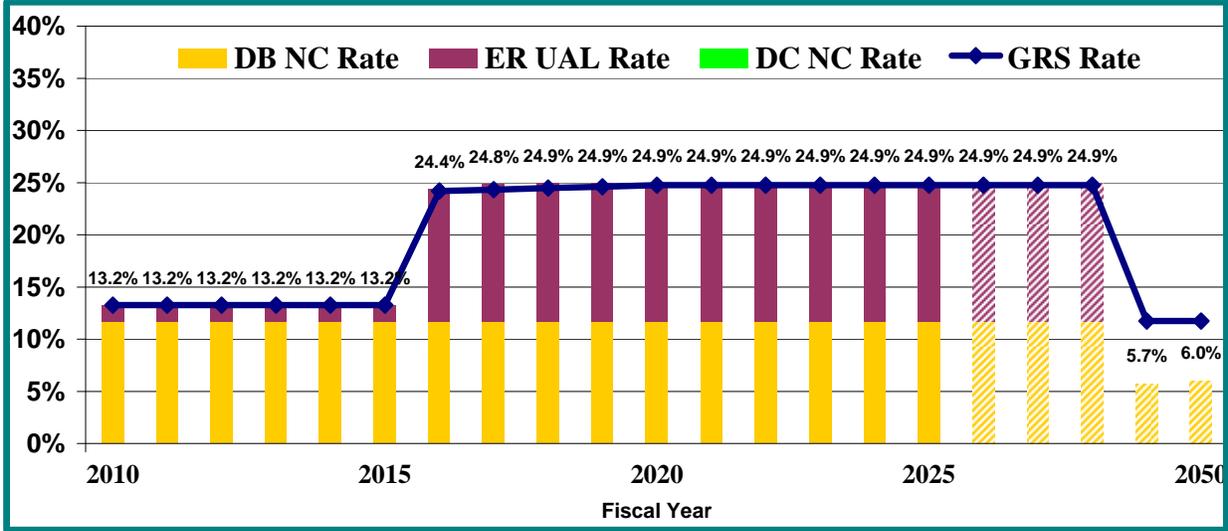
Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	18.37%	18.12%	0.25%
2014	20.87%	20.64%	0.23%
2015	23.19%	22.97%	0.22%
2020	23.57%	23.76%	-0.19%
2025	23.57%	23.76%	-0.19%
2030	23.57%	23.76%	-0.19%
2035	23.57%	23.76%	-0.19%
2040	23.57%	23.76%	-0.19%
2045	11.72%	5.45%	6.27%
2050	11.72%	6.46%	5.26%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.2%	80.2%	0.0%
2012	74.2%	74.2%	0.0%
2013	69.3%	69.4%	-0.1%
2018	74.3%	74.3%	0.0%
2023	79.9%	80.0%	-0.1%
2028	86.0%	86.4%	-0.4%
2033	93.7%	94.5%	-0.8%
2038	103.5%	104.4%	-0.9%
2043	114.6%	114.3%	0.3%
2048	117.8%	111.0%	6.8%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 6b
 Freeze Contribution Through FY 2015, 7.75% Investment Return Every Year



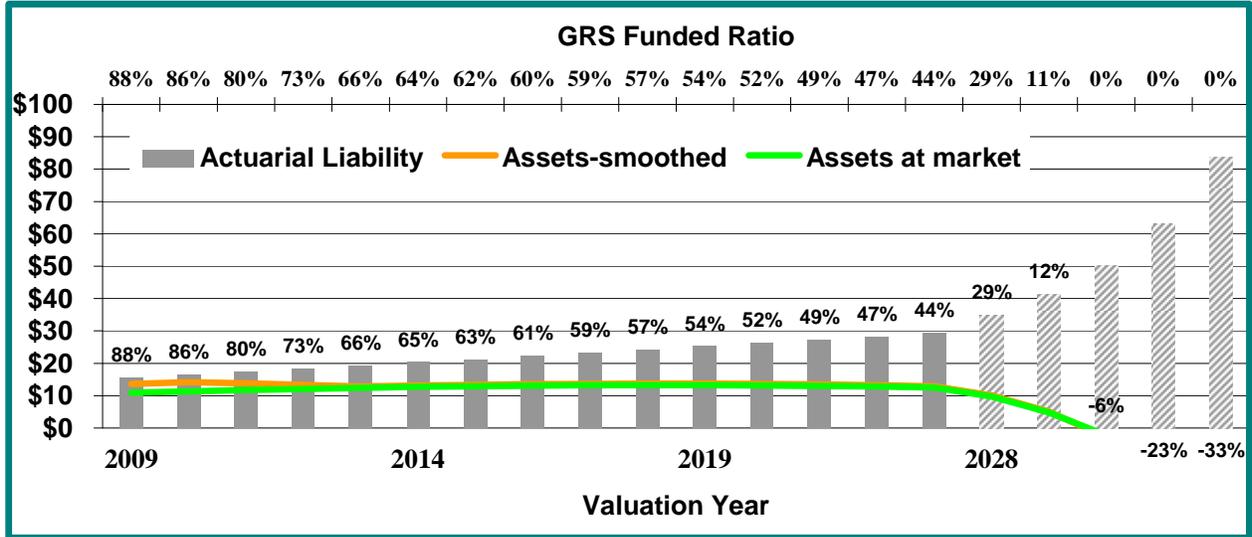
Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	13.25%	13.24%	0.01%
2014	13.25%	13.24%	0.01%
2015	13.25%	13.24%	0.01%
2020	24.75%	24.92%	-0.17%
2025	24.75%	24.92%	-0.17%
2030	24.75%	24.92%	-0.17%
2035	24.75%	24.92%	-0.17%
2040	24.75%	24.92%	-0.17%
2045	11.72%	5.73%	5.99%
2050	11.72%	6.04%	5.68%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.2%	80.2%	0.0%
2012	74.2%	74.2%	0.0%
2013	68.8%	68.9%	-0.1%
2018	70.3%	70.4%	-0.1%
2023	76.1%	76.4%	-0.3%
2028	82.5%	83.0%	-0.5%
2033	90.4%	91.4%	-1.0%
2038	100.5%	101.8%	-1.3%
2043	113.2%	113.7%	-0.5%
2048	117.5%	111.9%	5.6%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 7
 Freeze Contribution, 6.0% Investment Return Every Year



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	13.25%	13.24%	0.01%
2014	13.25%	13.24%	0.01%
2015	13.25%	13.24%	0.01%
2020	13.25%	13.24%	0.01%
2025	13.25%	13.24%	0.01%
2030	13.25%	13.24%	0.01%
2035	13.25%	13.24%	0.01%
2040	13.25%	13.24%	0.01%
2045	13.25%	13.24%	0.01%
2050	13.25%	13.24%	0.01%

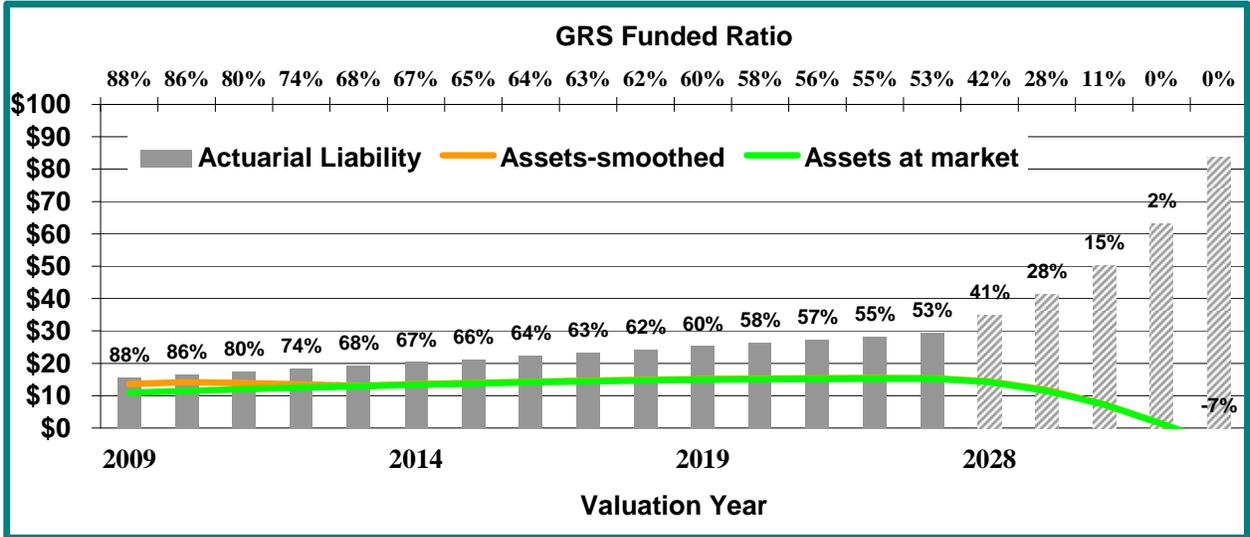
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.6%	85.6%	0.0%
2011	79.5%	79.5%	0.0%
2012	72.7%	72.7%	0.0%
2013	66.3%	66.4%	-0.1%
2018	56.6%	56.6%	0.0%
2023	44.2%	44.1%	0.1%
2028	29.1%	29.1%	0.0%
2033	11.4%	12.2%	-0.8%
2038	0.0%	-5.7%	5.7%
2043	0.0%	-23.0%	23.0%
2048	0.0%	-32.7%	32.7%

Note that we show a negative funded status to illustrate the size of the shortfall when the plan runs out of money. In reality, additional contributions would be required to pay the benefits.

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 8
 Freeze Contribution, 7.0% Investment Return Every Year



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	13.25%	13.24%	0.01%
2014	13.25%	13.24%	0.01%
2015	13.25%	13.24%	0.01%
2020	13.25%	13.24%	0.01%
2025	13.25%	13.24%	0.01%
2030	13.25%	13.24%	0.01%
2035	13.25%	13.24%	0.01%
2040	13.25%	13.24%	0.01%
2045	13.25%	13.24%	0.01%
2050	13.25%	13.24%	0.01%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.7%	85.8%	-0.1%
2011	79.9%	79.9%	0.0%
2012	73.5%	73.6%	-0.1%
2013	67.8%	67.8%	0.0%
2018	61.5%	61.6%	-0.1%
2023	52.8%	52.7%	0.1%
2028	41.5%	41.5%	0.0%
2033	27.6%	28.3%	-0.7%
2038	11.3%	14.6%	-3.3%
2043	0.0%	2.2%	-2.2%
2048	0.0%	-7.0%	7.0%

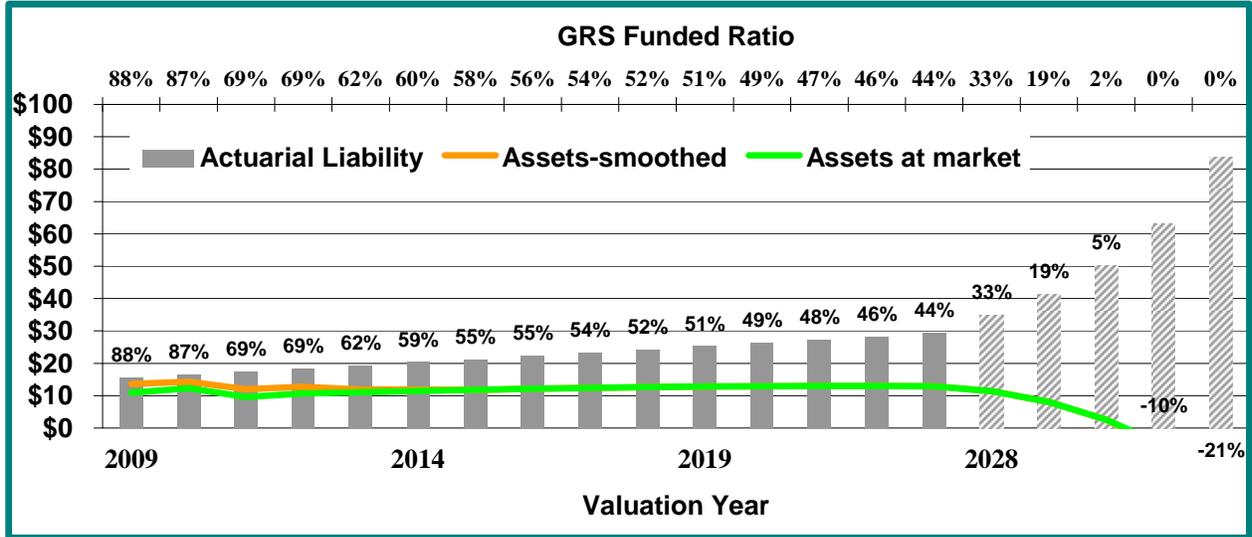
Note that we show a negative funded status to illustrate the size of the shortfall when the plan runs out of money. In reality, additional contributions would be required to pay the benefits.

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 9

Freeze Contribution, 15% Return for 2009, -20% for 2010, 15% for 2011, 7.75% Thereafter



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	13.25%	13.24%	0.01%
2014	13.25%	13.24%	0.01%
2015	13.25%	13.24%	0.01%
2020	13.25%	13.24%	0.01%
2025	13.25%	13.24%	0.01%
2030	13.25%	13.24%	0.01%
2035	13.25%	13.24%	0.01%
2040	13.25%	13.24%	0.01%
2045	13.25%	13.24%	0.01%
2050	13.25%	13.24%	0.01%

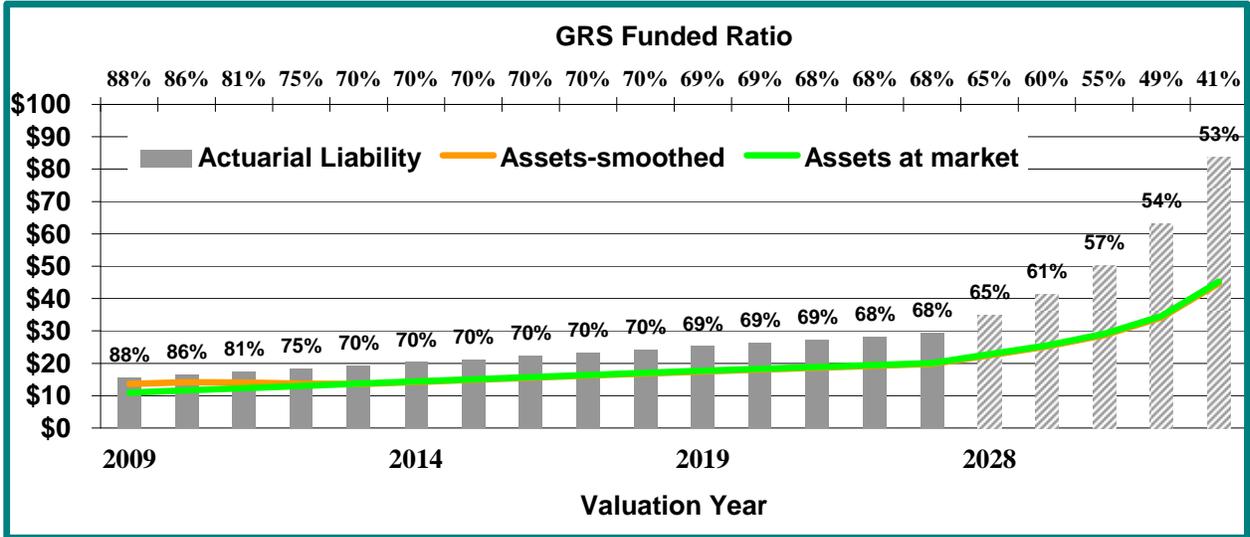
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	86.8%	86.8%	0.0%
2011	68.9%	69.0%	-0.1%
2012	69.4%	69.5%	-0.1%
2013	61.5%	61.6%	-0.1%
2018	52.2%	52.2%	0.0%
2023	44.1%	44.0%	0.1%
2028	32.9%	32.9%	0.0%
2033	18.7%	19.5%	-0.8%
2038	1.5%	5.1%	-3.6%
2043	0.0%	-10.4%	10.4%
2048	0.0%	-21.3%	21.3%

Note that we show a negative funded status to illustrate the size of the shortfall when the plan runs out of money. In reality, additional contributions would be required to pay the benefits.

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REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 10
 Freeze Contribution, 8.5% Investment Return Every Year



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	13.25%	13.24%	0.01%
2012	13.25%	13.24%	0.01%
2013	13.25%	13.24%	0.01%
2014	13.25%	13.24%	0.01%
2015	13.25%	13.24%	0.01%
2020	13.25%	13.24%	0.01%
2025	13.25%	13.24%	0.01%
2030	13.25%	13.24%	0.01%
2035	13.25%	13.24%	0.01%
2040	13.25%	13.24%	0.01%
2045	13.25%	13.24%	0.01%
2050	13.25%	13.24%	0.01%

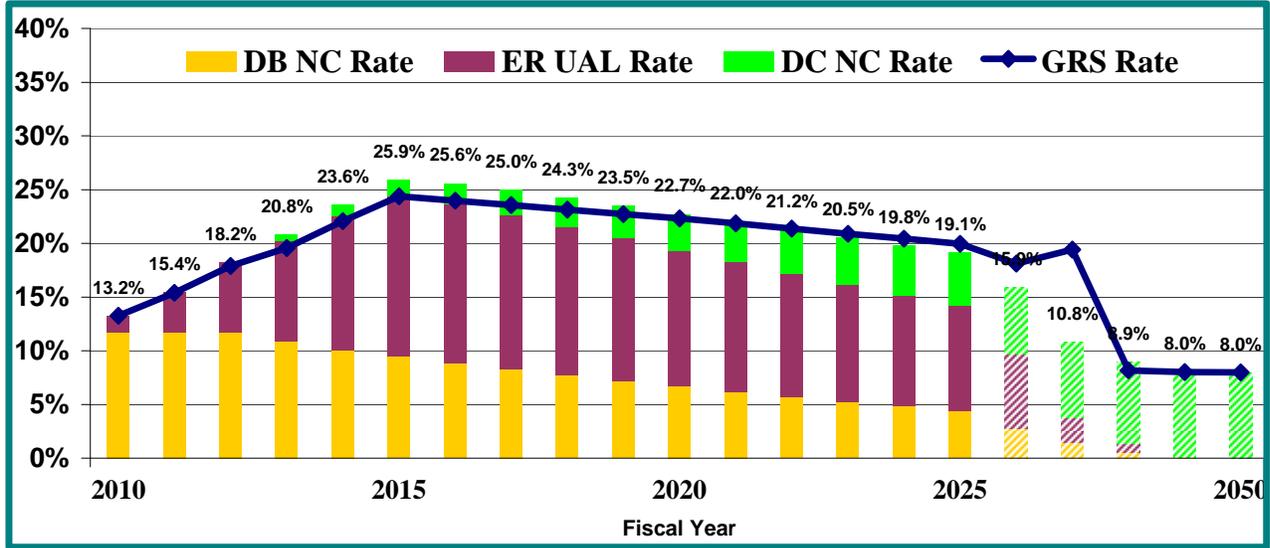
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.9%	86.0%	-0.1%
2011	80.5%	80.6%	-0.1%
2012	74.8%	74.9%	-0.1%
2013	69.9%	70.0%	-0.1%
2018	69.5%	69.5%	0.0%
2023	67.6%	67.6%	0.0%
2028	64.5%	64.6%	-0.1%
2033	60.4%	60.9%	-0.5%
2038	55.3%	57.2%	-1.9%
2043	49.0%	54.2%	-5.2%
2048	41.4%	53.3%	-11.9%

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REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 12

Freeze Participation, Level Dollar Amortization, 7.75% Investment Return Every Year



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	17.88%	18.21%	-0.33%
2013	19.56%	20.83%	-1.27%
2014	22.07%	23.59%	-1.52%
2015	24.37%	25.94%	-1.57%
2020	22.32%	22.73%	-0.41%
2025	19.95%	19.13%	0.82%
2030	18.11%	15.87%	2.24%
2035	19.42%	10.80%	8.62%
2040	8.16%	8.94%	-0.78%
2045	8.02%	8.03%	-0.01%
2050	8.00%	8.00%	0.00%

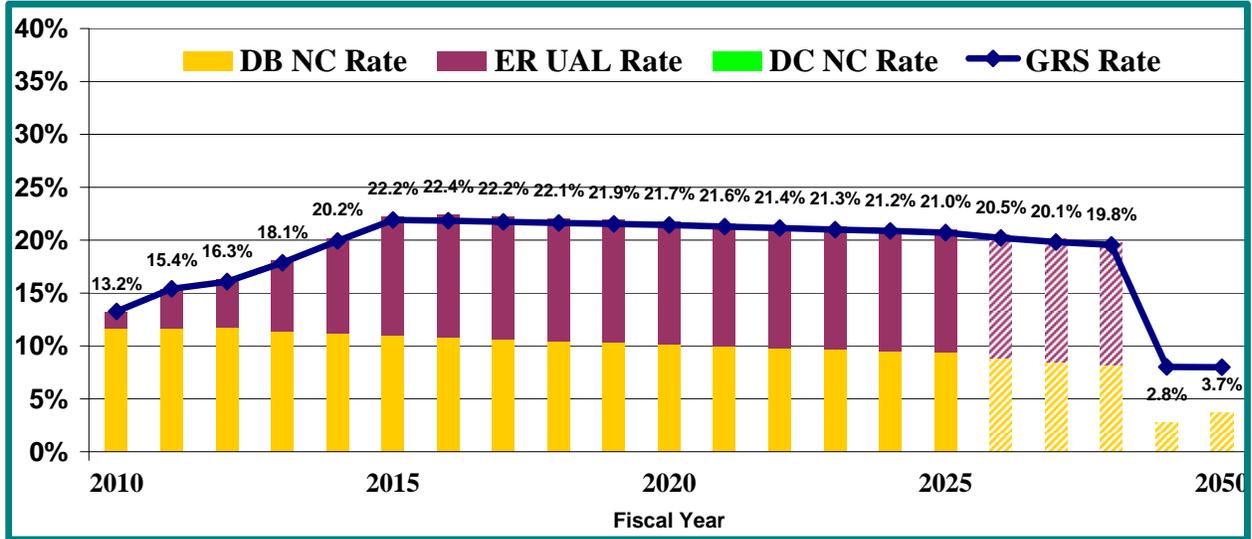
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.9%	80.5%	0.4%
2012	75.8%	75.1%	0.7%
2013	71.5%	71.0%	0.5%
2018	77.9%	78.7%	-0.8%
2023	83.7%	85.3%	-1.6%
2028	89.5%	90.6%	-1.1%
2033	96.9%	95.5%	1.4%
2038	104.7%	95.5%	9.2%
2043	107.7%	93.1%	14.6%
2048	113.2%	88.5%	24.7%

UTAH STATE LEGISLATURE
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 RELATING TO THE STATE RETIREMENT SYSTEM

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 13

Reduced Benefit for New Hires, 7.75% Investment Return Every Year



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	16.09%	16.28%	-0.19%
2013	17.85%	18.12%	-0.27%
2014	19.93%	20.23%	-0.30%
2015	21.92%	22.23%	-0.31%
2020	21.42%	21.74%	-0.32%
2025	20.72%	21.03%	-0.31%
2030	20.20%	20.49%	-0.29%
2035	19.81%	20.10%	-0.29%
2040	19.53%	19.81%	-0.28%
2045	8.02%	2.81%	5.21%
2050	8.00%	3.70%	4.30%

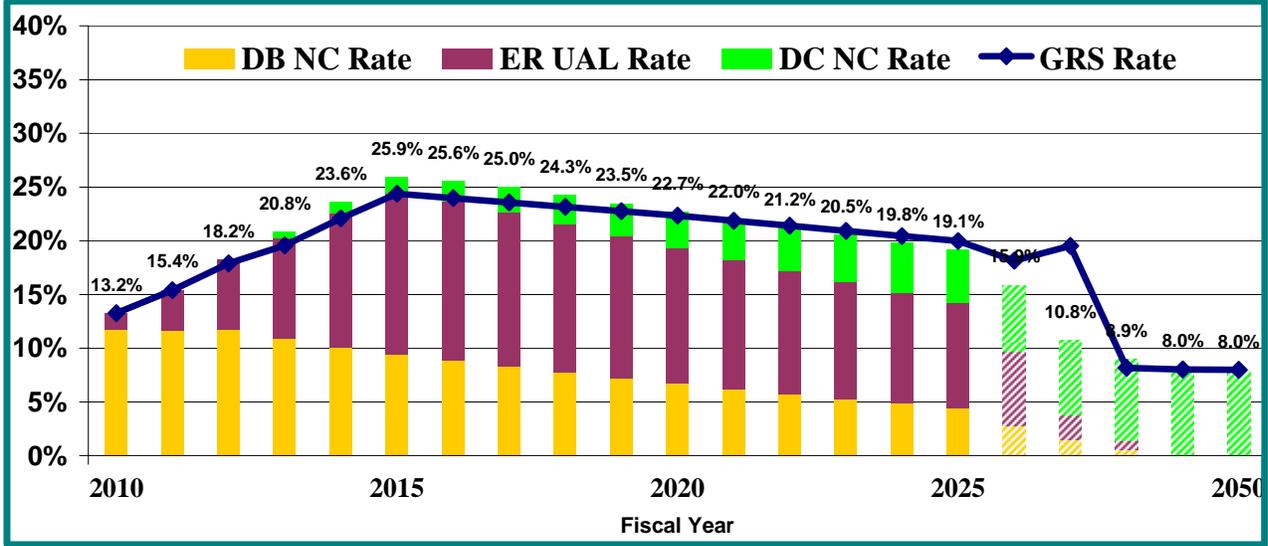
Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.6%	80.5%	0.1%
2012	75.1%	74.9%	0.2%
2013	70.5%	70.4%	0.1%
2018	74.6%	75.3%	-0.7%
2023	78.9%	80.5%	-1.6%
2028	83.9%	86.7%	-2.8%
2033	91.6%	94.8%	-3.2%
2038	105.7%	105.7%	0.0%
2043	126.9%	114.5%	12.4%
2048	146.3%	111.5%	34.8%

UTAH STATE LEGISLATURE
 AUDIT OF LONG-TERM ACTUARIAL PROJECTIONS
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REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

Replication of GRS Exhibit # 14

Reduced Benefit for New Hires, Level Dollar Amortization, 7.75% Investment Return



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	17.88%	18.21%	-0.33%
2013	19.56%	20.83%	-1.27%
2014	22.08%	23.59%	-1.51%
2015	24.38%	25.94%	-1.56%
2020	22.34%	22.73%	-0.39%
2025	19.97%	19.13%	0.84%
2030	18.14%	15.87%	2.27%
2035	19.52%	10.80%	8.72%
2040	8.16%	8.94%	-0.78%
2045	8.02%	8.03%	-0.01%
2050	8.00%	8.00%	0.00%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	87.8%	87.8%	0.0%
2010	85.8%	85.9%	-0.1%
2011	80.9%	80.5%	0.4%
2012	75.8%	75.1%	0.7%
2013	71.5%	71.0%	0.5%
2018	77.8%	78.7%	-0.9%
2023	83.7%	85.3%	-1.6%
2028	89.4%	90.6%	-1.2%
2033	96.9%	95.5%	1.4%
2038	104.9%	95.5%	9.4%
2043	107.9%	93.1%	14.8%
2048	113.5%	88.5%	25.0%

REPLICATION OF LONG-TERM ACTUARIAL PROJECTIONS

3rd Substitute of SB 43

On February 25, 2010, GRS provided an analysis of the 3rd Substitute of SB 43 which changes the work after retirement (WAR) provisions for URS and eliminated the maximum retirement allowances in the Public Safety, Firefighter, and Judges Retirement Systems.

Findings:

1. We agree with the basic analysis and the magnitude of the cost estimates appears reasonable, but we do not have the data necessary to confirm all of the calculations presented.
2. For the provisions affecting retirees who return to work before 7/1/2010 (Items 1 and 2), GRS identifies “Savings from Elimination of Amortization Payment” of \$5 million and “Possible Savings from Elimination of Required DC Contributions” of \$16.9 million. We note that while the possible savings due to the elimination of the required DC contributions, the \$5 million in savings from the elimination of the amortization payment is not a real permanent savings. By not making these amortization payments, the UAL and future amortization payments are that much larger. The \$5 million supposed savings will need to be collected at some point with interest.
3. GRS argues that the provisions affecting retirees who return to work after 7/1/2010 (Items 3 and 4) will reduce the number of people who work after retirement and therefore reduce the cost to the system. We generally agree, but note that this assessment is largely based on an assumption of how behavior will change. For employees who would retire and return to work under the current system, the savings are only achieved to the extent these employees choose instead to continue working until a later retirement date. If these employees choose to retire at the same time they would have otherwise and do not return to work, the costs could increase if a new employee is hired to perform this work.
4. GRS modeled the cost impact of the elimination of the maximum allowances without a change to retirement rates. We would expect changes in retirement behavior to add slightly to these cost estimates.

3rd Substitute of SB 63

On February 26, 2010, GRS provided an analysis of the 3rd Substitute of SB 63 which establishes a new Tier II retirement system for employees hired on or after July 1, 2011.

Findings:

1. We match the projections produced by GRS based on the assumptions they used and agree with their analysis as far as it goes, but have concerns about the limited nature of the analysis.
2. The dynamics of a system that offers choice between a defined benefit and a defined contribution plan can be complex. The addition of the fixed employer contribution of 10% of

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pay in SB 63 requiring the member to pick up any additional amounts further complicate the analysis with issues of generational equity and likely changes in new employee elections depending on the pattern of investment returns achieved. We recommend that the Legislature explore the following dynamics, if they haven't already, to ensure that offering this plan makes sense.

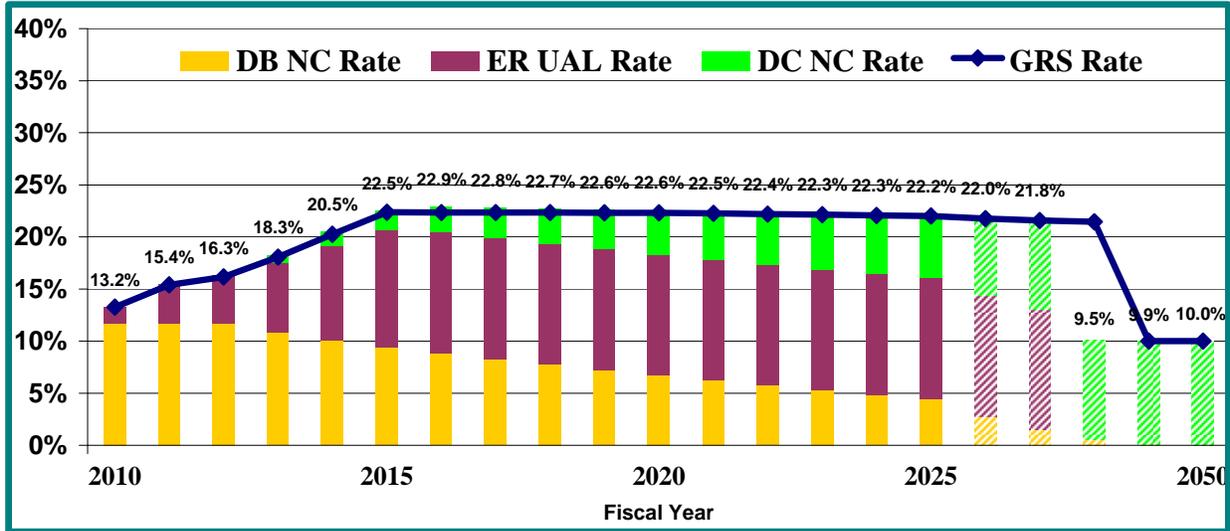
- a. The normal cost for an individual in a defined benefit plan depends on their age at hire with younger hires having a lower normal cost and older hires having a higher normal cost. Since all employees who choose the defined benefit plan receive the same contribution to the defined contribution plan, there will be a natural tendency for younger employees to elect the defined contribution plan and older employees to elect the defined benefit plan. This tendency is likely to increase the normal cost of the defined benefit plan above the amount predicted by GRS and ultimately may eliminate the defined contribution plan entirely for those who select the defined benefit plan.
 - b. Employees who elect the defined benefit plan will have essentially elected a minimum benefit equal to that provided by the defined benefit plan, but if investment returns are better than expected, their benefits will increase due to additional contributions to the defined contribution plan. If investment returns are poor, the employee will be subject to additional costs which could affect their decision to remain employed. That is, if costs are too high, these employees are likely to seek alternative employment. If enough of these employees leave, the costs of the defined benefit plan could continue to rise to unsustainable levels.
 - c. The pattern of investment returns achieved may affect who elects which plan. If investment returns are poor, contributions to the defined benefit plan will increase to pay for benefits already earned by existing employees. Consequently, more new employees would be likely to elect the defined contribution plan. Conversely, if investment returns are good, the cost of the defined benefit plan will decrease and more new employees are likely to elect the defined benefit plan.
 - d. When the new plans mature, active employees in the defined benefit plan will bear the burden of any investment or experience losses on retirees in the defined benefit plan. These losses could become so significant that no new employees would elect the defined benefit plan. Conversely, investment and experience gains on the retirees could make the defined benefit plan so attractive that almost all new employees elect the defined benefit plan. The potential for generational transfers of wealth are significant.
3. If the objective is to offer a plan that costs a fixed 10% of payroll, the Legislature may wish to consider offering just a defined contribution plan, just a variable defined benefit plan, or a choice between the two. A variable defined benefit plan takes advantage of pooling of risk to insure members against outliving their assets, disability, and death before retirement, but adjusts the level of benefits for actual investment returns so that the employer doesn't bear the investment risk. A full discussion of this alternative is beyond the scope of our audit.

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Replication of GRS Exhibit # 15

Tier II Contributory w/ 10% fixed cost, 7.75% Investment Return Every Year



Employer Contribution Rates Fiscal Year Ending June 30			
Fiscal Year	GRS	Cheiron	Difference
2010	13.25%	13.24%	0.01%
2011	15.39%	15.42%	-0.03%
2012	16.17%	16.28%	-0.11%
2013	18.06%	18.27%	-0.21%
2014	20.26%	20.46%	-0.20%
2015	22.36%	22.51%	-0.15%
2020	22.32%	22.55%	-0.23%
2025	22.00%	22.23%	-0.23%
2030	21.75%	21.98%	-0.23%
2035	21.58%	21.80%	-0.22%
2040	21.44%	9.51%	11.93%
2045	10.01%	9.93%	0.08%
2050	10.00%	9.99%	0.01%

Funded Status January 1			
Year	GRS	Cheiron	Difference
2008	96.5%	96.5%	0.0%
2009	N/A	87.8%	N/A
2010	N/A	85.9%	N/A
2011	N/A	80.5%	N/A
2012	N/A	74.9%	N/A
2013	N/A	70.4%	N/A
2018	N/A	75.0%	N/A
2023	N/A	79.8%	N/A
2028	N/A	85.5%	N/A
2033	N/A	94.3%	N/A
2038	N/A	110.3%	N/A
2043	N/A	124.4%	N/A
2048	N/A	141.8%	N/A

The funded status shown here assumes all future employees elect the defined contribution plan.

UTAH STATE LEGISLATURE
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**APPENDIX
GLOSSARY OF TERMS**

1. Actuarial Accrued Liability

The Actuarial Accrued Liability is the difference between the present value of all future system benefits and the present value of total future normal costs. This is also referred to by some actuaries as the “accrued liability” or “actuarial liability”.

2. Actuarial Assumptions

Estimates of future experience with respect to rates of mortality, disability, turnover, retirement rate, or rates of investment income and salary increases. Actuarial 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.

3. Accrued Service

Service credited under the System which was rendered before the date of the actuarial valuation.

4. Actuarial Equivalent

A single amount or series of amounts of equal actuarial value to another single amount or series of amounts, computed on the basis of appropriate actuarial assumptions.

5. Actuarial Funding Method

A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of a retirement system benefit between future normal cost and actuarial accrued liability. Sometimes referred to as the “actuarial funding method”.

6. Actuarial Gain (Loss)

The difference between actual experience and actuarial assumption anticipated experience during the period between two actuarial valuation dates.

7. 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.

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**APPENDIX
GLOSSARY OF TERMS**

8. Amortization

Paying off an interest-discounted amount with periodic payments of interest and principal—as opposed to paying off with a lump sum payment.

9. Annual Required Contribution (ARC) under GASB 25

The Governmental Accounting Standards Board (GASB) Statement No. 25 defines the Plan Sponsor’s “Annual Required Contribution” (ARC) that must be disclosed annually.

10. Normal Cost

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

11. Set back/Set forward

Set back is a period of years that a standard published table (i.e. mortality) is referenced backwards in age. For instance, if the set back period is 2 years and the participant’s age is currently 40, then the table value for age 38 is used from the standard published table. It is the opposite for set forward. A system would use set backs or set forwards to compensate for mortality experience in their work force.

12. Unfunded Actuarial Liability (UAL)

The difference between actuarial liability and valuation assets. Sometimes referred to as “unfunded actuarial accrued liability”.

Most retirement systems have unfunded actuarial liabilities. They typically arise each time new benefits are added and each time experience losses are realized.