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Report on Thirty Year Projections of the Mississippi Retirement Systems

Prepared as of June 30, 2018

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December 12, 2018

Board of Trustees
Public Employees' Retirement System of Mississippi
429 Mississippi Street
Jackson, MS 39201-1005

Ladies and Gentlemen:

Presented in this report are the results of 30 year projections of the Public Employees' Retirement System (PERS) of Mississippi, the Highway Safety Patrol Retirement System (HSPRS) and the Supplemental Legislative Retirement Plan (SLRP). The purpose of the projection study is to develop a forecast of the Systems' funding progress over time, to review the funding goals and benchmarks outlined in the funding policies that were adopted by the Board of Trustees and provide the status of the metrics/targets in the funding policies that determines whether or not a contribution rate increase should be recommended.

The projections are based on the June 30, 2018 valuations of PERS, HSPRS and SLRP. Membership was projected over a 30-year period from that date and actuarial valuations were performed annually for each of the 30 years to measure the Systems' funding progress.

The Executive Summary provides a summary of the main projection results. We certify that we are members of the American Academy of Actuaries and that we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Respectfully submitted,

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

Jonathan T. Craven, ASA, EA, FCA, MAAA
Consulting Actuary

EJK/JTC:mjn

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3550 Busbee Pkwy, Suite 250, Kennesaw, GA 30144
Phone (678) 388-1700 • Fax (678) 388-1730
www.CavMacConsulting.com
Offices in Kennesaw, GA • Bellevue, NE

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Section I - Executive Summary

Since 1985, the benefit structure of the Public Employees Retirement System (PERS) of Mississippi has undergone significant changes as noted in the table below (the entire HSPRS history of benefit modifications is listed in Appendix C).

Fiscal Year Beginning	Benefit Modifications
July 1, 1985	• Final average compensation calculated using the highest four consecutive years (reduced from highest five consecutive years) • Liberalized survivor benefit provision to reduce the marriage requirement from 5 years to 1 year and to allow a member to designate a child as beneficiary • Minimum benefit increased from $5.00 to $7.50 per month for each year of creditable service for current and future retirees • Eligibility for service retirement reduced from 10 years to 4 years at age 60 • Established "discretionary" COLA provision in addition to the base COLA provision to be paid to eligible retirees based on sufficient actuarial gains • 3% ad hoc increase for all retirees
July 1, 1986	• Eligibility for non-duty related disability retirement reduced from 10 years to 4 years • Permanent exemption from 3% penalty for those required to retire at age 60 • Retirement incentive granted – one additional year of credit to any member with 30 years of service credit or age 60
July 1, 1987	• Established service retirement eligibility based on 25 & out with reduced benefits • Benefit accrual increased from 1-5/8% to 1-3/4% for the first 20 years • Minimum benefit increased from $7.50 to $10.00 per month for each year of service for current and future retirees • 5% ad hoc increase for all retirees • Provided elected official leave credit
July 1, 1989	• Unreduced retirement at age 55 with 25 years of service • Benefit accrual increased from 1-3/4% to 1-7/8% for the first 30 years of service • Unreduced retirement lowered from age 65 to age 60 • 5% ad hoc increase for all retirees
July 1, 1990	• Provided that base COLA percentage granted shall be cumulative from year to year
July 1, 1991	• Unreduced retirement at any age with 25 years of service • Benefit accrual increased to 2% for all years of service over 25

Fiscal Year Beginning	Benefit Modifications
July 1, 1992	• Ad hoc increase for those retired prior to July 1, 1991, with more than 25 years of service • Tiered disability benefit • Expanded survivor benefits to include automatic spousal and dependent child benefits • Liberalized definition of average compensation to provide that the highest four years did not have to be consecutive years • Expanded military service credit to include all active duty military • Removed reference to "Governor's Salary" and established maximum compensation cap at $125,000
July 1, 1994	• Benefits for all retirees under Options 2(5) and 4A(5) were recalculated to remove the reduction imposed for the right to revert to the Maximum
July 1, 1999	• Benefit accrual increased from 2% to 2-1/4% for all years of service over 25 for current and future retirees • Base COLA increased to 3% simple up to age 55 and 3% compounded after age 55 • Reemployed retiree COLA will be based on all fiscal years in retirement, not just the fiscal years in retirement since the last retirement. • Provided that the COLA will be prorated and paid to the beneficiary of a retiree or beneficiary who is receiving the COLA in a lump sum and who dies between July 1 and December 1
July 1, 2000	• Benefit accrual increased from 1-7/8% to 2% for all years of service over 10 and less than 25 for current and future retirees
July 1, 2001	• Benefit accrual increased from 1-7/8% to 2% for all years of service over 5 and less than 25 for current and future retirees
July 1, 2002	• Benefit accrual increased from 1-7/8% to 2% for all years of service up to and including 25 and from 2-1/4% to 2-1/2% for all years of service over 25 for current and future retirees • Increased maximum compensation cap to $150,000 • Provided for free active duty military service for pre-1972 service in the Commissioned Corps of the U.S. Public Health Service for those retiring on or after July 1, 2002 • Reemployed retiree who has previously been retired for at least one full fiscal year no longer has to wait another full fiscal year for his or her COLA to resume • A local county or municipal elected official who is receiving retirement benefits may receive a salary for the elected position that does not exceed 25% of the retiree's average compensation

Fiscal Year Beginning	Benefit Modifications
July 1, 2004	• Removed remarriage penalty on certain spouse / survivor benefits and provided upon application for the reinstatement of spouse survivor benefits previously terminated due to remarriage
July 1, 2008	• Maximum reportable earned compensation was increased from $150,000 to $230,000 to coincide with the compensation limit set pursuant to Section 401(a)(17) of the Internal Revenue Code • Vesting requirement for those employees hired on or after July 1, 2007 was increased from 4 to 8 years of service.
July 1, 2010	• Members who retire on or after July 1, 2010 receive additional credit toward retirement for one-half day of leave for each full fiscal year of membership service accrued after June 30, 2010 • Option 4, a 75% joint and survivor annuity, made available to members who retire on or after January 1, 2011
July 1, 2011	• For members hired on or after July 1, 2011, 30 years of creditable service will be required for retirement regardless of age. • For members hired on or after July 1, 2011, 33 years of creditable service will be required to select a partial lump sum option at retirement. • For members hired on or after July 1, 2011, the retirement formula will be 2% of average compensation for the first 30 years of creditable service plus 2.5% of average compensation for each year beyond 30 years of creditable service. • For members hired on or after July 1, 2011, the actuarial reduction for early retirement will be the lesser of the number of years below 30 years of creditable service or the number of years in age a member is below age 65. • For members hired on or after July 1, 2011, the COLA will be a simple 3% of the annual retirement allowance at retirement up to the fiscal year in which the retired member reaches age 60. Thereafter, the COLA will be a compounded 3% for all future years.
July 1, 2016	• The interest rate on employee contributions shall be calculated based on the money market rate as published by the Wall Street Journal on December 31 of each preceding year with a minimum rate of one percent and a maximum rate of five percent.

Between 1985 and 2005, there was only one increase in the employer contribution rate from 8.75% to 9.75% effective January 1, 1990. However since that time, the employer contribution rate has increased from 9.75% to 17.40%. In addition, the employee contribution rate was increased from 6.00% to 6.50% effective July 1, 1989, to 7.25% effective July 1, 1991 and to 9.00% effective July 1, 2010.

Section I - Executive Summary

Since 1986, PERS' assets have experienced better than assumed investment returns overall. However, the negative returns for the 2008 and 2009 fiscal years have caused the employer contribution rates to increase and the funded ratio to decrease. The ten year rolling returns have been:

Ten Year Period Ending June 30	Ten Year Annualized Rate of Return
1986	9.7%
1987	9.3
1988	9.6
1989	10.3
1990	11.5
1991	13.6
1992	14.2
1993	12.4
1994	12.2
1995	11.3
1996	10.7
1997	11.6
1998	13.2
1999	12.9
2000	12.7
2001	10.8
2002	8.6
2003	7.8
2004	9.1
2005	8.4
2006	8.0
2007	7.9
2008	5.1
2009	1.7
2010	2.3
2011	5.4
2012	6.1
2013	7.1
2014	7.5
2015	6.9
2016	5.9
2017	5.5
2018	7.4

Section I - Executive Summary

The following report is being provided to the Board of Trustees of the Public Employees' Retirement System of Mississippi to develop a forecast of the Systems' funding progress over time, to review the funding goals and benchmarks outlined in the funding policies that were adopted by the Board of Trustees and provide the status of the metrics/targets in the funding policies that determines whether or not a contribution rate increase should be recommended. The objective of the current funding policies is to accumulate sufficient assets during a member's employment to fully finance the benefit the member receives throughout retirement. In order to reach that objective, some goals and benchmarks were established as follows:

- Preservation of the defined benefit structure for providing lifetime benefits to the membership,
- Maintain an increasing trend in the funded ratio over the projection period with an ultimate goal of being 100% funded,
- Ensure benefit improvements are funded through increases in contribution requirements in accordance with Article 14, S 272A, of the Mississippi Constitution.

The PERS funding policy includes two additional benchmarks that were included in the new policy that was adopted by the Board of Trustees on June 26, 2018:

- Contribution rate stability as a percentage of payroll (Fixed Contribution Rate – FCR),
- Require clear reporting and risk analysis of the metrics by the actuary as outlined in Section II of this policy using a "Signal Light" approach to assist the Board in determining whether increases or decreases are needed in the employer contribution rate, and

For PERS, if any one of the following metrics are in the Red Signal Light status in conjunction with the annual valuation report (presented in October) and the projection report (presented in December), the actuary will determine and recommend to the Board an employer contribution rate increase to consider that is sufficient enough to get all three metrics back into the Green Signal Light status.

- Funded Ratio – defined as the actuarial value of assets divided by the actuarial accrued liability. One of the funding goals is to have an increasing funded ratio over the projection period with an ultimate goal of having a 100% funded ratio. The Board sets the Signal Light definition as follows:

Status	Definition
Green	**Funded Ratio above 80% in 2047**
Yellow	**Funded Ratio between 65% and 80% in 2047**
Red	**Funded Ratio below 65% in 2047**

- Cash flow as a percentage of assets – defined as the difference between total contributions coming into the trust and the benefit payments made to retirees and beneficiaries going out of the trust as a percentage of beginning year market value of assets. Over the projection period, this percentage will fluctuate from year to year so for Signal Light testing, the net cash flow percentage over the entire projection period will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	**Net Cash Flow Percentage above negative 6.00% (-6.00%) during the projection period**
Yellow	**Net Cash Flow Percentage between negative 6.00% (-6.00%) and negative 7.75% (-7.75%) during the projection period**
Red	**Net Cash Flow Percentage below negative 7.75% (-7.75%) during the projection period**

- Actuarially Determined Contribution (ADC) – defined as the contribution requirement determined by the actuary using a contribution allocation procedure based on the principal elements disclosed in Section III of this funding policy:

    1. Actuarial Cost Method
    2. Asset Smoothing Method
    3. Amortization Method

The calculation of the ADC will be determined during the actuarial valuation and not during the projection report. The ratio of the ADC to the fixed contribution rate (ADC/FCR) as set by this Funding Policy will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	**ADC ratio at or below 100% of fixed contribution rate at valuation date**
Yellow	**ADC ratio between 100% and 110% of fixed contribution rate at valuation date**
Red	**ADC ratio above 110% of fixed contribution rate at valuation date**

Section I - Executive Summary

For SLRP, if the projected funded ratio is less than 60% in 2042 or less than 75% following two consecutive projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 85% in 2042. If a funded ratio of 100% or more is attained and is projected to remain above 100% for the ensuing 30 years following two consecutive annual projection reports, a reduced contribution pattern will be established provided the funded ratio remains at or above 100% in every future year.

For HSPRS, the employer contribution rate as a percentage of annual compensation was increased from 37.00% to 49.08% as of July 1, 2018. The funding policy still reads that if the projected funded ratio is less than 60% in 2042 or less than 70% following three consecutive projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 85% in 2042. If a funded ratio of 100% or more is attained and is projected to remain above 100% for the ensuing 30 years following three consecutive annual projection reports, a reduced contribution pattern will be established provided the funded ratio remains at or above 100% in every future year. Please note that the projections for HSPRS include additional contributions estimated at $3.5 million to be made in perpetuity due to Senate Bill No. 2659 (enacted in 2004) and House Bill No. 1015 (enacted in 2013).

Section I - Executive Summary

The results of the 30 year projections for each of the PERS, HSPRS and SLRP plans are shown in the next 3 sections of the report.

Regular actuarial valuations measure the Systems present financial position and contribution adequacy by calculating and financing the liabilities created by the present benefit program. This process involves discounting to present values the future benefit payments on behalf of present active and retired members and their survivors. However, valuations do not produce information regarding future changes in the makeup of the covered group or the amounts of benefits to be paid or investment income to be received – actuarial projections do provide this information.

Whereas valuations provide a snapshot of the System as of a given date, projections provide a moving forecast. Projected active and retired groups are developed from year to year by the application of assumptions regarding pre-retirement withdrawal from service, retirements, deaths, disabilities, and the addition of new members. Projected information regarding the retired life group leads to assumed future benefit payouts. Performing actuarial valuations every year during the projection period generates expected contribution rates and unfunded accrued liability (UAL) amortization periods. Combining future benefit payments with assumed contributions based on periodic valuations of the projected membership and expected investment earnings produces the net cash flow of the System each year, and thus end of year asset levels. Finally, the valuation results permit the development of the funded ratio trend line for the entire projection period.

Projections are used for many purposes. Among them are (i) developing cash flow patterns for investment policy and asset mix consideration, (ii) exploring the effect of alternative assumptions about future experience, and (iii) analyzing the impact on plan funding progress of changes in the workforce.

Projection results are useful in demonstrating changing relationships among key elements affecting plan financial activity (e.g., how benefits payable and plan assets will grow in future decades). Projections are not predictions of specific future events and do not provide numeric precision in absolute terms. For instance, cash flow projected to occur 10 years in the future will not be exact (except by coincidence), but understanding the changed relationship between future benefit payout and future investment income can be very useful.

The projection of System finances over 30 years requires an assumption regarding future new entrants to the Systems as well as the regular valuation assumptions used to estimate the timing of future events for current members. As members are assumed to terminate service for any reason, they are replaced with a sufficient number of new entrants to keep the active population constant in number. Valuations are then performed on the projected active and retired membership for each of the thirty years of the study.

Section I - Executive Summary

The main results from the study (details can be found in the following sections of this report) are noted on the following pages.

For PERS:

- With a fixed contribution rate as a percentage of annual compensation of 17.40% beginning July 1, 2019 (15.75% for this fiscal year ending June 30, 2019), the projection results for this study show that the Plan will have a funded ratio of 95.8% in 2047. In addition to the increase in the fixed contribution rate, PERS had favorable investment experience in the 2018 fiscal year. This results in a "Green" status for the funded ratio metric of the funding policy as the projected ratio is above 80% in 2047.

- The second metric in the funding policy is the cash flow as a percentage of assets – defined as the difference between total contributions coming into the trust and the benefit payments made to retirees and beneficiaries going out of the trust as a percentage of beginning year market value of assets. For the length of the projection period, the lowest cash flow rate is negative 5.54% in fiscal year 2031. Because this result is larger than negative 6.00%, there is a "Green" status for this metric of the funding policy.

- The third and final metric in the funding policy is the ratio of the Actuarially Determined Contribution (ADC) to the Fixed Contribution Rate (FCR) that is tested during the June 30, 2018 actuarial valuation. The ADC is determined by the actuary using a contribution allocation procedure based on the principal elements disclosed in Section III of this funding policy:

  1. Actuarial Cost Method
  2. Asset Smoothing Method
  3. Amortization Method

  During the June 30, 2018 valuation, this ratio was calculated as 101.26%, which results in a "Yellow" status (between 100% and 110%) for this metric of the funding policy.

- **Since none of the three metrics are in the "Red" status, this result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the employer contribution rate from 17.40% is necessary at this time.**

For HSPRS:

- Utilizing the funding policy for HSPRS, with a fixed contribution rate of 49.08% beginning July 1, 2018 for the length of the projection period, the projection results for this study show that the Plan will have a funded ratio of 103.5% in 2042. During last year's study, the funded ratio in 2042 was 96.5%. The main reason for the increase was due to the favorable investment experience in the 2018 fiscal year. We have assumed that the fund will earn 7.75% for each of the projection years and that the actuarial assumptions in the back of this report are experienced.

- **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the employer contribution rate from 49.08% is necessary at this time.**

For SLRP:

- Utilizing the funding policy for SLRP, with a fixed contribution rate of 7.40% for the length of the projection period, the projection results for 2018 show that the Plan will have a funded ratio of 97.5% in 2042. During last year's study, the funded ratio in 2042 was 109.7%. The main reason for the decrease was due to the change in the new entrant profile. It is important to note that we lowered the average pay for new entrants going forward as the members of the legislature have not had significant pay increases over the past few years. In addition, an eligibility service load of 2.50 years was included in the new entrant profile as the census data shows more and more active members in SLRP are entering the Plan with service from the PERS plan. We have also assumed that the fund will earn 7.75% for each of the projection years and that the actuarial assumptions in the back of this report are experienced.

- **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the employer contribution rate is necessary at this time.**

It must be kept in mind that projections do not purport to show exact numerical results over the entire period under study. They do however provide a good basis for drawing conclusions about the likely position of the Systems and the relative impact changes over the years will have on System finances. Below are tables showing the summary of the metrics in each of the three funding policies utilized for each plan.

PERS Plan

Metric	2018 Baseline Projection (7.75%)	Status
Funding Ratio in 2047	95.8%	**Green**
Cash Flow as a Percentage of Assets	-5.54%	**Green**
ADC/FCR Ratio from Valuation	101.26%	**Yellow**

2018 Summary of Funded Ratios in 2042

System	7.75% Assumption	7.50% Assumption	7.25% Assumption	7.00% Assumption
HSPRS	103.5%	91.9%	81.2%	71.6%
SLRP	97.5%	85.4%	74.4%	64.4%

Reconciliation of Projected Funded Ratio in 2042 from 2017 to 2018

Although the PERS funding policy does not have a requirement for the funded ratio in 2042, we have included PERS in the reconciliation of the projected funded ratio in the table below:

	PERS	HSPRS	SLRP
2017 Projected Funded Ratio in 2042	**70.1%**	**96.5%**	**109.7%**
Change in Employer Contribution Rate	12.9%	0.0%	0.0%
Assumption Changes	0.0%	0.0%	0.0%
Investment Experience	4.6%	4.7%	5.6%
Method Change*	0.0%	0.0%	(10.4)%
Demographic Experience	(6.2)%	2.3%	(7.4)%
2018 Projected Funded Ratio in 2042	**81.4%**	**103.5%**	**97.5%**

* For SLRP, the method change included adjustments in the new entrant profile (see the SLRP section of this report for more details).

Section II – PERS Projection Results

SPECIAL ASSUMPTIONS

In addition to the regular valuation assumptions used in performing the annual actuarial valuations of PERS (all assumptions utilized in the projection study are outlined in Appendix A), additional assumptions must be made that are unique to projections. The first of these is what, if any, change in the overall active membership will be anticipated. For this projection study it was assumed that the number of active members would remain static over the 30 year projection period.

But since we assume active members will leave the system through termination, death, disability or retirement, we need to make some assumptions as to the composition of new hires that will replace departing members in order to maintain the membership at a constant number. The new entrant profile we developed was based on the new hires over the 3 year period prior to the projection start date of June 30, 2018. That profile is summarized in the table on the following page.

Age	Average Pay	Percent Male	Weight
19	26,300	56%	0.9%
23	28,600	41	18.9
27	31,800	38	21.7
32	31,800	35	13.2
37	32,200	34	10.9
42	31,500	34	9.0
47	31,500	37	8.0
52	31,700	39	6.7
57	31,700	42	5.6
62	31,800	47	3.2
69	28,000	57	1.9

For the projection results presented in this section of the report, it was further assumed that the benefit structure as it exists on June 30, 2018 would remain in place for the following 30 years.

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Section II – PERS Projection Results

FUTURE MEMBERSHIP

The following chart and graph show the headcounts of active participants and retired members over the projection period. The actives are broken down into those existing as of June 30, 2018 and those who are hired after June 30, 2018. Although the membership at PERS has been trending downward over the past few years, we have still assumed the active membership will continue at its current population of 150,687 active members over the projected period. After a reduction in active membership since 2008, many statewide public sector systems are beginning to experience a turnaround and active membership is starting to level off and even increase. By the end of the projection period we estimate that about 98.7% of those active employees will have been hired after June 30, 2018 and be included in the Tier 4 benefit structure. After about 13 years, the retiree headcount begins to drop as retiree deaths outnumber new retirees.

Member	2018	2023	2028	2038	2048
Active – Existing Employees	150,687	85,633	48,109	12,390	1,960
Active – New Entrants	0	65,054	102,578	138,297	148,727
Retired	104,973	114,122	117,342	108,742	87,451
Total	255,660	264,809	268,029	259,429	238,138

PROJECTION RESULTS

The baseline projection results shown below use the same actuarial assumptions as used in the June 30, 2018 actuarial valuation. In addition, the projection results using different long-term investment return assumptions for future valuations (7.50%, 7.25% and 7.00%) are included.

Baseline Projection Results (7.75%)
($000's)

	2018	2023	2028	2038	2048
Total Payroll	$5,999,231	$6,861,195	$7,864,868	$10,651,637	$14,687,345
UAL	$16,940,459	$17,759,980	$18,247,223	$15,399,805	$289,126
Normal Cost Rate	1.45%	1.22%	1.08%	0.93%	0.88%
UAL Rate	15.95%	16.18%	16.32%	16.47%	16.52%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	61.8%	64.4%	66.4%	74.3%	99.6%
Amortization Period	31 years	27 years	22 years	11 years	1 years
Cash Flow Percentage	-4.4%	-5.0%	-5.5%	-4.9%	-2.1%

Section II – PERS Projection Results

Projection Results Assuming 7.50% Long-Term Investment Return
($000's)

	2018	2023	2028	2038	2048
Total Payroll	$5,999,231	$6,861,195	$7,864,868	$10,651,637	$14,687,345
UAL	$16,940,459	$19,482,483	$20,677,962	$20,424,728	$11,129,208
Normal Cost Rate	1.45%	1.68%	1.53%	1.37%	1.32%
UAL Rate	15.95%	15.72%	15.87%	16.03%	16.08%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	61.8%	61.9%	62.8%	66.7%	83.5%
Amortization Period	31 years	32 years	27 years	17 years	6 years
Cash Flow %	-4.4%	-5.1%	-5.6%	-5.3%	-2.4%

Projection Results Assuming 7.25% Long-Term Investment Return
($000's)

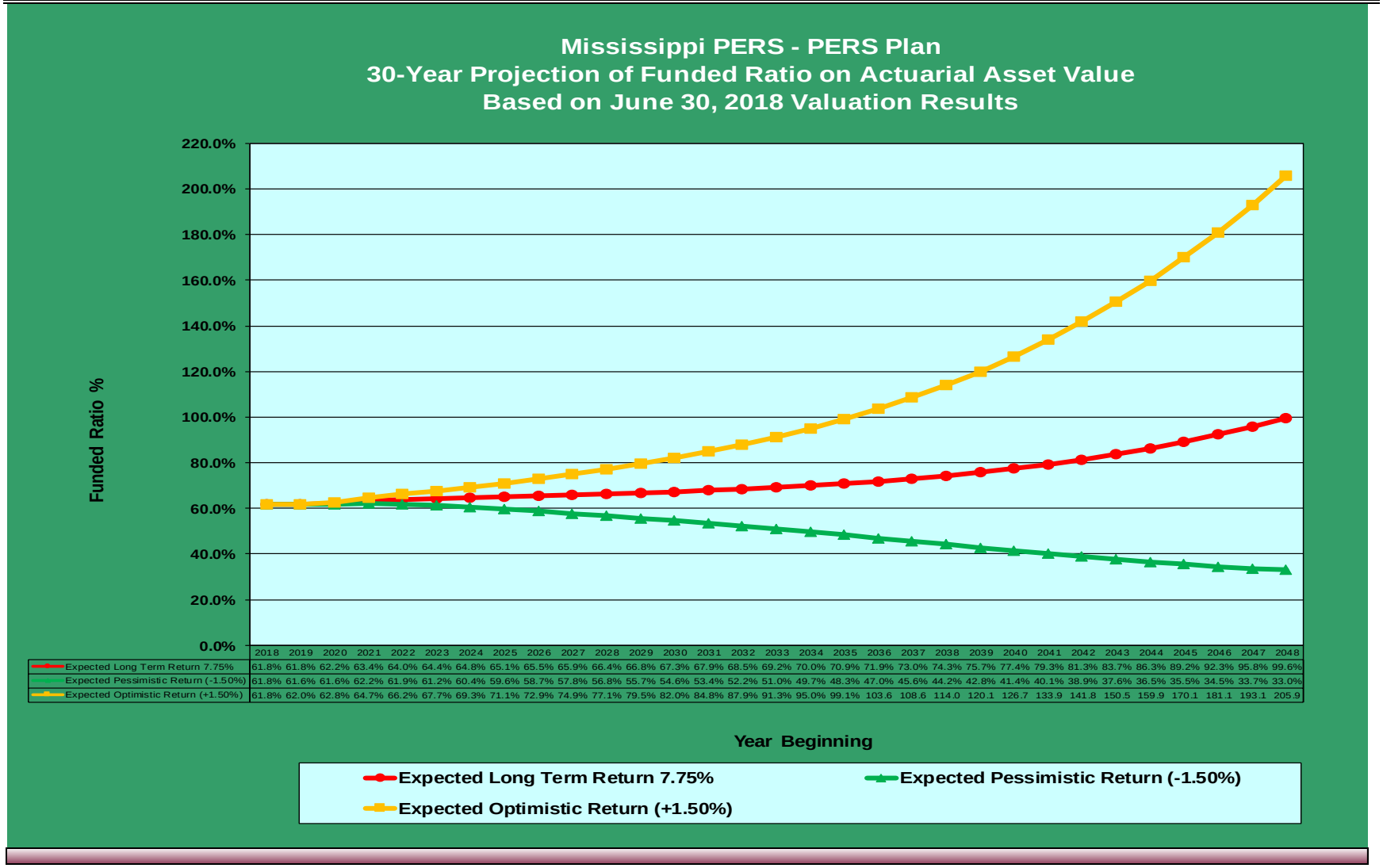
	2018	2023	2028	2038	2048
Total Payroll	$5,999,231	$6,861,195	$7,864,868	$10,651,637	$14,687,345
UAL	$16,940,459	$21,292,896	$23,178,119	$25,369,786	$21,349,220
Normal Cost Rate	1.45%	2.21%	2.03%	1.87%	1.81%
UAL Rate	15.95%	15.19%	15.37%	15.53%	15.59%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	61.8%	59.5%	59.4%	59.7%	69.2%
Amortization Period	31 years	39 years	34 years	23 years	12 years
Cash Flow %	-4.4%	-5.1%	-5.8%	-5.8%	-2.8%

Projection Results Assuming 7.00% Long-Term Investment Return
($000's)

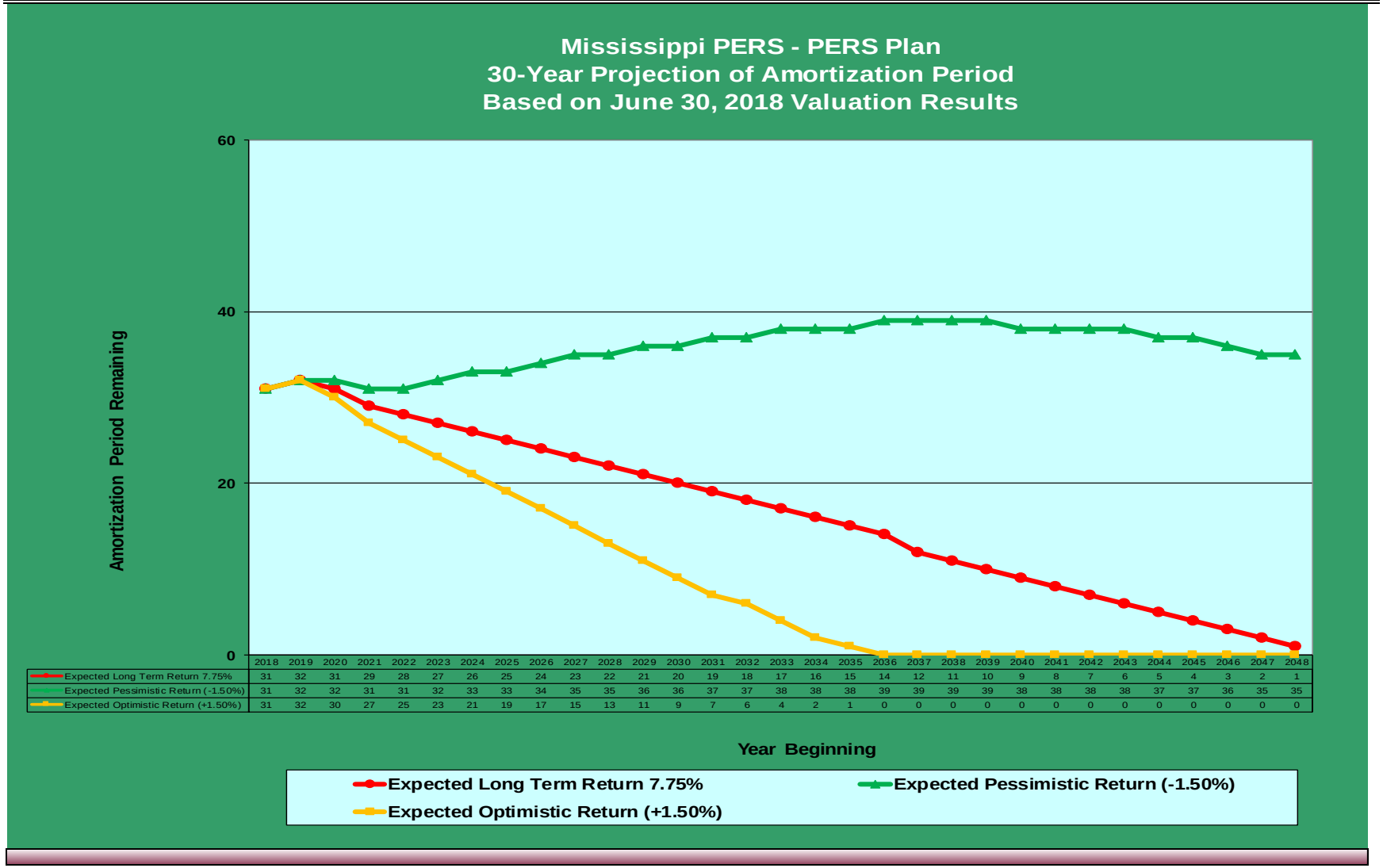
	2018	2023	2028	2038	2048
Total Payroll	$5,999,231	$6,861,195	$7,864,868	$10,651,637	$14,687,345
UAL	$16,940,459	$23,099,287	$25,654,485	$30,141,374	$30,878,500
Normal Cost Rate	1.45%	2.72%	2.53%	2.35%	2.30%
UAL Rate	15.95%	14.68%	14.87%	15.05%	15.10%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	61.8%	57.2%	56.2%	53.2%	56.7%
Amortization Period	31 years	47 years	42 years	31 years	19 years
Cash Flow %	-4.4%	-5.2%	-6.0%	-6.3%	-3.4%

Section II – PERS Projection Results

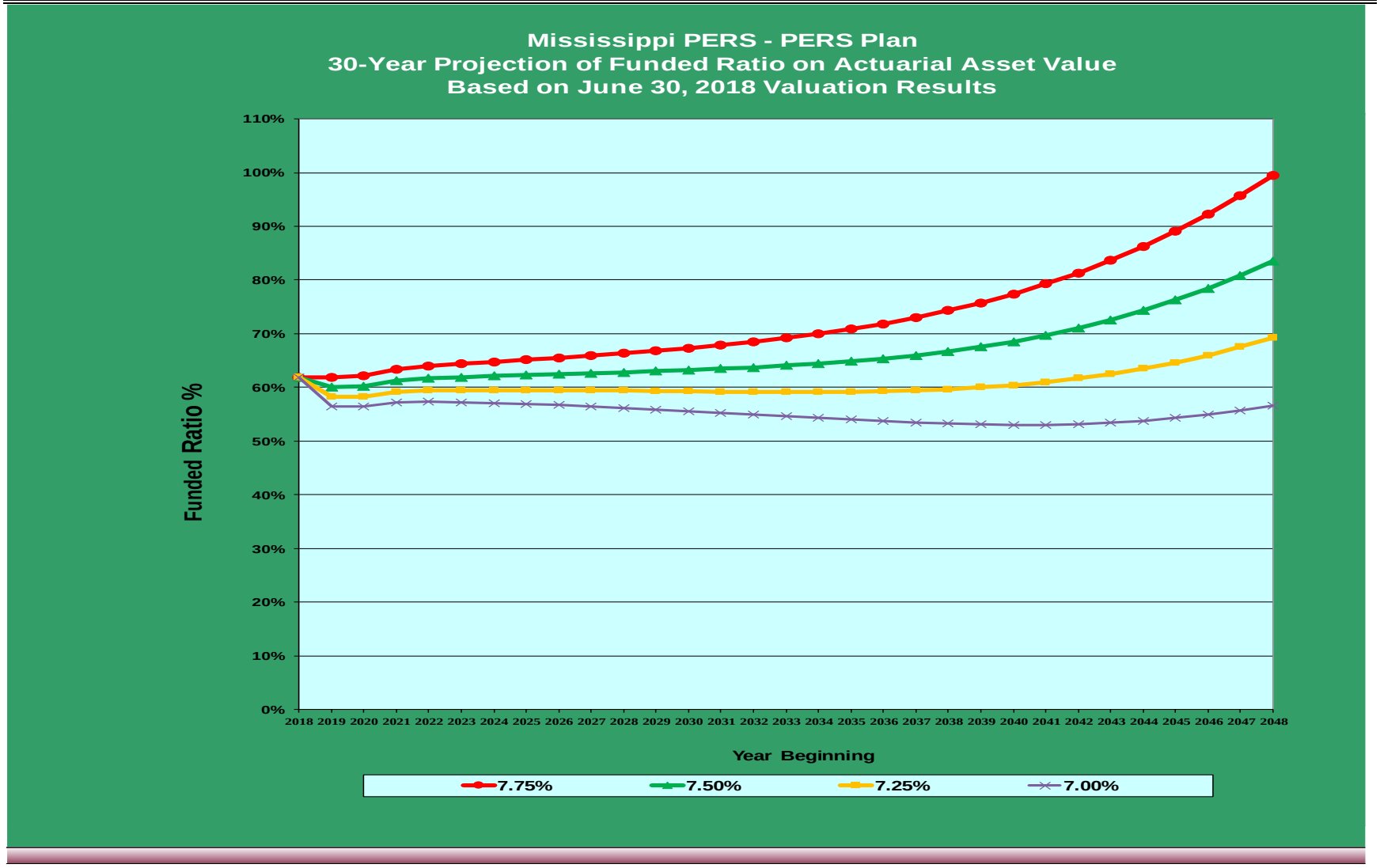
The following graphs show a comparison of the projected funded ratios and amortization periods for the baseline valuation (assuming 7.75%) and two alternative investment return scenarios to show an optimistic view if the fund earns 1.50% above the assumed rate each year of the projection study and a pessimistic view if the fund earns 1.50% less than the assumed rate each year of the projection study. As can be seen from the graphs, even under a pessimistic view of investment returns, the Plan remains solvent over the length of the projection period.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Expected Long Term Return 7.75%	61.8%	61.8%	62.2%	63.4%	64.0%	64.4%	64.8%	65.1%	65.5%	65.9%	66.4%	66.8%	67.3%	67.9%	68.5%	69.2%	70.0%	70.9%	71.9%	73.0%	74.3%	75.7%	77.4%	79.3%	81.3%	83.7%	86.3%	89.2%	92.3%	95.8%	99.6%
Expected Pessimistic Return (-1.50%)	61.8%	61.6%	61.6%	62.2%	61.9%	61.2%	60.4%	59.6%	58.7%	57.8%	56.8%	55.7%	54.6%	53.4%	52.2%	51.0%	49.7%	48.3%	47.0%	45.6%	44.2%	42.8%	41.4%	40.1%	38.9%	37.6%	36.5%	35.5%	34.5%	33.7%	33.0%
Expected Optimistic Return (+1.50%)	61.8%	62.0%	62.8%	64.7%	66.2%	67.7%	69.3%	71.1%	72.9%	74.9%	77.1%	79.5%	82.0%	84.8%	87.9%	91.3%	95.0%	99.1%	103.6	108.6	114.0	120.1	126.7	133.9	141.8	150.5	159.9	170.1	181.1	193.1	205.9



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Expected Long Term Return 7.75%	31	32	31	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	12	11	10	9	8	7	6	5	4	3	2	1
Expected Pessimistic Return (-1.50%)	31	32	32	31	31	32	33	33	34	35	35	36	36	37	37	38	38	38	39	39	39	39	38	38	38	38	37	37	36	35	35
Expected Optimistic Return (+1.50%)	31	32	30	27	25	23	21	19	17	15	13	11	9	7	6	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0


Mississippi PERS - PERS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2018 Valuation Results
Funded Ratio %
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048
Year Beginning
7.75%
7.50%
7.25%
7.00%

Section II – PERS Projection Results

CASH FLOW PROJECTIONS

The funded ratio is the primary measure of funded status of a pension plan and, thereby, the most common measurement used for drawing conclusions on funding progress. The funded ratio is the ratio of the actuarial value of assets to the actuarial or accrued liability of the system as calculated by the funding method used in developing system contribution levels. When using the funded ratio in assessing trends over several valuations, we recommend that the basis for determining both the assets and liabilities in the ratio are taken into consideration and reasonable efforts are made to adjust the ratio to reflect these differences when they are known. On a consistent basis, an increasing funded ratio would typically indicate progress in meeting the obligations of the system. In most cases, other measures should also be considered in a trend assessment. These may include the trend in the length of the amortization period, the required contribution rate, percentage of required contributions funded, and the unfunded actuarial liability as a percentage of payroll. Focusing solely on any one measure as the indication of funding progress is an over simplification of a complex and dynamic system.

Another of those additional metrics is an outlook on the cash flow as a percentage of assets for the System. Most retirement systems are funded with an advance-funding mechanism, meaning contributions and investment earnings are earned during a member's active lifetime in order to pay for the benefit payments during his retirement years. Many mature retirement systems, like PERS, have negative cash flow, where benefit payments paid out of the trust are more than the contributions being collected by employers and employees.

For the fiscal year ending June 30, 2019, we are projecting PERS to have a negative cash flow of approximately $1.2 Billion (benefit payments of $2.8 Billion and contributions of $1.6 Billion). With market value of assets of $27.8 Billion as of June 30, 2018, the cash flow as a percentage of assets is estimated to be negative 4.38% for the 2019 fiscal year. While market value of assets is assumed to earn 7.75% each year, the difference between the investment return assumption and the negative cash flow percentage is positive, meaning assets are projected to grow for the 2019 fiscal year. When assets do not earn a positive return enough to cover this negative cash flow percentage, assets are expected to decline for the year. As long as the negative cash flow percentage does not grow more than the assumed investment return assumption, the System's assets will continue to increase and sustainability of the plan may be achieved.

The tables on the following three pages demonstrate the open group projection of cash flow on the baseline assumption and then a sensitivity analysis, using a one-year return of negative 7.00% in 2019. This demonstrates the projection of this metric if PERS experiences one significant bad investment year in one of the next five years without a correction in the market. As can be seen from the table on page 20, the cash flow as a percentage of market value of assets does not get more than negative 5.54% on the baseline assumption, meaning that PERS' assets should continue to increase as long as all baseline actuarial assumptions are met. However, if there is a significant negative investment experience in one of the next five years (as seen on the table on page 21), the negative cash flow could be more than the investment experience of the Plan and PERS' assets may decrease at some point during the projection period. The good news is that under either of the pessimistic scenarios, the Plan would not reach insolvency and ultimately, the Plan's assets would begin to increase later in the projection period.

This metric will continue to be monitored as part of the funding policy under the baseline assumptions to ensure the continued growth of PERS' assets during the projection period.

Section II – PERS Projection Results

Mississippi PERS
30-year Open Group Projection of Cash Flow
PERS Plan
Based on June 30, 2018 Valuation Results

Projection of Cash Flow

Contribution Methodology: Employee and Employer Contributions
Investment Return Methodology: As Programmed

Valuation Year Beginning July 1	Expected Short-term Investment Return	Valuation Annual Payroll	Market Value of Assets July 1	Total Contributions	Projected Benefit Payments	Ratio of Cash Flow to MVA	Expected Investment Return	Net Cash Flow	Market Value of Assets June 30	Valuation Year Ending June 30
2018	7.75%	6,324,393,332	27,763,190,000	1,612,245,970	(2,828,793,050)	-4.38%	2,105,385,620	888,838,540	28,652,028,540	2019
2019	7.75%	6,415,906,049	28,652,028,540	1,635,574,850	(2,973,273,422)	-4.67%	2,169,663,582	831,965,010	29,483,993,550	2020
2020	7.75%	6,550,336,675	29,483,993,550	1,781,167,549	(3,113,249,943)	-4.52%	2,234,354,437	902,272,043	30,386,265,592	2021
2021	7.75%	6,697,013,805	30,386,265,592	1,821,051,994	(3,250,196,898)	-4.70%	2,300,589,526	871,444,622	31,257,710,214	2022
2022	7.75%	6,861,194,510	31,257,710,214	1,865,696,011	(3,386,514,453)	-4.87%	2,364,640,417	843,821,976	32,101,532,190	2023
2023	7.75%	7,038,654,379	32,101,532,190	1,913,950,899	(3,517,447,104)	-5.00%	2,426,892,635	823,396,430	32,924,928,620	2024
2024	7.75%	7,229,685,487	32,924,928,620	1,965,896,078	(3,650,682,677)	-5.12%	2,487,614,631	802,828,032	33,727,756,651	2025
2025	7.75%	7,430,677,505	33,727,756,651	2,020,549,827	(3,783,393,711)	-5.23%	2,546,865,521	784,021,637	34,511,778,289	2026
2026	7.75%	7,641,920,160	34,511,778,289	2,077,990,930	(3,920,713,123)	-5.34%	2,604,589,667	761,867,474	35,273,645,763	2027
2027	7.75%	7,864,868,301	35,273,645,763	2,138,614,988	(4,048,870,220)	-5.42%	2,661,066,319	750,811,087	36,024,456,850	2028
2028	7.75%	8,096,220,586	36,024,456,850	2,201,524,302	(4,173,647,327)	-5.47%	2,716,901,534	744,778,508	36,769,235,358	2029
2029	7.75%	8,337,872,446	36,769,235,358	2,267,234,276	(4,295,851,464)	-5.52%	2,772,473,566	743,856,377	37,513,091,735	2030
2030	7.75%	8,589,133,911	37,513,091,735	2,335,557,293	(4,413,854,988)	-5.54%	2,828,233,236	749,935,541	38,263,027,276	2031
2031	7.75%	8,850,982,820	38,263,027,276	2,406,759,248	(4,527,679,576)	-5.54%	2,884,732,430	763,812,102	39,026,839,378	2032
2032	7.75%	9,123,445,653	39,026,839,378	2,480,847,342	(4,638,175,497)	-5.53%	2,942,543,389	785,215,234	39,812,054,612	2033
2033	7.75%	9,404,883,951	39,812,054,612	2,557,376,044	(4,743,617,788)	-5.49%	3,002,298,073	816,056,329	40,628,110,942	2034
2034	7.75%	9,697,848,147	40,628,110,942	2,637,038,868	(4,843,344,427)	-5.43%	3,064,779,473	858,473,915	41,486,584,856	2035
2035	7.75%	10,002,875,366	41,486,584,856	2,719,981,870	(4,934,935,217)	-5.34%	3,130,982,352	916,029,005	42,402,613,861	2036
2036	7.75%	10,320,284,919	42,402,613,861	2,806,291,875	(5,018,137,215)	-5.22%	3,202,092,788	990,247,449	43,392,861,310	2037
2037	7.75%	10,651,636,757	43,392,861,310	2,896,393,067	(5,091,183,585)	-5.06%	3,279,485,508	1,084,694,990	44,477,556,300	2038
2038	7.75%	10,995,935,306	44,477,556,300	2,990,014,728	(5,152,773,421)	-4.86%	3,364,767,443	1,202,008,750	45,679,565,050	2039
2039	7.75%	11,354,065,932	45,679,565,050	3,087,397,608	(5,206,560,491)	-4.64%	3,459,580,938	1,340,418,055	47,019,983,105	2040
2040	7.75%	11,725,179,237	47,019,983,105	3,188,310,738	(5,251,425,651)	-4.39%	3,565,594,672	1,502,479,759	48,522,462,865	2041
2041	7.75%	12,109,719,858	48,522,462,865	3,292,875,024	(5,286,385,723)	-4.11%	3,684,683,691	1,691,172,992	50,213,635,857	2042
2042	7.75%	12,506,547,343	50,213,635,857	3,400,780,354	(5,317,450,908)	-3.82%	3,818,671,596	1,902,001,041	52,115,636,898	2043
2043	7.75%	12,915,001,534	52,115,636,898	3,511,847,217	(5,345,189,936)	-3.52%	3,969,245,383	2,135,902,664	54,251,539,562	2044
2044	7.75%	13,336,787,237	54,251,539,562	3,626,539,185	(5,374,542,936)	-3.22%	4,138,023,022	2,390,019,271	56,641,558,833	2045
2045	7.75%	13,772,211,725	56,641,558,833	3,744,939,812	(5,402,951,306)	-2.93%	4,326,671,649	2,668,660,156	59,310,218,989	2046
2046	7.75%	14,222,150,017	59,310,218,989	3,867,287,033	(5,429,537,335)	-2.63%	4,537,134,319	2,974,884,016	62,285,103,005	2047
2047	7.75%	14,687,344,651	62,285,103,005	3,993,782,757	(5,453,904,461)	-2.34%	4,771,571,472	3,311,449,769	65,596,552,773	2048
2048	7.75%	15,167,245,527	65,596,552,773	4,124,277,404	(5,478,023,744)	-2.06%	5,032,253,962	3,678,507,622	69,275,060,395	2049

Section II – PERS Projection Results

Mississippi PERS
30-year Open Group Projection of Cash Flow
PERS Plan
Based on June 30, 2018 Valuation Results

Projection of Cash Flow

Contribution Methodology: Employee and Employer Contributions
Investment Return Methodology: As Programmed

Valuation Year Beginning July 1	Expected Short-term Investment Return	Valuation Annual Payroll	Market Value of Assets July 1	Total Contributions	Projected Benefit Payments	Ratio of Cash Flow to MVA	Expected Investment Return	Net Cash Flow	Market Value of Assets June 30	Valuation Year Ending June 30
2018	-7.00%	6,324,393,332	27,763,190,000	1,612,245,970	(2,828,793,050)	-4.38%	(1,900,071,737)	(3,116,618,817)	24,646,571,183	2019
2019	7.75%	6,415,906,049	24,646,571,183	1,635,574,850	(2,973,273,422)	-5.43%	1,859,240,637	521,542,065	25,168,113,248	2020
2020	7.75%	6,550,336,675	25,168,113,248	1,781,167,549	(3,113,249,943)	-5.29%	1,899,873,713	567,791,319	25,735,904,566	2021
2021	7.75%	6,697,013,805	25,735,904,566	1,821,051,994	(3,250,196,898)	-5.55%	1,940,186,547	511,041,643	26,246,946,209	2022
2022	7.75%	6,861,194,510	26,246,946,209	1,865,696,011	(3,386,514,453)	-5.79%	1,976,306,207	455,487,766	26,702,433,975	2023
2023	7.75%	7,038,654,379	26,702,433,975	1,913,950,899	(3,517,447,104)	-6.01%	2,008,462,524	404,966,319	27,107,400,294	2024
2024	7.75%	7,229,685,487	27,107,400,294	1,965,896,078	(3,650,682,677)	-6.22%	2,036,756,186	351,969,587	27,459,369,880	2025
2025	7.75%	7,430,677,505	27,459,369,880	2,020,549,827	(3,783,393,711)	-6.42%	2,061,065,546	298,221,662	27,757,591,543	2026
2026	7.75%	7,641,920,160	27,757,591,543	2,077,990,930	(3,920,713,123)	-6.64%	2,081,140,195	238,418,002	27,996,009,545	2027
2027	7.75%	7,864,868,301	27,996,009,545	2,138,614,988	(4,048,870,220)	-6.82%	2,097,049,513	186,794,281	28,182,803,826	2028
2028	7.75%	8,096,220,586	28,182,803,826	2,201,524,302	(4,173,647,327)	-7.00%	2,109,173,424	137,050,398	28,319,854,224	2029
2029	7.75%	8,337,872,446	28,319,854,224	2,267,234,276	(4,295,851,464)	-7.16%	2,117,646,528	89,029,339	28,408,883,563	2030
2030	7.75%	8,589,133,911	28,408,883,563	2,335,557,293	(4,413,854,988)	-7.32%	2,122,657,102	44,359,407	28,453,242,970	2031
2031	7.75%	8,850,982,820	28,453,242,970	2,406,759,248	(4,527,679,576)	-7.45%	2,124,474,147	3,553,819	28,456,796,789	2032
2032	7.75%	9,123,445,653	28,456,796,789	2,480,847,342	(4,638,175,497)	-7.58%	2,123,365,088	(33,963,067)	28,422,833,722	2033
2033	7.75%	9,404,883,951	28,422,833,722	2,557,376,044	(4,743,617,788)	-7.69%	2,119,633,454	(66,608,290)	28,356,225,433	2034
2034	7.75%	9,697,848,147	28,356,225,433	2,637,038,868	(4,843,344,427)	**-7.78%**	2,113,708,346	(92,597,212)	28,263,628,220	2035
2035	7.75%	10,002,875,366	28,263,628,220	2,719,981,870	(4,934,935,217)	**-7.84%**	2,106,203,212	(108,750,135)	28,154,878,085	2036
2036	7.75%	10,320,284,919	28,154,878,085	2,806,291,875	(5,018,137,215)	**-7.86%**	2,097,893,265	(113,952,074)	28,040,926,011	2037
2037	7.75%	10,651,636,757	28,040,926,011	2,896,393,067	(5,091,183,585)	**-7.83%**	2,089,710,523	(105,079,995)	27,935,846,016	2038
2038	7.75%	10,995,935,306	27,935,846,016	2,990,014,728	(5,152,773,421)	-7.74%	2,082,784,896	(79,973,797)	27,855,872,219	2039
2039	7.75%	11,354,065,932	27,855,872,219	3,087,397,608	(5,206,560,491)	-7.61%	2,078,244,744	(40,918,139)	27,814,954,080	2040
2040	7.75%	11,725,179,237	27,814,954,080	3,188,310,738	(5,251,425,651)	-7.42%	2,077,204,923	14,090,010	27,829,044,091	2041
2041	7.75%	12,109,719,858	27,829,044,091	3,292,875,024	(5,286,385,723)	-7.16%	2,080,943,736	87,433,037	27,916,477,128	2042
2042	7.75%	12,506,547,343	27,916,477,128	3,400,780,354	(5,317,450,908)	-6.87%	2,090,641,795	173,971,240	28,090,448,368	2043
2043	7.75%	12,915,001,534	28,090,448,368	3,511,847,217	(5,345,189,936)	-6.53%	2,107,293,272	273,950,553	28,364,398,921	2044
2044	7.75%	13,336,787,237	28,364,398,921	3,626,539,185	(5,374,542,936)	-6.16%	2,131,769,622	383,765,871	28,748,164,792	2045
2045	7.75%	13,772,211,725	28,748,164,792	3,744,939,812	(5,402,951,306)	-5.77%	2,164,933,610	506,922,117	29,255,086,909	2046
2046	7.75%	14,222,150,017	29,255,086,909	3,867,287,033	(5,429,537,335)	-5.34%	2,207,861,583	645,611,280	29,900,698,189	2047
2047	7.75%	14,687,344,651	29,900,698,189	3,993,782,757	(5,453,904,461)	-4.88%	2,261,780,099	801,658,396	30,702,356,584	2048
2048	7.75%	15,167,245,527	30,702,356,584	4,124,277,404	(5,478,023,744)	-4.41%	2,327,953,758	974,207,418	31,676,564,002	2049

SOLVENCY TESTING

While not a metric that is part of the new PERS' funding policy, another metric that is often reviewed during the valuation process is the Solvency Testing. The Solvency Test is a test of current assets to different categories of actuarial accrued liability.

1. Accumulated Employee Contributions with Interest
2. Retirees and Beneficiaries currently receiving benefits
3. Employer financed portion of Active and Inactive member benefits

In the test, we calculate the portion of accrued liabilities from the categories above that are covered by the Actuarial Value of Assets. As can be seen from the table below (from the 2018 valuation report), assets cover 100% of category #1 but only 78.5% of category #2 as of June 30, 2018. The purpose of this metric is to monitor this Solvency Test and see if progress is made during the projection period for funding of category #2 and eventually category #3.

	Actuarial Accrued Liabilities for						
Valuation Date	(1) Accumulated Employee Contributions Including Allocated Investment Earnings	(2) Retirees and Beneficiaries Currently Receiving Benefits	(3) Active and Inactive Members Employer Financed Portion	Net Assets Available for Benefits	Portions of Accrued Liabilities Covered by Assets (1)	(2)	(3)
6/30/09	$4,235,466	$15,665,712	$10,693,368	$20,597,581	100.0%	100.0%	6.5%
6/30/10	4,266,621	16,763,455	10,369,912	20,143,426	100.0	94.7	0.0
6/30/11	4,356,556	18,001,718	10,296,191	20,315,165	100.0	88.7	0.0
6/30/12	4,463,252	19,547,367	10,482,254	19,992,797	100.0	79.4	0.0
6/30/13	5,053,888	20,789,551	9,699,409	20,490,555	100.0	74.3	0.0
6/30/14	5,277,944	22,033,588	9,703,756	22,569,940	100.0	78.5	0.0
6/30/15	5,379,226	24,012,624	10,972,734	24,387,161	100.0	79.2	0.0
6/30/16	5,468,859	25,390,774	11,137,880	25,185,078	100.0	77.7	0.0
6/30/17	5,534,403	26,686,958	10,945,130	26,364,446	100.0	78.1	0.0
6/30/18	5,570,524	27,874,365	10,951,272	27,455,702	100.0	78.5	0.0

During the baseline projection, we anticipate that the percentage in category #2 will actually decrease over the first 10 years of the projection period but once the baby boomer generation of retirees begin to die, then the Solvency Test will begin to improve. Below is the baseline projection of the Solvency Test:

Section II – PERS Projection Results

Mississippi PERS
30-year Open Group Projection of Solvency Test
PERS Plan
Based on June 30, 2018 Valuation Results

($ in Thousands)

Valuation Date	(1) Accumulated Employee Conts with Interest	(2) Retiree and Beneficiary Liability	(3) Active Employer Financed	(4) Total Accrued Liability	(5) Ratio of Retiree Liability to Total Liability	Actuarial Value of Assets	Solvency Testing Portion of Accrued Liabilities by Assets (1)	(2)	(3)
2018	5,570,524	27,874,365	10,951,272	44,396,161	62.8%	27,455,702	100.0%	78.5%	0.0%
2019	5,681,934	29,628,490	10,240,019	45,550,443	65.0%	28,144,938	100.0%	75.8%	0.0%
2020	5,795,573	30,812,456	10,068,576	46,676,605	66.0%	29,017,058	100.0%	75.4%	0.0%
2021	5,911,484	31,955,002	9,916,040	47,782,526	66.9%	30,312,462	100.0%	76.4%	0.0%
2022	6,029,714	33,059,672	9,755,010	48,844,397	67.7%	31,257,708	100.0%	76.3%	0.0%
2023	6,150,308	34,130,959	9,580,243	49,861,510	68.5%	32,101,530	100.0%	76.0%	0.0%
2024	6,273,314	35,163,033	9,401,717	50,838,064	69.2%	32,924,926	100.0%	75.8%	0.0%
2025	6,398,780	36,161,407	9,209,571	51,769,758	69.9%	33,727,754	100.0%	75.6%	0.0%
2026	6,526,756	37,117,548	9,010,658	52,654,961	70.5%	34,511,776	100.0%	75.4%	0.0%
2027	6,657,291	38,000,747	8,828,925	53,486,964	71.0%	35,273,644	100.0%	75.3%	0.0%
2028	6,790,437	38,830,798	8,650,443	54,271,678	71.5%	36,024,455	100.0%	75.3%	0.0%
2029	6,926,246	39,599,325	8,484,644	55,010,215	72.0%	36,769,233	100.0%	75.4%	0.0%
2030	7,064,771	40,313,111	8,324,891	55,702,773	72.4%	37,513,090	100.0%	75.5%	0.0%
2031	7,206,066	40,959,132	8,185,868	56,351,066	72.7%	38,263,025	100.0%	75.8%	0.0%
2032	7,350,187	41,549,415	8,057,578	56,957,180	72.9%	39,026,837	100.0%	76.2%	0.0%
2033	7,497,191	42,103,029	7,921,448	57,521,668	73.2%	39,812,052	100.0%	76.8%	0.0%
2034	7,647,135	42,595,518	7,805,020	58,047,673	73.4%	40,628,109	100.0%	77.4%	0.0%
2035	7,800,078	43,010,737	7,728,113	58,538,928	73.5%	41,486,583	100.0%	78.3%	0.0%
2036	7,956,080	43,345,391	7,700,855	59,002,326	73.5%	42,402,612	100.0%	79.5%	0.0%
2037	8,115,202	43,566,613	7,763,410	59,445,225	73.3%	43,392,859	100.0%	81.0%	0.0%
2038	8,277,506	43,683,329	7,916,525	59,877,359	73.0%	44,477,554	100.0%	82.9%	0.0%
2039	8,443,056	43,701,187	8,166,892	60,311,135	72.5%	45,679,563	100.0%	85.2%	0.0%
2040	8,611,917	43,643,206	8,500,852	60,755,976	71.8%	47,019,981	100.0%	88.0%	0.0%
2041	8,784,155	43,520,852	8,918,167	61,223,174	71.1%	48,522,461	100.0%	91.3%	0.0%
2042	8,959,838	43,392,950	9,373,262	61,726,050	70.3%	50,213,634	100.0%	95.1%	0.0%
2043	9,139,035	43,305,489	9,827,983	62,272,507	69.5%	52,115,635	100.0%	99.2%	0.0%
2044	9,321,816	43,250,079	10,298,593	62,870,488	68.8%	54,251,537	100.0%	100.0%	16.3%
2045	9,508,252	43,234,098	10,781,221	63,523,571	68.1%	56,641,557	100.0%	100.0%	36.2%
2046	9,698,417	43,252,997	11,286,872	64,238,286	67.3%	59,310,217	100.0%	100.0%	56.3%
2047	9,892,385	43,306,095	11,824,143	65,022,623	66.6%	62,285,101	100.0%	100.0%	76.8%
2048	10,090,233	43,416,875	12,378,568	65,885,677	65.9%	65,596,551	100.0%	100.0%	97.7%

Section III – HSPRS Projection Results

SPECIAL ASSUMPTIONS

In addition to the regular valuation assumptions used in performing the annual actuarial valuations of HSPRS (all assumptions utilized in the projection study are outlined in Appendix B), additional assumptions must be made that are unique to projections. The first of these is what, if any, change in the overall active membership will be anticipated. For this projection study it was assumed that the number of active members would remain static over the 30 year projection period.

But since we assume active members will leave the system through termination, death, disability or retirement, we need to make some assumptions as to the composition of new hires that will replace departing members in order to maintain the membership at a constant number. The new entrant profile we developed was based on the new hires in the 3 years (2012, 2015 and 2018) with a significant group of entering trainees through the projection start date of June 30, 2018. That profile is summarized in the table below.

Age	Average Pay	Percent Male	Weight
22	$40,000	94%	11.0%
26	40,000	98	36.0
30	40,000	93	25.0
34	41,000	99	14.0
38	42,000	99	4.0
42	43,000	99	6.0
46	45,000	99	4.0

For the projection results presented in this section of the report, it was further assumed that the benefit structure as it exists on June 30, 2018 would remain in place for the following 30 years.

Section III – HSPRS Projection Results

FUTURE MEMBERSHIP

The following chart and graph show the headcounts of active participants and retired members over the projection period. The actives are broken down into those existing as of June 30, 2018 and those who are hired after June 30, 2018. We have assumed the active membership will continue at the current population of 511 active members over the projected period.

Member	2018	2023	2033	2042	2048
Active – Existing Employees	511	375	158	41	6
Active – New Entrants	0	136	353	470	505
Retired	725	865	1,081	1,160	1,192
Total	1,236	1,376	1,592	1,671	1,703

PROJECTION RESULTS

The baseline projection results shown below use the same actuarial assumptions as used the June 30, 2018 actuarial valuation report. Please note that contributions from SB 2659 and HB 1015 are assumed to continue to provide an additional $3,500,000 annually throughout the projection period under all scenarios. These dollars are in addition to the employer contributions as a percent of payroll shown below. In addition, the projection results using different long-term investment return assumptions for future valuations (7.50%, 7.25% and 7.00%) are included.

Baseline Projection Results (7.75%)
($000's)

	2018	2023	2033	2042	2048
Total Payroll	$29,555	$34,134	$40,254	$51,146	$61,768
UAL	$175,013	$163,414	$108,194	($29,260)	($219,759)
Normal Cost Rate	15.18%	15.28%	15.04%	14.91%	14.88%
UAL Rate	33.90%	33.80%	34.04%	34.17%	34.20%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.8%	72.8%	85.2%	103.5%	124.1%
Amortization Period	18 years	14 years	6 years	0 years	0 years
Cash Flow %	-3.2%	-3.6%	-4.3%	-3.3%	-2.3%

Section III – HSPRS Projection Results

Projection Results Assuming 7.50% (Long-Term Investment Return)
($000's)

	2018	2023	2033	2042	2048
Total Payroll	$29,555	$34,134	$40,254	$51,146	$61,768
UAL	$175,013	$185,283	$156,010	$68,791	($60,550)
Normal Cost Rate	15.18%	16.72%	16.46%	16.32%	16.30%
UAL Rate	33.90%	32.36%	32.62%	32.76%	32.78%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.8%	70.0%	79.2%	91.9%	106.5%
Amortization Period	18 years	18 years	11 years	2 years	0 years
Cash Flow %	-3.2%	-3.7%	-4.5%	-3.6%	-2.7%

Projection Results Assuming 7.25% (Long-Term Investment Return)
($000's)

	2018	2023	2033	2042	2048
Total Payroll	$29,555	$34,134	$40,254	$51,146	$61,768
UAL	$175,013	$208,279	$204,133	$163,718	$89,825
Normal Cost Rate	15.18%	18.35%	18.07%	17.93%	17.90%
UAL Rate	33.90%	30.73%	31.01%	31.15%	31.18%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.8%	67.2%	73.5%	81.2%	90.7%
Amortization Period	18 years	24 years	17 years	9 years	3 years
Cash Flow %	-3.2%	-3.7%	-4.7%	-4.0%	-3.0%

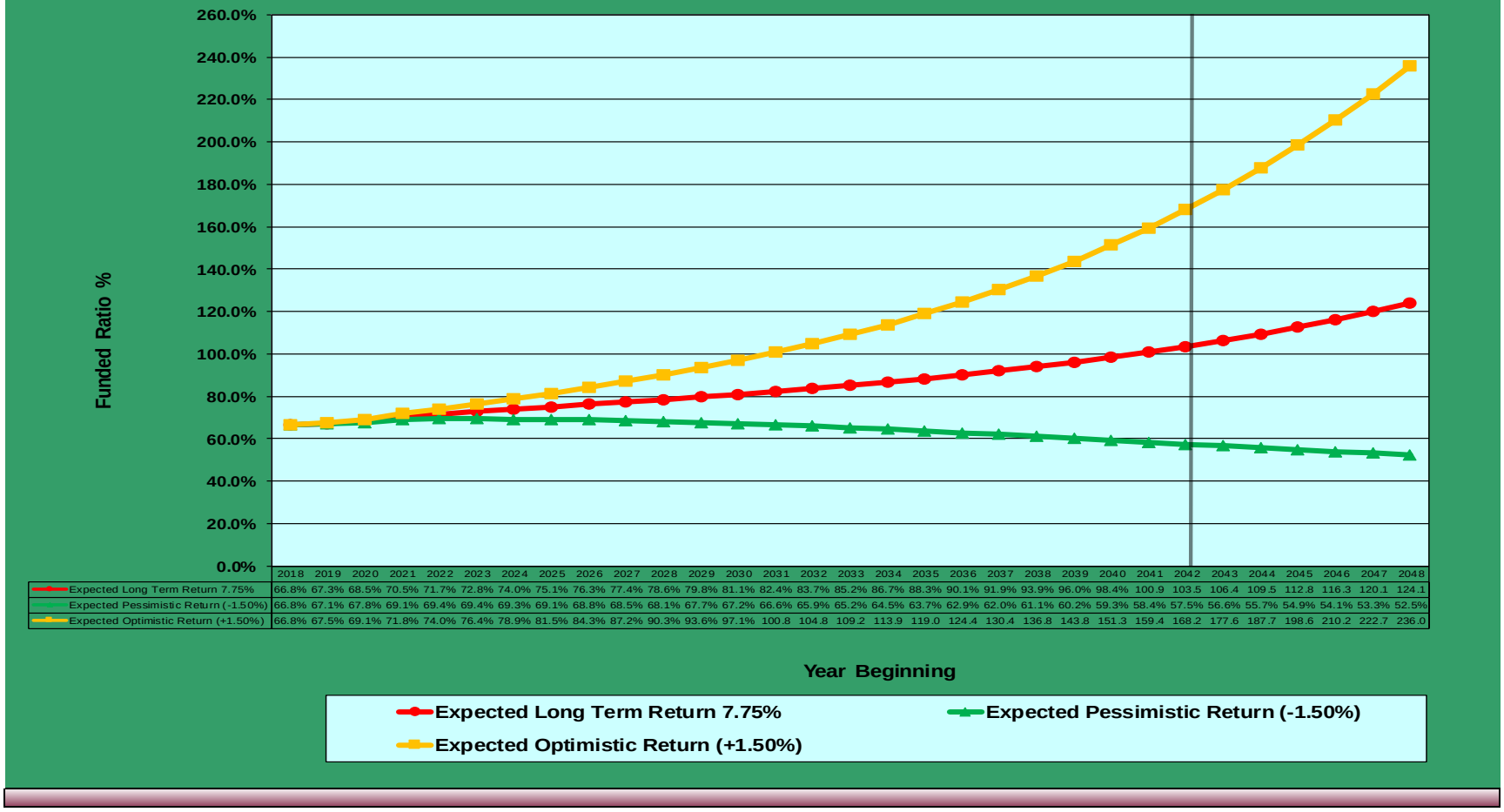
Projection Results Assuming 7.00% (Long-Term Investment Return)
($000's)

	2018	2023	2033	2042	2048
Total Payroll	$29,555	$34,134	$40,254	$51,146	$61,768
UAL	$175,013	$231,223	$251,267	$254,259	$230,391
Normal Cost Rate	15.18%	19.93%	19.62%	19.48%	19.45%
UAL Rate	33.90%	29.15%	29.46%	29.60%	29.63%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.8%	64.6%	68.2%	71.6%	76.7%
Amortization Period	18 years	30 years	26 years	19 years	12 years
Cash Flow %	-3.2%	-3.8%	-4.9%	-4.4%	-3.5%

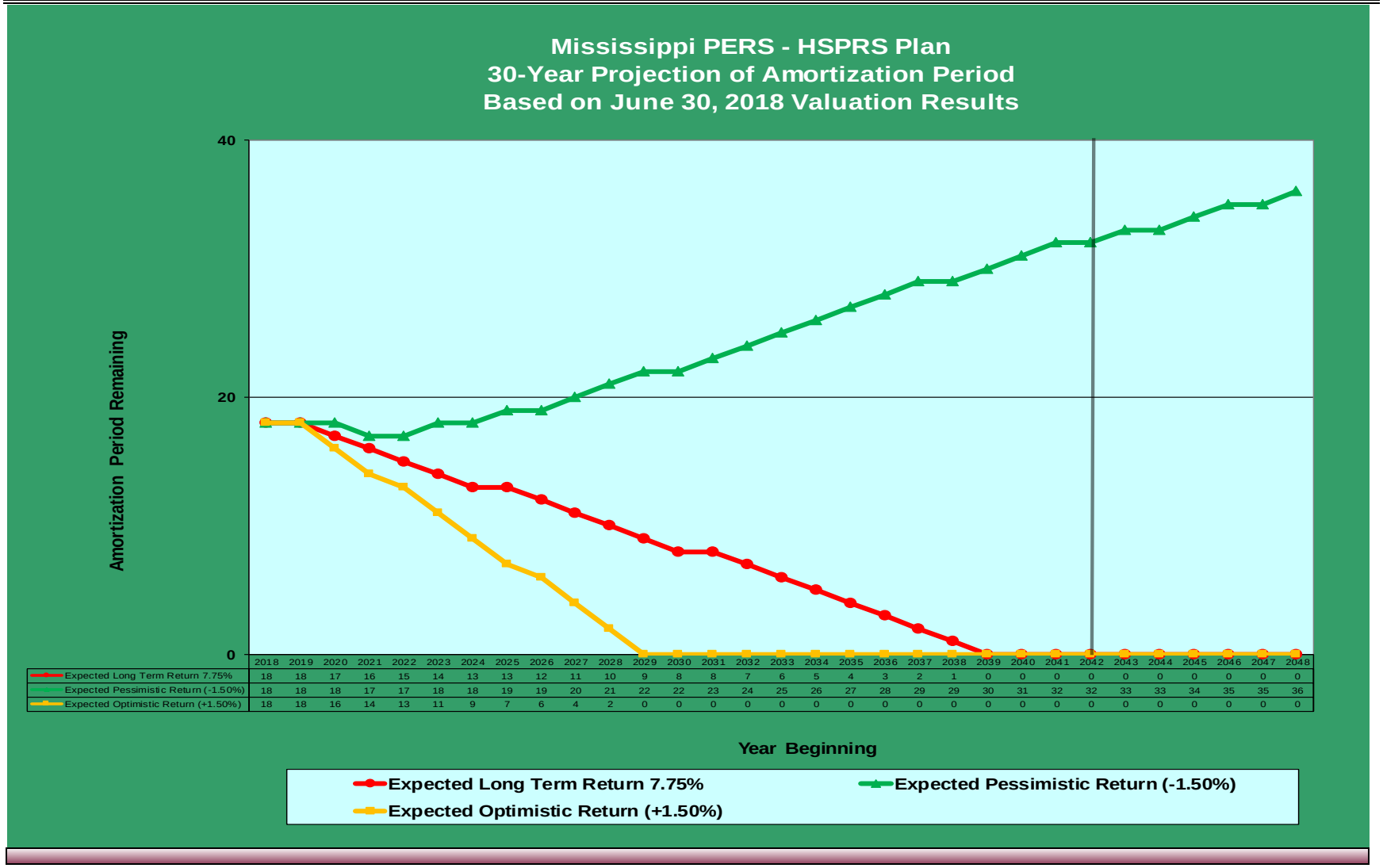
Section III – HSPRS Projection Results

The following graphs show a comparison of the projected funded ratios and amortization periods for the baseline valuation (assuming 7.75%) and two alternative investment return scenarios to show an optimistic view if the fund earns 1.50% above the assumed rate each year of the projection study and a pessimistic view if the fund earns 1.50% less than the assumed rate each year of the projection study. As can be seen from the graphs, under a pessimistic view of investment returns, the Plan remains solvent over the length of the projection period.

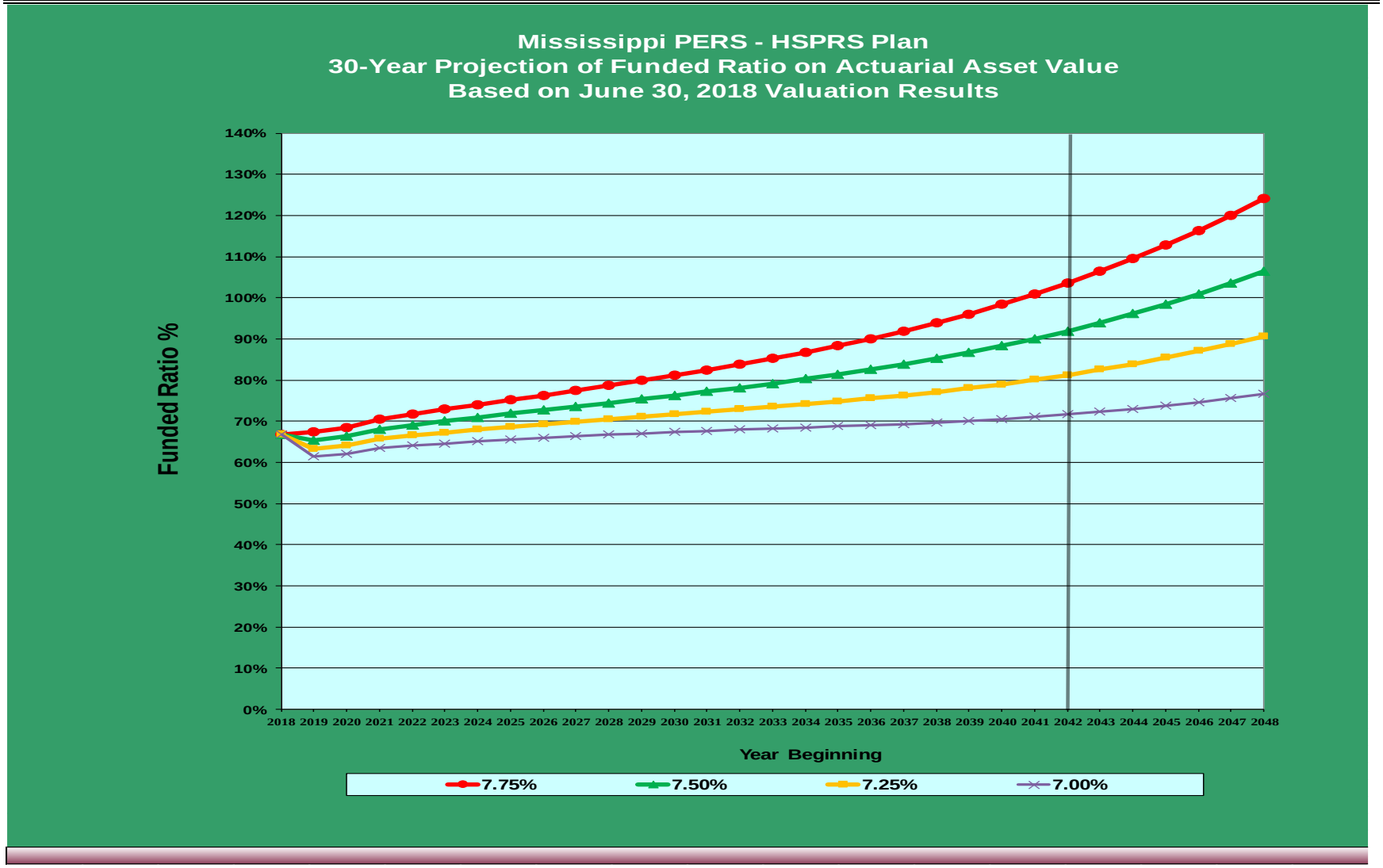
Mississippi PERS - HSPRS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2018 Valuation Results



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Expected Long Term Return 7.75%	66.8%	67.3%	68.5%	70.5%	71.7%	72.8%	74.0%	75.1%	76.3%	77.4%	78.6%	79.8%	81.1%	82.4%	83.7%	85.2%	86.7%	88.3%	90.1%	91.9%	93.9%	96.0%	98.4%	100.9	103.5	106.4	109.5	112.8	116.3	120.1	124.1
Expected Pessimistic Return (-1.50%)	66.8%	67.1%	67.8%	69.1%	69.4%	69.4%	69.3%	69.1%	68.8%	68.5%	68.1%	67.7%	67.2%	66.6%	65.9%	65.2%	64.5%	63.7%	62.9%	62.0%	61.1%	60.2%	59.3%	58.4%	57.5%	56.6%	55.7%	54.9%	54.1%	53.3%	52.5%
Expected Optimistic Return (+1.50%)	66.8%	67.5%	69.1%	71.8%	74.0%	76.4%	78.9%	81.5%	84.3%	87.2%	90.3%	93.6%	97.1%	100.8	104.8	109.2	113.9	119.0	124.4	130.4	136.8	143.8	151.3	159.4	168.2	177.6	187.7	198.6	210.2	222.7	236.0



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Expected Long Term Return 7.75%	18	18	17	16	15	14	13	13	12	11	10	9	8	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0
Expected Pessimistic Return (-1.50%)	18	18	18	17	17	18	18	19	19	20	21	22	22	23	24	25	26	27	28	29	29	30	31	32	32	33	33	34	35	35	36
Expected Optimistic Return (+1.50%)	18	18	16	14	13	11	9	7	6	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0


Mississippi PERS - HSPRS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2018 Valuation Results
Funded Ratio %
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048
Year Beginning
7.75%
7.50%
7.25%
7.00%

Section IV – SLRP Projection Results

SPECIAL ASSUMPTIONS

In addition to the regular valuation assumptions used in performing the annual actuarial valuations of SLRP (all assumptions utilized in the projection study are outlined in Appendix D), additional assumptions must be made that are unique to projections. The first of these is what, if any, change in the overall active membership will be anticipated. For this projection study it was assumed that the number of active members would remain static over the 30-year projection period.

Since we assume active members will leave the system through termination, death, disability or retirement, we need to make some assumptions as to the composition of new hires that will replace departing members in order to maintain the membership at a constant number. The new entrant profile we developed was based on the new hires over the 3 year period prior to the projection start date of June 30, 2018.

It is important to note that we lowered the average pay for new entrants for this projection report compared to last year as members of the legislature have not had significant pay increases over the past few years. In addition, an eligibility service load of 2.50 years was included in the new entrant profile as the census data shows more and more active members in SLRP are entering the Plan with service from the PERS plan. That profile is summarized in the table below.

Age	Average Pay	Percent Male	Weight
32	$37,500	85.0%	16%
39	37,500	85.0	16%
45	37,500	85.0	23%
51	37,500	85.0	25%
55	37,500	85.0	10%
66	37,500	85.0	10%

For the projection results presented in this section of the report, it was further assumed that the benefit structure as it exists on June 30, 2018 would remain in place for the following 30 years.

Section IV – SLRP Projection Results

FUTURE MEMBERSHIP

The following chart and graph show the headcounts of active participants and retired members over the projection period. The actives are broken down into those existing as of June 30, 2018 and those who are hired after June 30, 2018. We have assumed the active membership will continue at the current maximum population of 174 active members over the projected period. After about 11 years, the retiree headcount begins to drop as retiree deaths outnumber new retirees.

Member	2018	2023	2033	2042	2048
Active – Existing Employees	174	119	38	14	5
Active – New Entrants	0	55	136	160	169
Retired	207	213	188	142	125
Total	381	387	362	316	299

PROJECTION RESULTS

The baseline projection results shown below use the same actuarial assumption as used in the June 30, 2017 actuarial valuation report. In addition, the projection results using different long-term investment return assumptions for future valuations (7.50%, 7.25% and 7.00%) are included.

Baseline Projection Results (7.75%)
($000's)

	2018	2023	2033	2042	2048
Total Payroll	$6,833	$7,913	$10,410	$13,702	$16,535
UAL	$4,374	$4,475	$3,725	$820	($3,798)
Normal Cost Rate	2.79%	2.92%	3.05%	2.95%	2.77%
UAL Rate	4.61%	4.48%	4.35%	4.45%	4.63%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	82.1%	87.2%	97.5%	110.4%
Amortization Period	20 years	18 years	11 years	2 years	0 years
Cash Flow %	-5.0%	-5.4%	-5.2%	-3.7%	-3.0%

Section IV – SLRP Projection Results

Projection Results Assuming 7.50% Long-Term Investment Return
($000's)

	2018	2023	2033	2042	2048
Total Payroll	$6,833	$7,913	$10,410	$13,702	$16,535
UAL	$4,374	$5,309	$5,666	$4,884	$2,798
Normal Cost Rate	2.79%	3.20%	3.33%	3.22%	3.03%
UAL Rate	4.61%	4.20%	4.07%	4.18%	4.37%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	79.2%	80.9%	85.4%	92.5%
Amortization Period	20 years	26 years	19 years	11 years	5 years
Cash Flow %	-5.0%	-5.5%	-5.5%	-4.2%	-3.5%

Projection Results Assuming 7.25% Long-Term Investment Return
($000's)

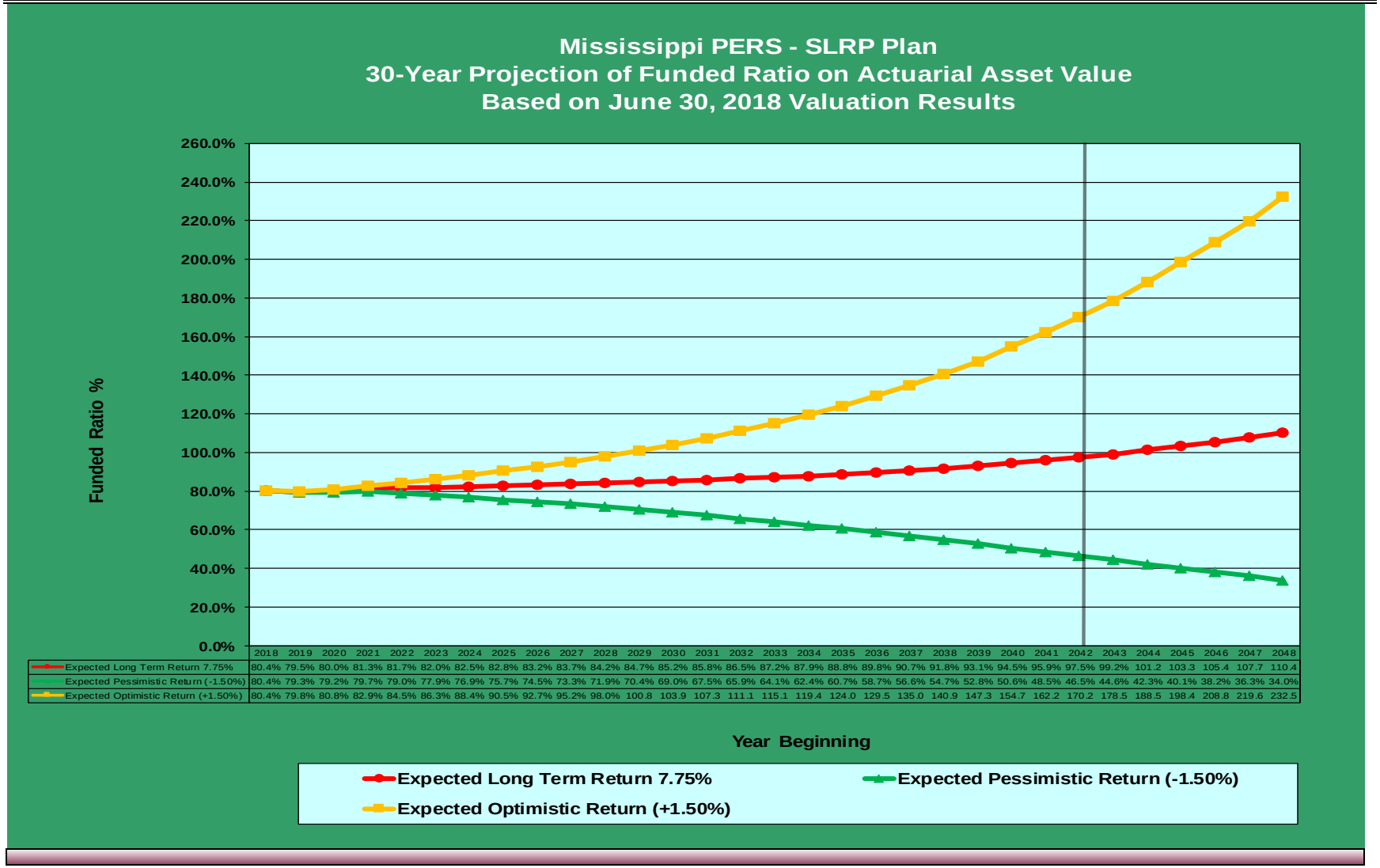
	2018	2023	2033	2042	2048
Total Payroll	$6,833	$7,913	$10,410	$13,702	$16,535
UAL	$4,374	$6,174	$7,596	$8,777	$8,966
Normal Cost Rate	2.79%	3.52%	3.64%	3.52%	3.31%
UAL Rate	4.61%	3.88%	3.76%	3.88%	4.09%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	76.3%	75.0%	74.4%	76.6%
Amortization Period	20 years	37 years	35 years	26 years	19 years
Cash Flow %	-5.0%	-5.5%	-5.8%	-4.7%	-4.2%

Projection Results Assuming 7.00% Long-Term Investment Return
($000's)

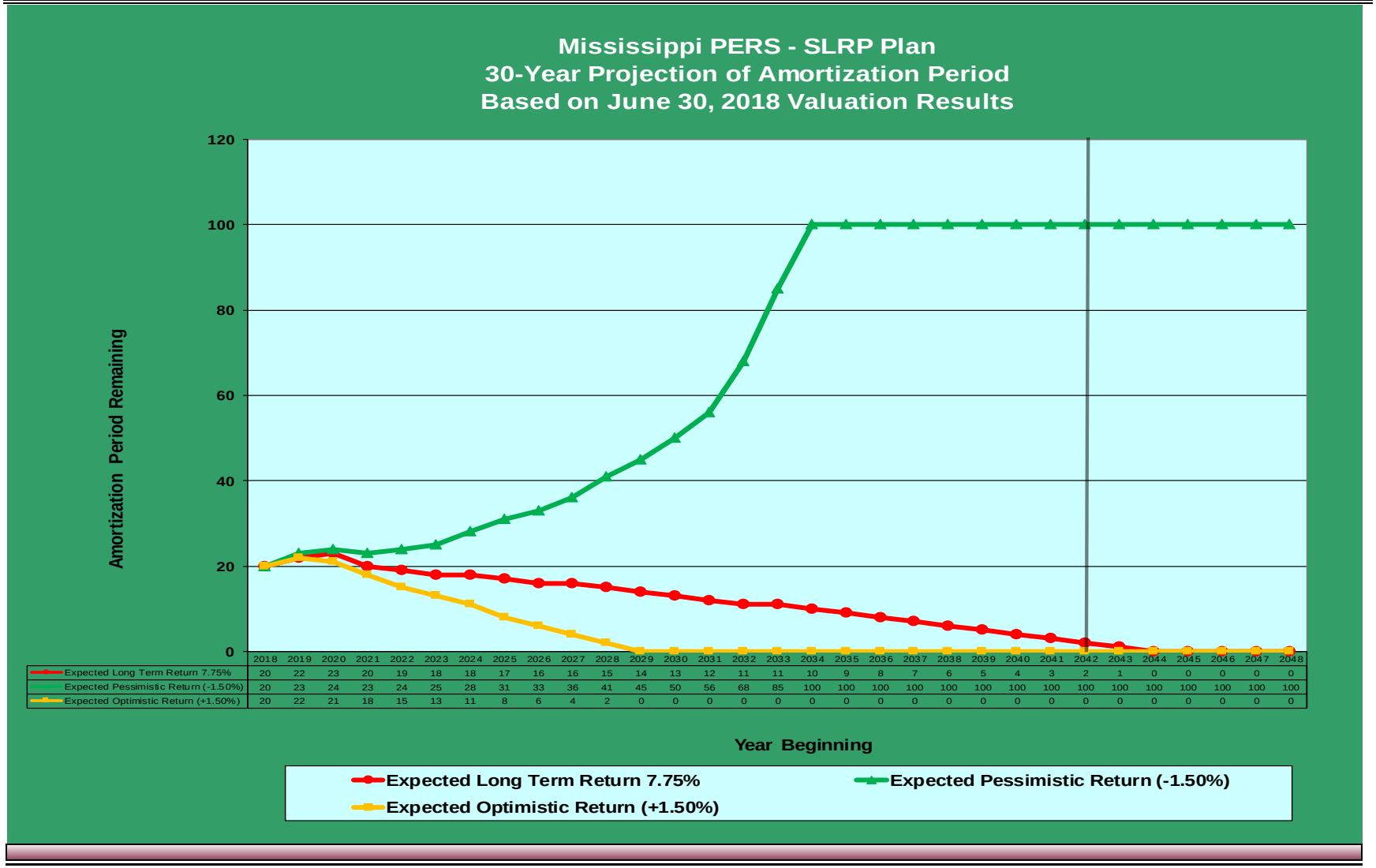
	2018	2023	2033	2042	2048
Total Payroll	$6,833	$7,913	$10,410	$13,702	$16,535
UAL	$4,374	$7,036	$9,481	$12,474	$14,701
Normal Cost Rate	2.79%	3.83%	3.94%	3.81%	3.59%
UAL Rate	4.61%	3.57%	3.46%	3.59%	3.81%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	73.6%	69.4%	64.4%	62.4%
Amortization Period	20 years	59 years	74 years	63 years	49 years
Cash Flow %	-5.0%	-5.6%	-6.1%	-5.3%	-5.0%

Section IV – SLRP Projection Results

The following graphs show a comparison of the projected funded ratios and amortization periods for the baseline valuation (assuming 7.75%) and two alternative investment return scenarios to show an optimistic view if the fund earns 1.50% above the assumed rate each year of the projection study and a pessimistic view if the fund earns 1.50% less than the assumed rate each year of the projection study. As can be seen from the graphs, even under a pessimistic view of investment returns, the Plan remains solvent over the length of the projection period.

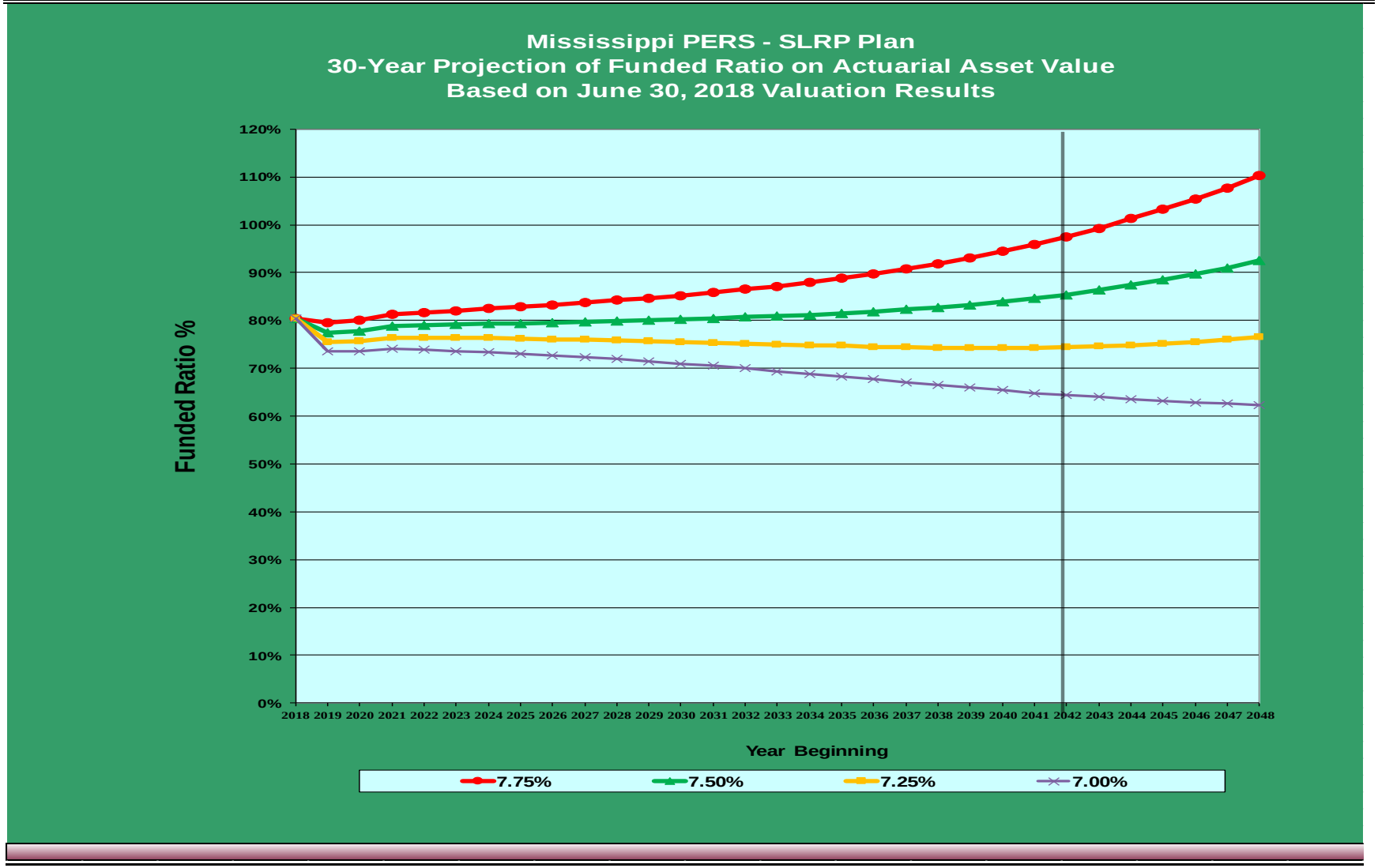


	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Expected Long Term Return 7.75%	80.4%	79.5%	80.0%	81.3%	81.7%	82.0%	82.5%	82.8%	83.2%	83.7%	84.2%	84.7%	85.2%	85.8%	86.5%	87.2%	87.9%	88.8%	89.8%	90.7%	91.8%	93.1%	94.5%	95.9%	97.5%	99.2%	101.2	103.3	105.4	107.7	110.4
Expected Pessimistic Return (-1.50%)	80.4%	79.3%	79.2%	79.7%	79.0%	77.9%	76.9%	75.7%	74.5%	73.3%	71.9%	70.4%	69.0%	67.5%	65.9%	64.1%	62.4%	60.7%	58.7%	56.6%	54.7%	52.8%	50.6%	48.5%	46.5%	44.6%	42.3%	40.1%	38.2%	36.3%	34.0%
Expected Optimistic Return (+1.50%)	80.4%	79.8%	80.8%	82.9%	84.5%	86.3%	88.4%	90.5%	92.7%	95.2%	98.0%	100.8	103.9	107.3	111.1	115.1	119.4	124.0	129.5	135.0	140.9	147.3	154.7	162.2	170.2	178.5	188.5	198.4	208.8	219.6	232.5



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Expected Long Term Return 7.75%	20	22	23	20	19	18	18	17	16	16	15	14	13	12	11	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0
Expected Pessimistic Return (-1.50%)	20	23	24	23	24	25	28	31	33	36	41	45	50	56	68	85	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Expected Optimistic Return (+1.50%)	20	22	21	18	15	13	11	8	6	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Section IV – SLRP Projection Results



Section V – Sensitivity Analysis

As mentioned earlier in the report, the intended purpose of the Projection Report is to help assess the Plan's funding progress and to provide information to decision makers to help ensure that the applicable pension liabilities and funding mechanisms are managed in a manner that promotes sustainability. The Projection Report process should be viewed as an enhancement to the actuarial valuation control cycle by providing additional evaluation metrics to assess the need for further, in-depth analysis of the risks to the Plan's sustainability. The actuarial valuation control cycle is a key component of managing a long-term liability whose ultimate value is based upon uncertain future events. As the ultimate value of future cash flows cannot be predicted with certainty, pension liabilities are managed in the short-term through the continuous monitoring of economic and demographic assumptions, with a keen eye on the identification, measurement, and management of risks.

The Projection Report process, like other actuarial modeling, is not intended to provide absolute results. The intended purpose of the Projection Report process is to identify anticipated trends and to compare various outcomes, under a given methodology, rather than predicting certain future events. The results produced by the Projection Report process do not predict the financial condition of the Plan or the Plan's ability to pay benefits in the future and do not provide any guarantee of future financial soundness of the Plan. Because actual experience will not unfold exactly as expected, actual results can be expected to differ from the results presented herein. To the extent actual experience deviates significantly from the assumptions, results could be significantly better or significantly worse than the expected outcome indicated in this report.

Actuarial assumptions are a key component of both the snapshot measurements in the actuarial valuation process and the projection of future valuation results. Actual experience can be expected to vary from year to year, even if the actuarial assumptions are met over the long term. The variability of certain key measures can have a significant impact on the date the Plan will reach full funding (actuarial value of assets equal to or greater than the actuarial accrued liability). The key variables include:

- Investment return
- Active membership growth
- Individual pay increases for active members

Of these variables, investment return is, by far, the most significant variable and the most volatile. The active membership growth and pay increase variables are also very important, but not nearly as significant as the investment return variable.

Section V – Sensitivity Analysis

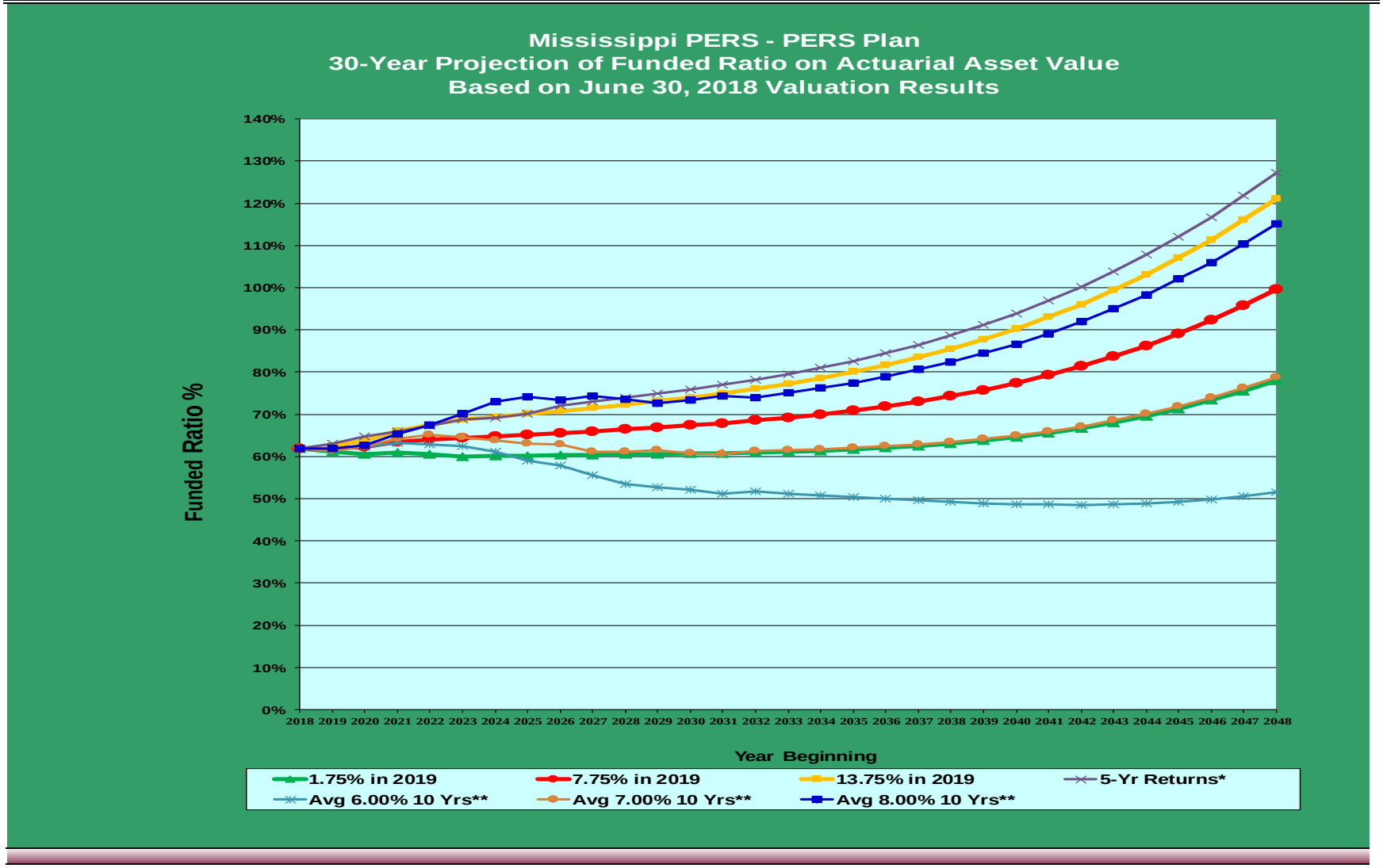
In this section of the report, we will demonstrate the variability in achieving funding goals based on sensitivity around the three key variables listed above. Earlier in this section, we reviewed the projections if the long-term investment return assumption was lowered to rates below 7.75%. In this section, we keep the long-term investment return assumption at 7.75% but review the sensitivity of short-term investment returns as a single year event (and then 7.75% for all years thereafter) and simulate the next 5- or 10-year periods of return (and then 7.75% for all years thereafter).

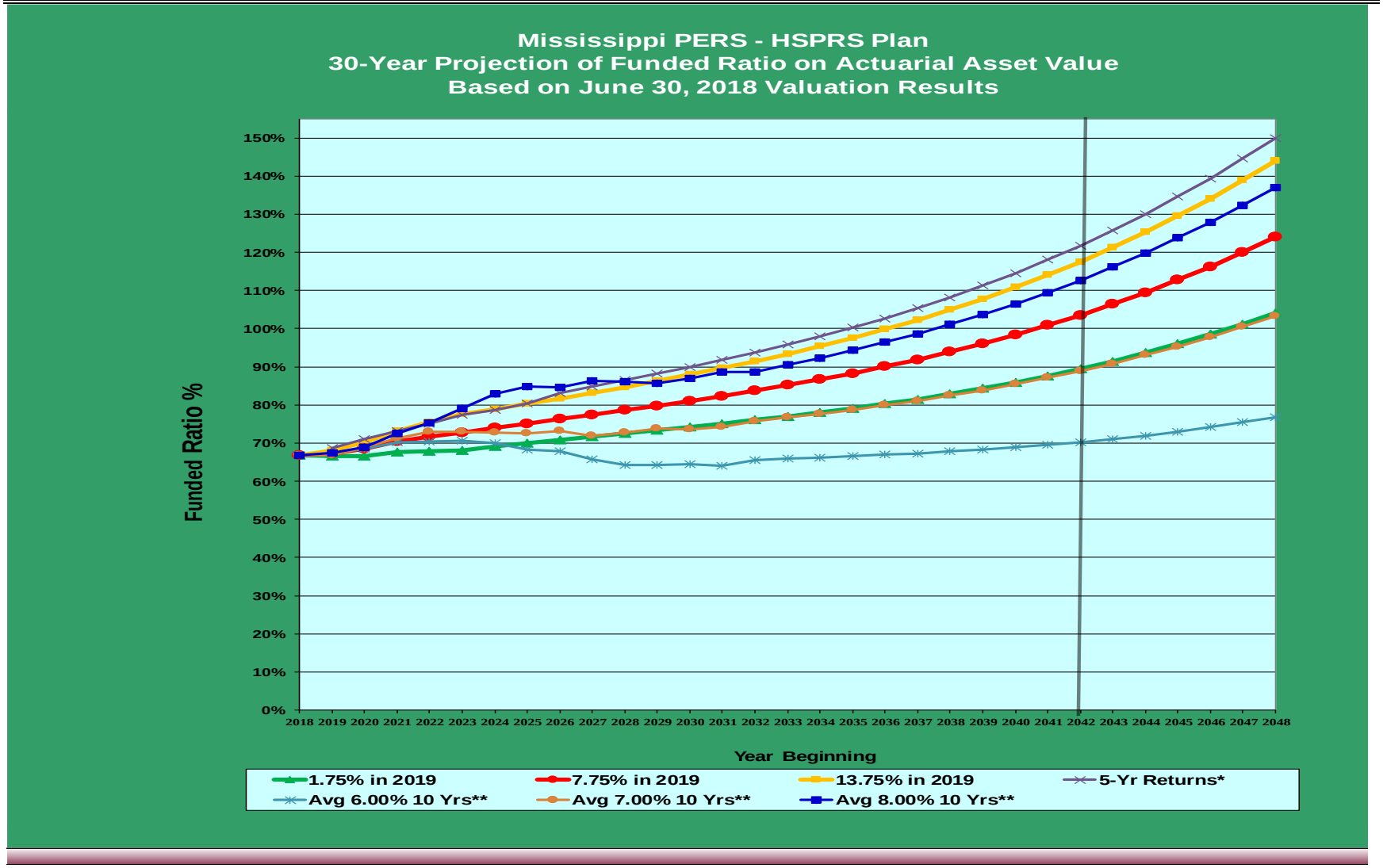
Projected Funded Ratios

Projected to:	2047	2042	2042
Single Year Event	**PERS**	**HSPRS**	**SLRP**
• 1.75% in 2019	75.5%	89.5%	79.6%
• 3.75% in 2019	82.3%	94.2%	85.6%
• 5.75% in 2019	89.0%	98.9%	91.5%
• 7.75% in 2019 (Baseline)	95.8%	103.5%	97.5%
• 9.75% in 2019	102.5%	108.2%	103.5%
• 11.75% in 2019	109.3%	112.9%	109.5%
• 13.75% in 2019	116.1%	117.6%	115.4%
• Simulate 2008 loss using -15% in 2019	19.0%	50.3%	29.6%
Returns over next 5-Year Period			
• Next five years equal to last five years (18.73%, 3.46%, 0.89%, 14.96%, 9.59%)*	121.7%	121.8%	120.4%
Average Returns over next 10-Year Period (Simulated returns using mean and standard deviations from PERS' Investment Consultant's Capital Market Assumptions)**			
• 6.00%	50.6%	70.2%	58.1%
• 7.00%	76.2%	88.9%	80.5%
• 8.00%	110.4%	112.7%	110.6%

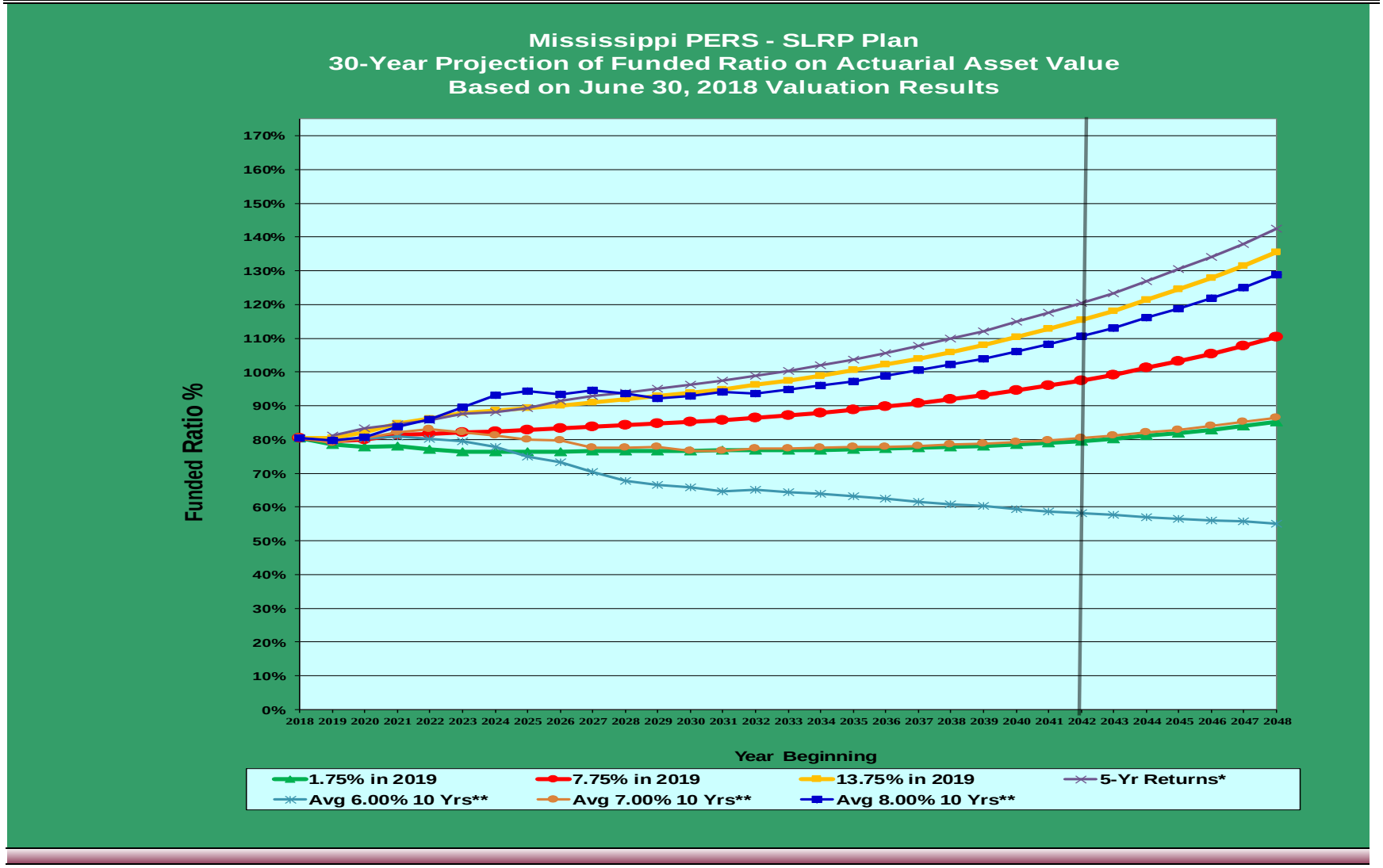
***6.00% Average Returns over the next 10-Year Period: 7.04%, 10.32%, 2.25%, 5.45%, 8.52%, 0.00%, 5.44%, 11.49%,-7.04%, 18.53%*
7.00% Average Returns over the next 10-Year Period: 3.61%, 20.67%,-0.02%, 11.58%,-4.84%, 8.13%, 18.10%, 2.04%, 0.83%, 12.67%
8.00% Average Returns over the next 10 Year Period: 9.00%, 9.01%, 16.24%, 4.84%, 16.62%, 6.78%,-3.74%, 6.19%, 18.57%,-1.19%

To put this table of funded ratios in perspective, the graphs on the next three pages provide the projection results of several of these sensitivity scenarios on short-term investment returns. We believe it demonstrates the importance of these continued projection reports and the continued monitoring of this sensitivity analysis because short-term differences in investment returns can have a major impact on the projection of funded ratios.


Mississippi PERS - PERS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2018 Valuation Results
Funded Ratio %
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048
Year Beginning
1.75% in 2019
7.75% in 2019
13.75% in 2019
5-Yr Returns*
Avg 6.00% 10 Yrs**
Avg 7.00% 10 Yrs**
Avg 8.00% 10 Yrs**


Mississippi PERS - HSPRS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2018 Valuation Results
Funded Ratio %
150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048
Year Beginning
1.75% in 2019
7.75% in 2019
13.75% in 2019
5-Yr Returns*
Avg 6.00% 10 Yrs**
Avg 7.00% 10 Yrs**
Avg 8.00% 10 Yrs**

Section V – Sensitivity Analysis



Section V – Sensitivity Analysis

While actual investment returns compared to that assumed is the most critical driver of funding, many other assumptions are used in the actuarial projections to review sensitivity, such as population growth and wage inflation. Variances in these other assumptions over the long-term may also have an impact on the funding of the Plan.

For the PERS and HSPRS plans, there have been significant decreases in active membership since 2008. In the baseline projections we assume a static population, meaning the active membership will be the same in each of the projection than it is in 2018. For sensitivity analysis, we have performed the projections assuming both a 0.25% and 0.50% increase and decrease each year around this static assumption. For PERS, a 0.50% decrease in active population each year of the projection results in the active population dropping to 120,000 (it is currently 150,000). Since SLRP has a set number of active legislative members and should remain static over the projection period, we have not reviewed the sensitivity around this assumption.

In the table below, we review these alternatives to the static active membership growth:

Projected Funded Ratios

Projected to:	2047	2042	2042
Active Membership Growth	**PERS**	**HSPRS**	**SLRP**
• Increase 0.50% each year	107.8%	107.6%	N/A
• Increase 0.25% each year	101.8%	105.6%	N/A
• Static Population (Baseline Assumption)	95.8%	103.5%	97.5%
• Decrease 0.25% each year	89.8%	101.5%	N/A
• Decrease 0.50% each year	83.8%	99.6%	N/A

The other assumption we performed a sensitivity analysis for is the wage inflation. As a result of the experience study presented in April, 2017, the Board adopted a reduction in the wage inflation assumption from 3.75% to 3.25%, which is 0.25% above the price inflation of 3.00%. Wage inflation is major component of the underlying salary increase assumptions, as well as the amortization of the Unfunded Accrued Liability which is based on the level percent of payroll amortization methodology.

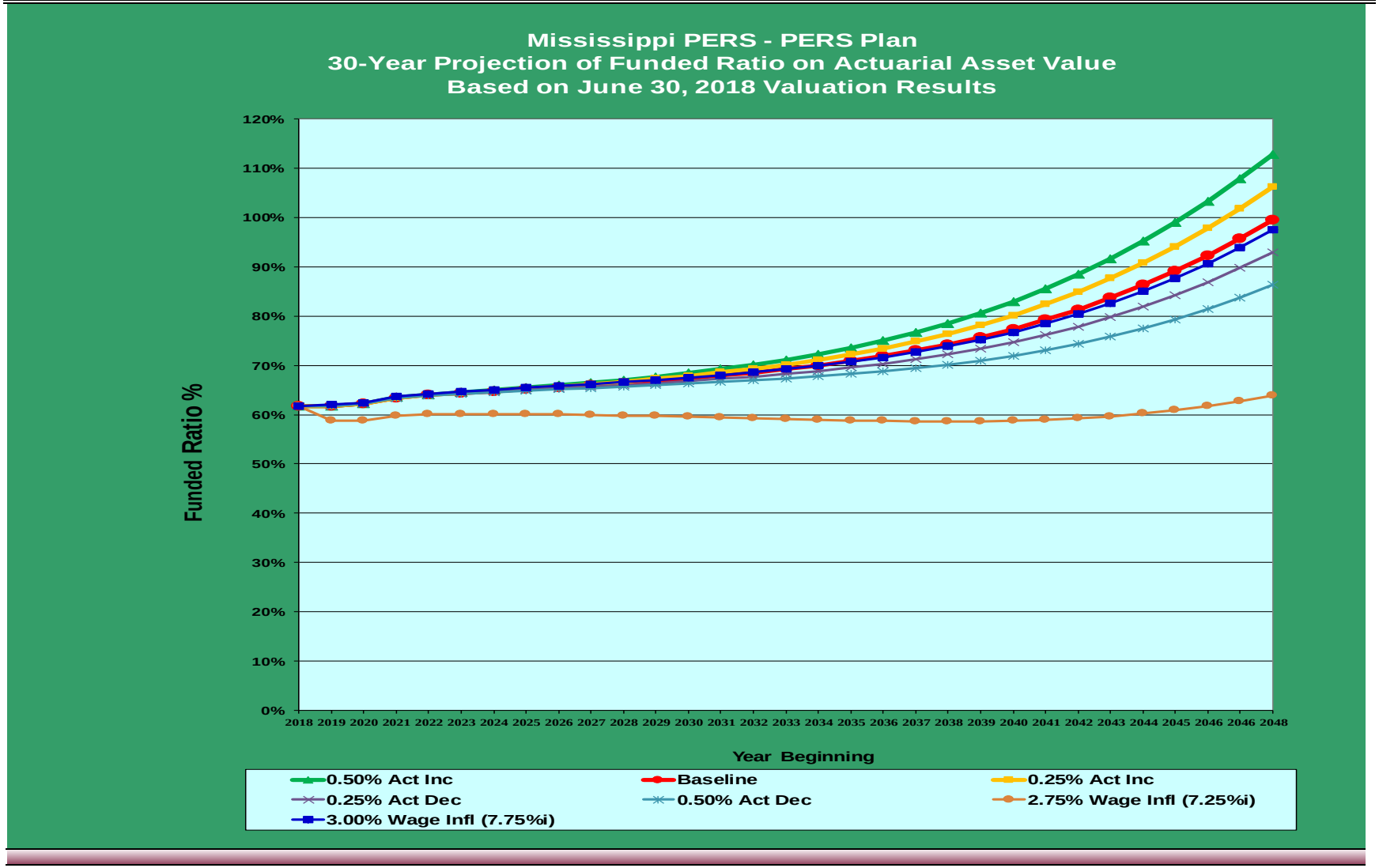
In the table below, the second scenario lowers the price and wage inflation by 0.25% but keeps the discount rate at 7.75% and the third scenario lowers all three assumptions by 0.50%.

Projected Funded Ratios

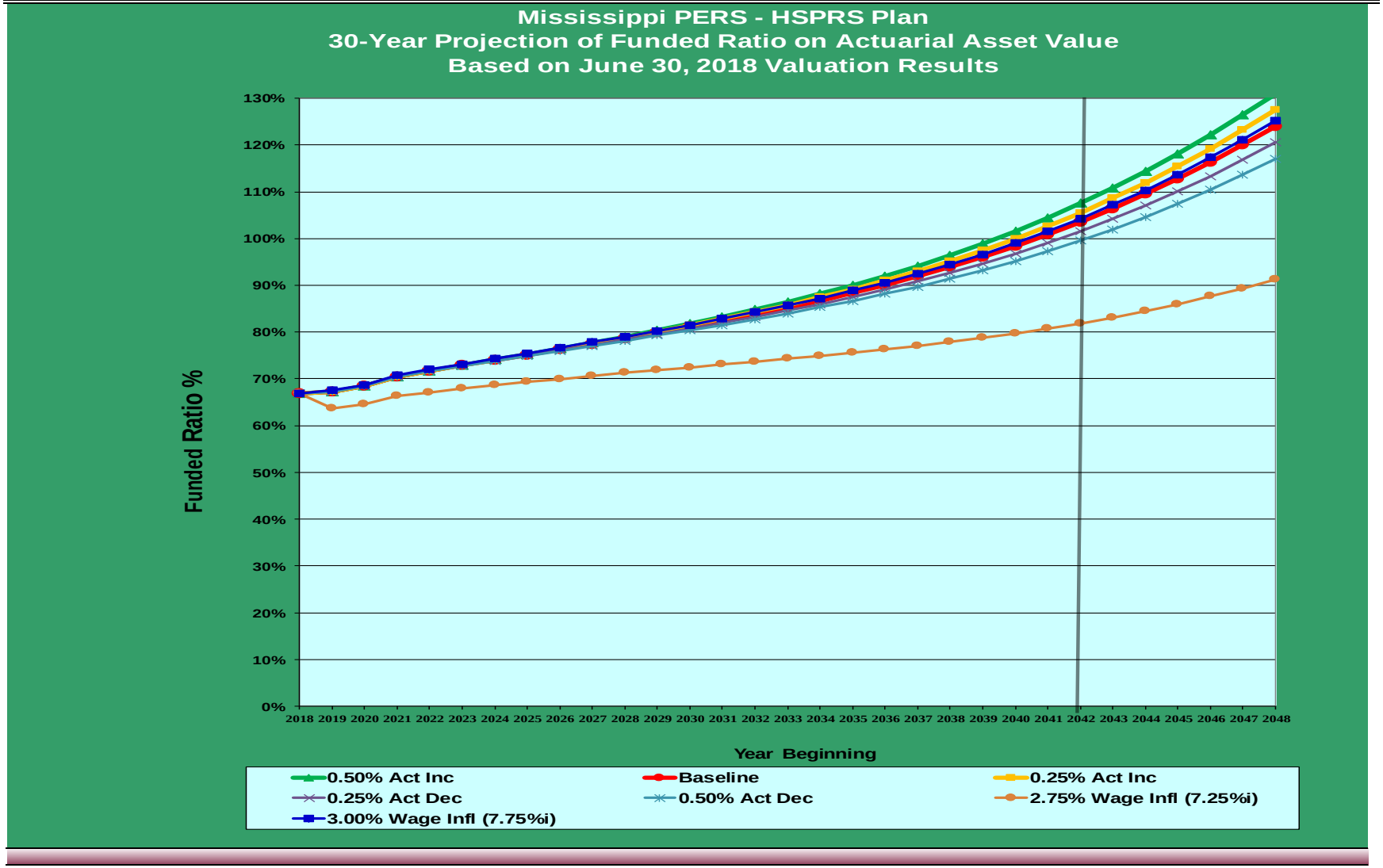
Projected to:				2047	2042	2042
Scenario	**Price Inflation**	**Discount Rate**	**Wage Inflation**	**PERS**	**HSPRS**	**SLRP**
1 – Baseline	3.00%	7.75%	3.25%	95.8%	103.5%	97.5%
2	2.75%	7.75%	3.00%	94.0%	104.3%	99.1%
3	2.50%	7.25%	2.75%	62.7%	81.9%	78.6%

Section V – Sensitivity Analysis

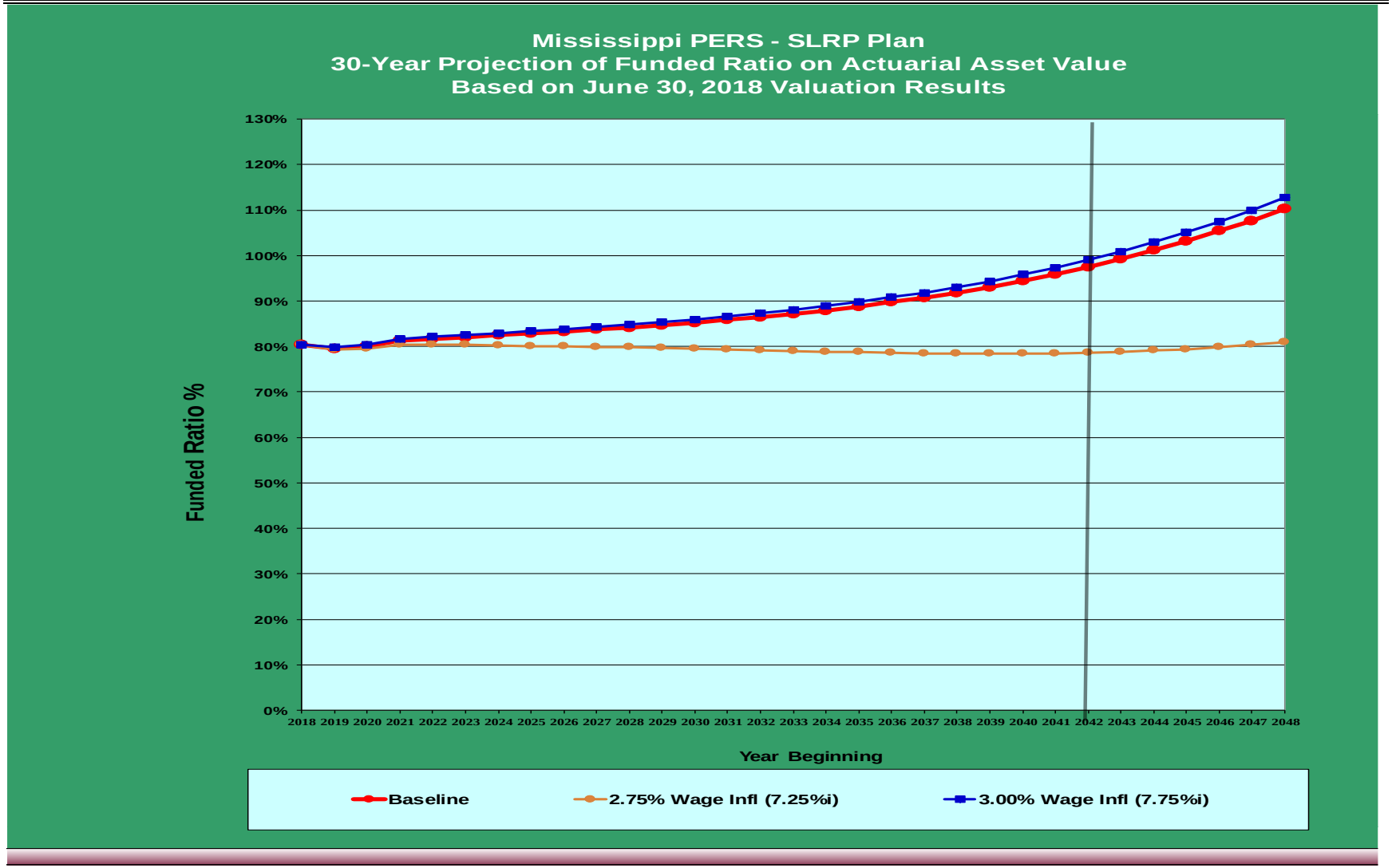
Over a long projection period, gains and losses due to population growth and wage inflation assumptions will be relatively concentrated around the expected value of these assumptions. So, the impact of the sensitivity around these baseline assumptions is small when compared to the investment return assumption. We have included graphs of these sensitivity projections on the next three pages. As can be seen, only the lowering of wage inflation to 2.75% (price inflation to 2.50%) and investment return assumption to 7.25% has a major impact on the baseline projections. The sensitivity of the active membership growth is minor when compared to the investment sensitivity.


Mississippi PERS - PERS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2018 Valuation Results
Funded Ratio %
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2046 2048
Year Beginning
0.50% Act Inc
Baseline
0.25% Act Inc
0.25% Act Dec
0.50% Act Dec
2.75% Wage Infl (7.25%i)
3.00% Wage Infl (7.75%i)

Section V – Sensitivity Analysis



Section V – Sensitivity Analysis



Section VI – Conclusion

PERS

Utilizing the funding policy for PERS, with a fixed contribution rate as a percentage of annual compensation of 17.40% beginning July 1, 2019 (15.75% for this fiscal year ending June 30, 2019), the projection results for 2018 show that the Plan will have a "Green" light status for the funding ratio and cash flow metrics and have a "Yellow" status for the ADC metric. **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the PERS employer contribution rate is necessary at this time.**

HSPRS

Utilizing the funding policy for HSPRS, with a fixed contribution rate of 49.08%% for the length of the projection period, the projection results for 2018 show that the Plan will have a funded ratio of 103.5% in 2042. **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the HSPRS employer contribution rate is necessary at this time.**

SLRP

Utilizing the funding policy for SLRP, with a fixed contribution rate of 7.40% for the length of the projection period, the projection results for 2018 show that the Plan will have a funded ratio of 97.5% in 2042. **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the SLRP employer contribution rate is necessary at this time.**

Going forward, short-term variations, both positive and negative, are to be expected given the volatility inherent in the actual investment return from year to year and should not elicit extreme concern without further analysis. Hopefully, with the addition of several actuarial metrics and sensitivity on the projection results, the Board will have more information on the trend of funded ratios for each of the Systems when making decisions in the future.

Appendix A – PERS Actuarial Assumptions and Methods

INTEREST RATE: 7.75% per annum, compounded annually (net of investment expense only). The expected return on assets consists of 3.00% price inflation and 4.75% real rate of return.

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed rates of separation from active service are as follows:

	Annual Rates of					
	Withdrawal and Vesting*		Death		Disability	
Age	Male	Female	Male	Female	Male	Female
20	25.00%	30.00%	0.0256%	0.0080%	0.010%	0.009%
25	18.00	18.25	0.0306	0.0085	0.012	0.011
30	11.50	12.00	0.0286	0.0107	0.017	0.014
35	8.50	8.75	0.0330	0.0141	0.036	0.017
40	6.75	7.00	0.0397	0.0195	0.110	0.070
45	6.25	6.00	0.0615	0.0324	0.230	0.140
50	6.25	6.00	0.1065	0.0543	0.290	0.220
55	6.25	6.00	0.1761	0.0811	0.500	0.380
60	6.25	6.00	0.2868	0.1137	0.530	0.410
65	6.25	6.00	0.4862	0.1694	0.200	0.150
70	6.25	6.00	0.7656	0.2850	0.200	0.150
74	6.25	6.00	1.1226	0.4322	0.200	0.150

	Annual Rates of Service Retirements			
	Male		Female	
Age	Under 25 Years of Service**	25 Years of Service and Over**	Under 25 Years of Service**	25 Years of Service and Over**
45		21.75%		17.50%
50		14.50		12.50
55		18.25		19.00
60	10.25%	19.50	13.00%	22.25
62	20.25	32.00	18.75	37.50
65	24.00	29.50	28.75	42.50
70	20.00	25.00	24.00	25.50
75	100.00	100.00	100.00	100.00

* For all ages, rates of 32.5% for 1st year of employment and 23.5% for 2nd year.
** For Tier 4 members, 30 years of service.

Appendix A – PERS Actuarial Assumptions and Methods

SALARY INCREASES: Representative values of the assumed annual rates of salary increases are as follows:

Service	Merit & Seniority	Annual Rates of Base (Economy)	Increase Next Year
0	15.25%	3.25%	18.50%
1	5.25	3.25	8.50
2	2.75	3.25	6.00
3	1.75	3.25	5.00
4	1.25	3.25	4.50
5-7	0.75	3.25	4.00
8-27	0.25	3.25	3.50
28 and Over	0.00	3.25	3.25

DEATH AFTER RETIREMENT: The mortality table, for post-retirement mortality, used in evaluating allowances to be paid is the RP-2014 Healthy Annuitant Blue Collar Table projected with Scale BB to 2022 with male rates set forward one year and adjusted by 106% for males at all ages and as follows for females: 90% for ages less than 76, 95% for age 76, 105% for age 78 and 110% for ages 79 and greater. The RP-2014 Disabled Retiree Table set forward 4 years for males and 3 years for females was used for the period after disability retirement. This assumption is used to measure the probabilities of each benefit payment being made after retirement. Mortality improvement is anticipated under this assumption as recent mortality experience shows actual deaths 11.2% greater than expected under the selected table for non-disability mortality and 10.5% greater than expected under the selected table for disability mortality.

PAYROLL GROWTH: 3.25% per annum, compounded annually.

ADMINISTRATIVE EXPENSES: 0.23% of payroll.

TIMING OF DECREMENTS AND PAY INCREASES: Middle of Year.

ACTIVE MEMBER DISABILITY ASSUMPTION: 7% of active member disabilities are assumed to be in the line of duty and 93% of active member disabilities are assume to not be in the line of duty.

ACTIVE MEMBER DEATH ASSUMPTION: 6% of active deaths are assumed to be in the line of duty and 94% of active member deaths are assumed to not be in the line of duty.

Appendix A – PERS Actuarial Assumptions and Methods

ACTIVE MEMBER WITHDRAWAL ASSUMPTION: 60% of vested participants who terminate before retirement elect to receive a deferred benefit upon attaining the eligibility requirements for retirement. They are assumed to commence their benefit at age 60 for Tiers 1, 2 and 3 and age 62 for Tier 4. The remaining 40% elect to withdraw their contributions.

MARRIAGE ASSUMPTION: 85% married with the husband three years older than his wife.

UNUSED SICK LEAVE: Assumed 0.50 years at retirement.

MILITARY SERVICE: For those who don't have a military service included in the data, we have assumed 0.20 years at retirement.

MAXIMUM COVERED EARNINGS ASSUMPTION GROWTH: 3.25%

AGE-LIMITED DISABILITY DECREMENTS: Assumed to turn off at age 60.

DEFERRED VESTEDS: Deferred vested benefits are assumed to commence at age 60 for Tiers 1, 2 and 3 and at age 65 for Tier 4.

ASSUMED INTEREST RATE ON EMPLOYEE CONTRIBUTIONS: 2.00%.

ASSET VALUATION METHOD: Actuarial value. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value.

VALUATION METHOD: The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 7.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

Appendix A – PERS Actuarial Assumptions and Methods

The employer contributions required to support the benefits of PERS are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made for pension benefits to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.

The unfunded actuarial accrued liability is determined by subtracting the current assets and the present value of prospective employer normal contributions and member contributions from the present value of expected benefits to be paid from the PERS. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.

Appendix B – HSPRS Actuarial Assumptions and Methods

INTEREST RATE: 7.75% per annum, compounded annually (net of investment expenses only). The expected return on assets consists of 3.00% price inflation and 4.75% real rate of return.

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of separation from active service are as follows:

		Death		Disability			
Age	Withdrawal and Vesting	Males	Females	Non-Duty	Duty	Service	Service Retirement*
25	5.60%	0.03%	0.01%	0.07%	0.00%	5	5%
30	4.00	0.03	0.01	0.09	0.01	10	5%
35	3.00	0.03	0.01	0.12	0.04	15	5%
40	2.00	0.04	0.02	0.15	0.05	20	5%
45	1.00	0.06	0.03	0.22	0.05	25	10%
50	1.00	0.11	0.05	0.38	0.04	30	25%
55	0.00	0.18	0.08	0.68	0.01	35	25%
60	0.00	0.29	0.11	1.16	0.00	40+	100%

* The annual rate of service retirement is 100% at age 61.

It is assumed that a member will be granted 1¾ years of service credit for unused leave at termination of employment. In addition, it is assumed that, on average, ¼ year of service credit for peace-time military service will be granted to each member.

SALARY INCREASES: Representative values of the assumed annual rates of salary increases are as follows:

	Annual Rates of		
Age	Merit & Seniority	Base (Economy)	Increase Next Year
20	5.56%	3.25%	8.81%
25	2.31	3.25	5.56
30	1.49	3.25	4.74
35	1.49	3.25	4.74
40	1.49	3.25	4.74
45	1.00	3.25	4.25
50	0.50	3.25	3.75
55	0.50	3.25	3.75
60	0.00	3.25	3.25

Appendix B – HSPRS Actuarial Assumptions and Methods

DEATH AFTER RETIREMENT: The mortality table, for post-retirement mortality, used in evaluating allowances to be paid was the RP-2014 Healthy Annuitant Blue Collar Mortality Table projected with Scale BB to 2022 with male rates set forward one year and adjusted by 106% for males at all ages and as follows for females: 90% for ages less the 76, 95% for age 76, 105% for age 78, and 110% for ages 79 and greater. The RP-2014 Disabled Retiree Mortality Table set forward 4 years for males and 3 years for females was used for the period after disability retirement. This assumption is used to measure the probabilities of each benefit payment being made after retirement. Mortality improvement is anticipated under this assumption as recent mortality experience shows actual deaths 11.2% greater than expected under the selected table for non-disability mortality and 10.5% greater than expected under the selected table for disability mortality.

PAYROLL GROWTH: 3.25% per annum, compounded annually.

ADMINISTRATIVE EXPENSES: 0.23% of payroll.

TIMING OF DECREMENT AND PAY INCREASES: Middle of Year.

ASSUMED INTEREST RATE ON EMPLOYEE CONTRIBUTIONS: 2.00%

MARRIAGE ASSUMPTION: 100% married with the husband three years older than his wife.

SURVIVING CHILD BENEFITS ASSUMPTION: A small load is applied for surviving children.

MAXIMUM COVERED EARNINGS ASSUMPTION GROWTH: 3.25%

MODIFIED CASH REFUND: Benefits were valued with a twelve year certain period for retirees and five year certain for active members to estimate the value of the modified cash refund feature.

ASSET VALUATION METHOD: Actuarial value. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value.

Appendix B – HSPRS Actuarial Assumptions and Methods

VALUATION METHOD: The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 7.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

The employer contributions required to support the benefits of HSPRS are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made for pension benefits to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.

The unfunded actuarial accrued liability is determined by subtracting the current assets and the present value of prospective employer normal contributions and member contributions from the present value of expected benefits to be paid from the HSPRS. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.

Appendix C – HSPRS History of Benefit Improvements

MISSISSIPPI HIGHWAY SAFETY PATROL RETIREMENT SYSTEM
History of Benefit Modifications

Fiscal Year Beginning	Benefit Modifications
July 1, 1958	• Mississippi Highway Safety Patrol Retirement System created.
July 1, 1966	• Removed limit of $200 per month for disability retirement payments. • Eliminated reduction in retirement benefits resulting from Social Security payments. • Provided same survivor benefits to disability retirant's beneficiaries as those provided for service retirant's beneficiaries.
July 1, 1974	• Authorized military service credit (not to exceed 4 years maximum unless proof furnished member was retained by causes beyond his control).
July 1, 1975	• Provided additional benefit payments (13th Checks) to retired patrolmen. • Authorized payment of benefits to spouses and families of patrolmen who die after serving minimum period or who are killed in line of duty.
July 1, 1976	• Provided benefits to widows of highway patrolmen who were killed in line of duty prior to enactment of highway patrol retirement system.
July 1, 1977	• Provided that a highway patrolman who reenters service with the highway safety patrol may receive retirement credit for prior years upon repayment of amount refunded and interest from date of refund to repayment.
July 1, 1979	• Provided guaranty of benefits and maximum retirement allowance in the highway safety patrol retirement system.
July 1, 1980	• Provided a minimum service and disability retirement benefit for members of MHSPRS. • Provided any member who served in maritime service during periods of hostility in WWII shall be allowed credit for maritime service. • Provided all members who served in armed forces during war or military conflict or in maritime service during periods of hostility in WWII shall be allowed credit regardless of when they retired.
July 1, 1982	• Provided employer pickup of member contributions. • Increases additional payment (13th check) to 1/2 of annual percentage change of CPI not to exceed 2 1/2%.
July 1, 1984	• Provided that unused leave shall be treated as creditable service under MHSPRS.
July 1, 1985	• Increased 13th check to an amount equal to 2 1/2% of annual percentage change in CPI for years thru 6-30-85; and for subsequent years 100% of annual percentage change in CPI not to exceed 2 1/2%; provided an additional amount could be paid in increments of 1/4 of 1% to a maximum of 1 1/2% provided there were sufficient gains in excess of accrued liability.
July 1, 1986	• Reduced to 5 years the required years to qualify to retire at age 55. • Provided full retirement with 30 years creditable service regardless of age. • Reduced the number of years which determine average compensation to 4 highest consecutive years.

Appendix C – HSPRS History of Benefit Improvements

Fiscal Year Beginning	Benefit Modifications
	• 3% reduction in retirement allowance shall apply to the lesser of: each year of age below age 55 or each year less 30 years of creditable service. • Provided retirement allowance shall not exceed 85% of average compensation. • Provided mandatory retirement and termination of membership at age 60. • Provided no monthly benefit payment may be made for a period of time in excess of that allowed by federal law. • Provided an ad hoc increase of 3% to retirees who retired prior to July 1, 1986, and average compensation was based on 5 consecutive years of earned compensation instead of 4. • Provided that a retiree may elect by an irrevocable agreement to receive additional payment (13th check) in equal installments not to exceed 6 months. • Amended section 25-13-13 on death benefits to conform to section 25-13-11 allowing 5 year vesting by deleting 10 year requirement. • Provided a one-time early retirement for any member who had at least 20 years of creditable service; exempted early service retirement allowance from the 3% reduction if member is below age 55; allowance was based on current fiscal year's salary.
July 1, 1989	• Provided survivor benefits from day one of employment to a spouse and/or dependent children of a member who is either killed in the line of performance of duty or dies as a direct result.
July 1, 1990	• Amended section 25-13-11 to reduce from 30 to 25 numbers of years required for full retirement regardless of age. • Provided a 10% ad hoc increase in annual retirement allowance to retired members and beneficiaries with minimum benefits of $500.00 if retired with 15 or more years of service credit; $300.00 per month if retired with 10 or more but less than 15 years credit; $250.00 per month to anyone with less than 10 years credit; beneficiaries to receive a minimum of $250.00 per month. • Established options for service and disability retirees retiring 7-1-90 or later. • Provided an active member qualified for retirement may pre-select an option. • Provided option selection will take precedence over automatic survivor benefits.
July 1, 1991	• Allowed sworn agents of MS Bureau of Narcotics, who were employed by such bureau prior to December 1, 1990, regardless of age, may be employed as enforcement officers, if they meet all other qualifications. Those employed retain all compensatory, personal and sick leave accrued; • Provided cost-of-living payment (13th check) shall be cumulative to conform to PERS law. • Provided regular interest shall be credited annually to member's employee contribution account.
July 1, 1992	• Provided benefits to dependent children to age 23 if they remain in school.
July 1, 1997	• Allowed retired Highway Patrolmen to irrevocably elect to have COLA (13th check) paid in twelve (12) equal installments.

Appendix C – HSPRS History of Benefit Improvements

Fiscal Year Beginning	Benefit Modifications
July 1, 1999	• Provide that if the member and beneficiary die before having received in benefits an amount equal to the total of the contributions and accrued interest of the member at the time of death, that the balance will be refunded to the designated beneficiary or by statutory succession. • Provided that payment of death benefits shall be in accordance with the statutory provisions set forth as of the date of death of the member. • Authorized a retiree who retired before or after July 1, 1999, to be eligible for the same "pop-up" and "pop-down" provisions of PERS; and recalculates the benefits of those retirees who selected Option 5 "pop-up" protection. • Authorized an ad hoc benefit adjustment to each member of the Mississippi Highway Safety Patrol Retirement System (MHSPRS) retired on or before July 1, 1999, in the amount of $3.50 per month for each full fiscal year of retirement through June 30, 1999, plus $1.00 per month for each year of service credit used in the calculation of benefits. • Removed from consideration in the base COLA the requirement that the Consumer Price Index (CPI) have increased by at least 2 ½%. • Provided that a prorated portion of the annual adjustment will be paid to the beneficiary or estate of any member or beneficiary who is receiving the annual adjustment in a lump sum, but who dies between July 1 and December 1 in those cases where no more monthly benefits will be paid after the member's or beneficiary's death. This prorated portion will be equal to the amount that such recipient would have received had he or she elected to receive the annual adjustment for the year on a monthly basis.
July 1, 2000	• Deleted the maximum option where no additional benefits are payable after death. The statute retains Option 9, which provides a maximum option with a 50% survivor benefit with no reduction in the member's retirement allowance. • Provided for a new retirement option that would allow a member who is eligible for an unreduced retirement benefit to select a partial lump-sum option at retirement. • **Allowed the Cost of Living Adjustment to be calculated on all full fiscal years in retirement, not just the years since the retirant's last retirement.** • Provided for the same service credit for active duty, as is allowed in PERS and is no longer limited to active duty service during times of conflict. This amendment applies to all persons who have retired from the Highway Patrol and who qualify for such credit, whether they retired before or after July 1, 2000. This provision, however, did not require any back payments. • Changed the maximum limitation on the retirement benefit from 85% of the average compensation regardless of the years of service to 100% of the average compensation.
July 1, 2002	• Provided that Option 4-C, Social Security Leveling Option, will no longer be available to members retiring on or after July 1, 2004. • Provided that any member who has five years of service (reduced from 10 years) may apply for a regular non-duty related disability retirement allowance.

Appendix C – HSPRS History of Benefit Improvements

Fiscal Year Beginning	Benefit Modifications
	• Provided for a compounded COLA, based on 3% of the retirement allowance for each full fiscal year in retirement with the 3% compounding beginning at age 60; to further provide that the age at which the compounding begins will be reduced gradually to age 55 as such can be accomplished without causing the unfunded accrued liability amortization period to exceed 20 years; to further provide that a pro-rated share of the lump-sum COLA will be paid if a benefit terminates before December 1 of the fiscal year. Also, allows the Board to grant a change in the manner the COLA is paid if a hardship is shown.
July 1, 2004	• Conformed the MHSPRS COLA section (except for the age of compounding) to the provisions in PERS. • Eliminated the re-marriage penalty which terminates a spouse's benefit, currently provided in subsections (1) and (3), upon his/her remarriage. This amendment also allows those spouses whose benefits have been previously terminated to apply to have the benefits reinstated prospectively.
July 1, 2008	• Allowed a retroactive effective date (up to 3 months) for retirees who revert from Option 2 or Option 4A to the maximum option following the death of the named beneficiary.
July 1, 2011	• Option 4, a 75% joint and survivor annuity, made available to members who retire on or after July 1, 2011 • For members hired on or after July 1, 2011, the mandatory retirement age was increased from age 60 to age 63.
July 1, 2016	• The interest rate on employee contributions shall be calculated based on the money market rate as published by the Wall Street Journal on December 31 of each preceding year with a minimum rate of one percent and a maximum rate of five percent. • The early retirement formula shall be reduced by an actuarially determined percentage or factor (rather than a fixed 3%) for each year of age below 55 or for each year of service below 25, whichever is less.

Appendix D – SLRP Actuarial Assumptions and Methods

INTEREST RATE: 7.75% per annum, compounded annually (net of investment expenses only). The expected return on assets consists of 3.00% price inflation and 4.75% real rate of return.

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed rates of separation from active service are as follows:

	Annual Rate of Death		
Age	Male	Female	Disability*
20	0.03%	0.01%	0.04%
25	0.03	0.01	0.05
30	0.03	0.01	0.07
35	0.03	0.01	0.11
40	0.04	0.02	0.17
45	0.06	0.03	0.23
50	0.11	0.05	0.30
55	0.18	0.08	0.35
60	0.29	0.11	0.40
65	0.49	0.17	0.00
70	0.77	0.29	0.00
75	1.24	0.48	0.00

* 93% are presumed to be non-duty related, and 7% are assumed to be duty related.

WITHDRAWAL AND VESTING: 20% in an election year, none in a non-election year.

SERVICE RETIREMENT: 30% in an election year, none in a non-election year. All members are assumed to retire no later than age 80.

It is assumed that a member will be granted 2.5 years of service credit for unused leave at termination of employment.

SALARY INCREASES: 3.25% per annum, for all ages.

Appendix D – SLRP Actuarial Assumptions and Methods

DEATH AFTER RETIREMENT: The mortality table, for post-retirement mortality, used in evaluating allowances to be paid was the RP-2014 Healthy Annuitant Blue Collar Mortality Table projected with Scale BB to 2022 with male rates set forward one year and adjusted by 106% for males at all ages and as follows for females: 90% for ages less the 76, 95% for age 76, 105% for age 78, and 110% for ages 79 and greater. The RP-2014 Disabled Retiree Mortality Table set forward 4 years for males and 3 years for females was used for the period after disability retirement. This assumption is used to measure the probabilities of each benefit payment being made after retirement. Mortality improvement is anticipated under this assumption as recent mortality experience shows actual deaths 11.2% greater than expected under the selected table for non-disability mortality and 10.5% greater than expected under the selected table for disability mortality.

PAYROLL GROWTH: 3.25% per annum, compounded annually.

ADMINISTRATIVE EXPENSES: 0.23% of payroll.

TIMING OF DECREMENTS AND PAY INCREASES: Middle of Year.

ASSUMED INTEREST RATE ON EMPLOYEE CONTRIBUTIONS: 2.00%

MARRIAGE ASSUMPTION: 85% married with the husband three years older than his wife.

MAXIMUM COVERED EARNINGS ASSUMPTION GROWTH: 3.25%

MODIFIED CASH REFUND: Benefits were valued with a six year certain period for retirees and a five year certain period for active members to estimate the value of the modified cash refund feature.

ASSET VALUATION METHOD: Actuarial value. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value.

Appendix D – SLRP Actuarial Assumptions and Methods

VALUATION METHOD: The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 7.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

The employer contributions required to support the benefits of SLRP are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made for pension benefits to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.

The unfunded actuarial accrued liability is determined by subtracting the current assets and the present value of prospective employer normal contributions and member contributions from the present value of expected benefits to be paid from the SLRP. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.

Appendix E – Board Funding Policies

Funding Policy for PERS

The purpose of the funding policy is to state the overall funding goals and objectives for the Public Employees' Retirement System of Mississippi (PERS), and to document both the metrics that will be used to measure progress toward achieving those goals, and the methods and assumptions employed to develop the metrics.

The employer contribution rate for PERS will be set based on the metrics, assumptions and methods outlined in Section II and III of this policy.

Section I - Funding Goals and Objectives

The objective in requiring employer and employee contributions to PERS is to accumulate sufficient assets during a member's active employment to fully finance the benefits the member will receive in retirement. In meeting this objective, PERS will strive to meet the following goals:

- Preservation of the defined benefit structure for providing lifetime benefits to the PERS membership,
- Contribution rate stability as a percentage of payroll (Fixed Contribution Rate – FCR),
- Maintain an increasing trend in the funded ratio over the projection period with an ultimate goal of being 100% funded,
- Require clear reporting and risk analysis of the metrics by the actuary as outlined in Section II of this policy using a "Signal Light" approach to assist the Board in determining whether increases or decreases are needed in the employer contribution rate, and
- Ensure benefit improvements are funded through increases in contribution requirements in accordance with Article 14, S 272A, of the Mississippi Constitution.

Section II – Metrics

To track progress in achieving the outlined funding goals and objectives and to assist the Board in making a determination whether an increase or decrease in the employer contribution rate for PERS should be considered, certain metrics will be measured annually in conjunction with information provided in the actuarial valuation and projection report. As part of the annual valuation and projection reports, each metric will be calculated and assigned a "Signal Light" with the following definitions:

Status	Definition
Green	Plan passes metric and PERS' funding goals and objectives are achieved
Yellow	Plan passes metric but a warning is issued that negative experience may lead to failing status
Red	Plan fails metric and PERS must consider contribution increases

Appendix E – Board Funding Policies

If any one of the metrics are in the Red Signal Light status in conjunction with the annual valuation report (presented in October) and the projection report (presented in December), the actuary will determine and recommend to the Board an employer contribution rate increase to consider that is sufficient enough to get all three metrics back into the Green Signal Light status. The employer contribution rate increase would be effective for the July 1st, 18 months following the completion of the projection report (e.g. if the projection report in 2019 deems an increase to be considered, then it would be effective for July 1, 2021).

The following metrics will be measured:

- Funded Ratio – defined as the actuarial value of assets divided by the actuarial accrued liability. One of the funding goals is to have an increasing funded ratio over the projection period with an ultimate goal of having a 100% funded ratio. The Board sets the Signal Light definition as follows:

Status	Definition
Green	Funded Ratio above 80% in 2047
Yellow	Funded Ratio between 65% and 80% in 2047
Red	Funded Ratio below 65% in 2047

- Cash flow as a percentage of assets – defined as the difference between total contributions coming into the trust and the benefit payments made to retirees and beneficiaries going out of the trust as a percentage of beginning year market value of assets. Over the projection period, this percentage will fluctuate from year to year so for Signal Light testing, the net cash flow percentage over the entire projection period will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	Net Cash Flow Percentage above negative 6.00% (-6.00%) during the projection period
Yellow	Net Cash Flow Percentage between negative 6.00% (-6.00%) and negative 7.75% (-7.75%) during the projection period
Red	Net Cash Flow Percentage below negative 7.75% (-7.75%) during the projection period

- Actuarially Determined Contribution (ADC) – defined as the contribution requirement determined by the actuary using a contribution allocation procedure based on the principal elements disclosed in Section III of this funding policy:

    1. Actuarial Cost Method
    2. Asset Smoothing Method
    3. Amortization Method

The calculation of the ADC will be determined during the actuarial valuation and not during the projection report. The ratio of the ADC to the fixed contribution rate (ADC/FCR) as set by this Funding Policy will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	ADC ratio at or below 100% of fixed contribution rate at valuation date
Yellow	ADC ratio between 100% and 110% of fixed contribution rate at valuation date
Red	ADC ratio above 110% of fixed contribution rate at valuation date

Section III – Assumptions and Methods

Each year, the actuary will perform an actuarial valuation and projection report for funding purposes. During the process, the actuary shall calculate all the metrics listed in Section II of this Funding Policy and PERS' Signal Light status for each metric. The following three major components of a funding valuation will be used:

- **Actuarial Cost Method** – This component determines the attribution method upon which the cost/liability of the retirement benefits are allocated to a given period, defining the normal cost or annual accrual rate associated with projected benefits. The Entry Age Normal Cost Method (EAN) is to be used for determination of the normal cost rate and the actuarial accrued liability for purposes of calculating the Actuarial Determined Contribution (ADC).
- **Asset Valuation Method** – This component dictates the method by which the asset value, used in the determination of the Unfunded Actuarial Accrued Liability (UAAL) and Funded Ratio, is determined. The asset valuation method to be used shall be a five-year smoothed market value of assets. The difference between the actual market value investment returns and the expected market investment returns is recognized equally over a five-year period.
- **Amortization Method** – This component prescribes, in terms of duration and pattern, the systematic manner in which the difference between the accrued liability and the actuarial value of assets is reduced. For purposes of calculating the ADC metric, the following amortization method assumptions are used**:**

    1. Once established for any component of the UAAL, the amortization period for that component will be closed and will decrease by one year annually.
    2. The amortization payment will be determined on a level percentage of pay basis.
    3. The length of the amortization periods will be as follows:
        a. Existing UAAL on June 30, 2018 – 30 years.
        b. Annual future actuarial experience gains and losses, assumption changes or benefit enhancements or reductions – 25 years from the date of the valuation.
    4. If any future annual actuarial valuation indicates that PERS has a negative UAAL, the ADC shall be set equal to the Normal Cost.

- **Actuarial Assumptions** – The actuarial assumptions are used to develop the annual and projected actuarial metrics, as well as the ADC rates. The actuarial assumptions are derived and proposed by the actuary and adopted by the PERS' Board in conformity with the *Actuarial Standards of Practice*. The actuarial assumptions for this funding policy were developed using the experience for the four-year period ending June 30, 2016 (State of Mississippi Retirement Systems Experience Investigation for the Four-Year Period Ending June 30, 2016). The long-term investment return assumption adopted by the PERS' Board in conjunction with the Experience Investigation is 7.75%.

Section IV – Governance Policy/Process

Below is a list of specific actuarial and funding related studies, the frequency at which they should be commissioned by the Board and additional responsibilities related to each:

- **Actuarial Valuation (performed annually in October)** – The Board is responsible for the review of PERS' annual actuarial valuation report, which provides the annual funded ratio and the calculation of the ADC.

- **Projection Report (performed annually in December)** – The Board is responsible for the review of PERS' 30-year projection report, which will include the actuarial metrics and Signal Light status for each metric over a 30-year period.

- **Experience Analysis (performed every two years on a rolling four year basis and presented in April)** – The Board is responsible for ensuring that an experience analysis is performed as prescribed, review of the results of the study, and approving the actuarial assumptions and methodologies to be used for all actuarial purposes relating to the defined benefit pension plan.

- **Actuarial Audit (performed at least every five years)** – The Board is responsible for the review of an audit report performed by a new actuarial firm to provide a critique of the reasonableness of the actuarial methods and assumptions in use and the resulting actuarially computed liabilities and contribution rates.

- **Funding Policy Review (performed at least annually)** – The Board is responsible for the periodic review of this policy, but at least annually following the Projection Report and biennially following the Experience Analysis.

Section V - Glossary of Funding Policy Terms

- **Actuarial Accrued Liability (AAL):** The AAL is the value at a particular point in time of all past normal costs. This is the amount of assets the plan would have today if the current plan provisions, actuarial assumptions, and participant data had always been in effect, contributions equal to the normal cost had been made, and all actuarial assumptions had been met.
- **Actuarial Cost Method:** The actuarial cost method allocates a portion of the total cost (present value of benefits) to each year of service, both past service and future service.
- **Actuarial Determined Contribution (ADC):** The potential payment to the plan as determined by the actuary using a contribution allocation procedure which, if contributed consistently and combined with investment earnings, would be sufficient to pay promised benefits in full over the long-term. The ADC may or may not be the amount actually paid by the plan sponsor or other contributing entity.
- **Asset Values**:
  - **Actuarial Value of Assets (AVA):** The AVA is the market value of assets less the deferred investment gains or losses not yet recognized by the asset smoothing method.
  - **Market Value of Assets (MVA):** The MVA is the fair value of assets of the plan as reported in the plan's audited financial statements.
- **Entry Age Normal Actuarial Cost Method (EAN):** The EAN actuarial cost method is a funding method that calculates the normal cost as a level percentage of pay or level dollar amount over the working lifetime of the plan's members.
- **Funded Ratio:** The funded ratio is the ratio of the plan assets to the plan's actuarial accrued liabilities.
  - **Actuarial Value Funded Ratio:** is the ratio of the AVA to the AAL.
- **Normal Cost**: The normal cost is the cost allocated under the actuarial cost method to each year of active member service.
- **Present Value of Benefits (PVB) or total cost:** The PVB is the value at a particular point in time of all projected future benefit payments for current plan members. The future benefit payments and the value of those payments are determined using actuarial assumptions regarding future events. Examples of these assumptions are estimates of retirement and termination patterns, salary increases, investment returns, etc.
- **Surplus:** A surplus refers to the positive difference, if any, between the AVA and the AAL.
- **Unfunded Actuarial Accrued Liability (UAAL):** The UAAL is the portion of the AAL that is not currently covered by the AVA. It is the positive difference between the AAL and the AVA.
- **Valuation Date:** The valuation date is the annual date upon which an actuarial valuation is performed; meaning that the trust assets and liabilities of the plan are valued as of that date. PERS' annual valuation date is June 30th.

Appendix E – Board Funding Policies

Funding Policy for SLRP

The purpose of the funding policy is to state the overall funding goals for the Supplemental Legislative Retirement Plan (referred to as "System" in this policy), the benchmarks that will be used to measure progress in achieving those goals, and the methods and assumptions that will be employed to develop the benchmarks.

The policy refers to pension benefits and does not address retiree healthcare benefits that may be provided under statute in the future. In addition to periodic reviews of this policy, the Board will amend the policy if retiree healthcare benefits become payable.

I. Funding Goals

The objective in requiring employer and member contributions to the System is to accumulate sufficient assets during a member's employment to fully finance the benefits the member receives throughout retirement. In meeting this objective, the System will strive to meet the following funding goals:

- To maintain an increasing ratio of system assets to accrued liabilities and reach an 80 percent minimum funded ratio in 2042;
- To maintain adequate asset levels to finance the benefits promised to members;
- To develop a pattern of stable contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the normal cost determined under the Entry Age Normal funding method;
- To provide intergenerational equity for taxpayers with respect to System costs; and
- To fund benefit improvements through increases in contribution rates in accordance with Article 14, § 272A, of the Mississippi Constitution.

II. Benchmarks

To track progress in achieving the previously outlined funding goals, the following benchmarks will be measured annually as of the actuarial valuation date (with due recognition that a single year's results may not be indicative of long-term trends):

- **Funded ratio** - The funded ratio, defined as the actuarial value of System assets divided by the System's actuarial accrued liability, should be increasing over time, before adjustments for changes in benefits, actuarial methods, and/or actuarial assumptions, with a target of at least 80 percent in 2042. If the projected funded ratio is less than 60 percent in 2042 or if the projected funded ratio is projected

to be less than 75 percent in 2042 following two consecutive annual projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 85 percent in 2042. If a funded ratio of 100 percent or more is attained, and is projected to remain above 100 percent for the ensuing 30 years following two consecutive annual projection reports, a reduced contribution pattern will be established provided the projected funded ratio remains at or above 100 percent in every future year.

- **Contribution rate history -** Employer and member contribution rates should be level from year to year when expressed as a percent of active member payroll unless the projected funded ratio reaches a level that triggers a change in contribution rates. The initial employer contribution rates for the Supplemental Legislative Retirement Plan (SLRP) set under this policy, as revised October 23, 2012, will be 7.40 percent of active member payroll effective July 1, 2013.
- **Unfunded Actuarial Accrued Liability (UAAL) amortization period -** The amortization period for the System's UAAL should be declining over time.

III. Methods and Assumptions

The actuarial funding method used to develop the benchmarks will be entry age normal. The method used to develop the actuarial value of assets will recognize the underlying market value of the assets by spreading each year's unanticipated investment income (gains and losses) over a five-year smoothing period (20 percent per year) as adopted by the Board.

The actuarial assumptions used will be those last adopted by the Board based upon the advice and recommendation of the System's actuary. The actuary shall conduct an investigation into the system's experience at least every two years on a rolling four year basis, and utilize the results of the investigation to form the basis for those recommendations.

The Board will have an audit of the System's actuarial valuation results conducted by an independent actuary at least every six years. The purpose of such a review is to provide a critique of the reasonableness of the actuarial methods and assumptions in use and the resulting actuarially computed liabilities and contribution rates.

IV. Funding Policy Review

The funding policy components and triggers will be reviewed annually following the annual actuarial valuation and in conjunction with the annual projection report and will be amended as necessary following each experience investigation conducted by the Board.

Appendix E – Board Funding Policies

Funding Policy for HSPRS

The purpose of the funding policy is to state the overall funding goals for the Mississippi Highway Safety Patrol Retirement System (System), the benchmarks that will be used to measure progress in achieving those goals, and the methods and assumptions that will be employed to develop the benchmarks.

I. Funding Goals

The objective in requiring employer and member contributions is to accumulate sufficient assets during a member's employment to fully finance the benefits the member receives throughout retirement. In meeting this objective, the System will strive to meet the following funding goals:

- To maintain an increasing ratio of System assets to accrued liabilities and reach an 80 percent minimum funded ratio in 2042;
- To maintain adequate asset levels to finance the benefits promised to members;
- To develop a pattern of stable contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the normal cost determined under the Entry Age Normal funding method;
- To provide intergenerational equity for taxpayers with respect to system costs; and
- To fund benefit improvements through increases in contribution rates in accordance with Article 14, § 272A, of the Mississippi Constitution.

II. Benchmarks

To track progress in achieving the previously outlined funding goals, the following benchmarks will be measured annually as of the actuarial valuation date (with due recognition that a single year's results may not be indicative of long-term trends):

- **Funded ratio -** The funded ratio, defined as the actuarial value of System assets divided by the System's actuarial accrued liability, should be increasing over time before adjustments for changes in benefits, actuarial methods, and/or actuarial assumptions, with a target of at least 80 percent in 2042. If the funded ratio is projected to be less than 60 percent in 2042 or if the funded ratio is projected to be less than 70 percent following three consecutive annual projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 90 percent in 2042. If a funded ratio of 100 percent or more is attained, and is projected to remain above 100 percent for the ensuing 30 years following three consecutive annual projection reports, a reduced contribution pattern

will be established provided the projected funded ratio remains at or above 100 percent in every future year.

- **Contribution rate history** - Employer and member contribution rates should be level from year to year when expressed as a percent of active member payroll unless the projected funded reaches a level that triggers a change in contribution rates. The initial employer contribution rate set under this policy as revised June 19, 2013 is 37.00 percent of active member payroll effective July 1, 2013. This contribution rate will increase to 49.08 percent of active member payroll effective July 1, 2018.
- **Unfunded Actuarial Accrued Liability (UAAL) amortization period** - The amortization period for the System's UAAL should be declining over time.

III. Methods and Assumptions

The actuarial funding method used to develop the benchmarks will be entry age normal. The method used to develop the actuarial value of assets will recognize the underlying market value of the assets by spreading each year's unanticipated investment income (gains and losses) over a five-year smoothing period (20 percent per year), as adopted by the Board of Trustees of the Public Employees' Retirement System of Mississippi (PERS).

The actuarial assumptions used will be those last adopted by the PERS Board based upon the advice and recommendation of the System's actuary. The actuary shall conduct an investigation into the System's experience at least every two years on a rolling four-year basis, and utilize the results of the investigation to form the basis for those recommendations.

The PERS Board will have an audit of the System's actuarial valuation results conducted by an independent actuary at least every six years. The purpose of such a review is to provide a critique of the reasonableness of the actuarial methods and assumptions in use and the resulting actuarially computed liabilities and contribution rates.

IV. Funding Policy Review

The funding policy components and triggers will be reviewed annually following the annual actuarial valuation and in conjunction with the annual projection report and will be amended as necessary following each experience investigation conducted by the Board.