Pennsylvania Public School Employees' Retirement System

Five-Year Experience Review
Prepared as of June 30, 2015

June 10, 2016

Disclosures

The information contained herein is developed for the Board of Trustees and Staff of PSERS by Buck Consultants, LLC using generally accepted actuarial principles and techniques in accordance with all applicable Actuarial Standards of Practice (ASOPs). The presentation contains key results of the June 30, 2015 five-year experience study. All recommendations contained in this report are consistent with each other, as appropriate.

The material contained herein is based on member and financial data, actuarial assumptions and methods, and plan provisions applicable for the June 30, 2015 experience investigation of the Pennsylvania Public School Employees' Retirement System.

Where presented, references to "funded ratio" and "unfunded accrued liability" are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in reduced funded ratios and increased unfunded accrued liabilities. Moreover, the funded ratio is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan were a settlement being considered.

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Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. An analysis of the potential range of future results is beyond the scope of this study.

David L. Driscoll is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. Edward Quinn and Salvador Nakar are Members of the American Academy of Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We are available to answer any questions on the material contained herein, or to provide explanations or further details as may be appropriate.

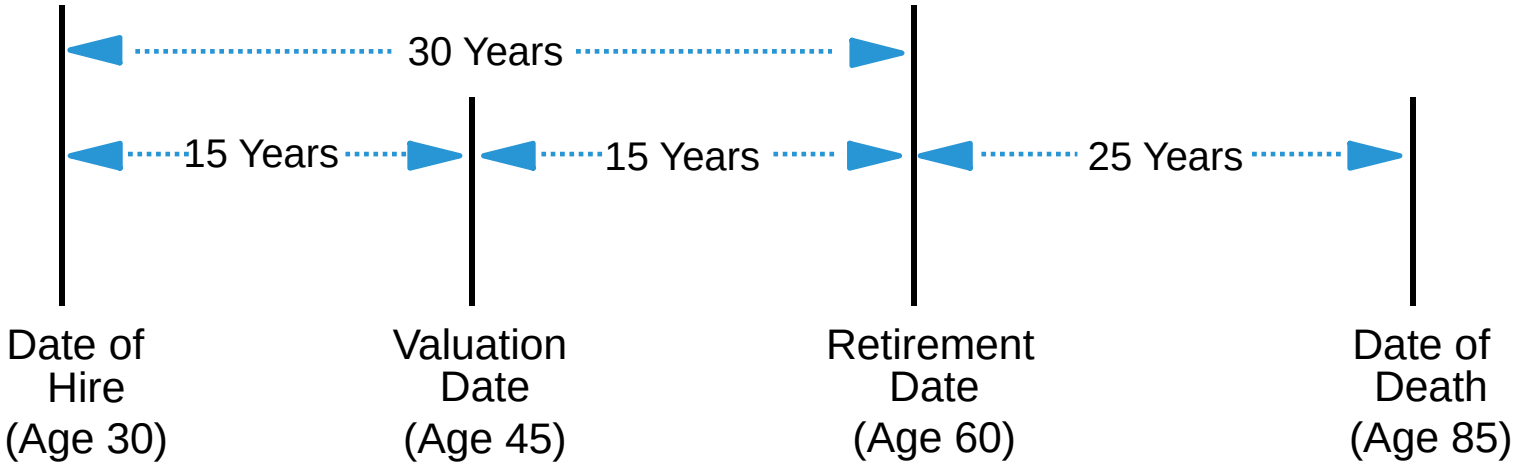
Experience Review

- Experience review results based on 5 years of data
- Act 120 created two new classes of PSERS active members, T-E and T-F:
  - Employees who become members of PSERS on or after July 1, 2011 are automatically enrolled as Class T-E members
  - Class T-E members may elect membership into Class T-F within 45 days of enrollment
  - Actuarial valuations currently apply the same demographic assumptions used for legacy Classes T-C and T-D to Classes T-E and T-F.
  - As of the June 30, 2015 actuarial valuation, there were 41,189 Class T-E members with average service of 1.3 years and 7,280 Class T-F members with average service of 1.7 years.
  - As of June 30, 2015, there is insufficient Class T-E and Class T-F data accumulated to develop demographic assumptions solely for Class T-E and Class T-F active members.
    - The experience for Class T-E and Class T-F members for non-vested withdrawal prior to 5 years of Service and Superannuation (age 65 with 3 years of service) have been combined with the experience of Class T-C and Class T-D members.
    - The Class T-E and Class T-F experience will be reviewed when the next scheduled study is prepared as of June 30, 2020 and changes, if warranted, will be recommended at that time.

Things That Happen to Members (Demographics Assumptions)

- **KNOWN at valuation date:**
  1. Age
  2. Gender
  3. Service to date
  4. Membership class

- **ASSUMED at valuation date:**
  1. Retirement rate(s)
  2. Death rates before and after retirement
  3. Disability rates
  4. Other termination rates



Things That Happen to Members – Salary Increases (Economic Assumptions)

- KNOWN at valuation date:

Salary History	
Age 45	$ 38,954
Age 46	40,999
Age 47	43,069
Total	$123,022

Current 3-Year FAS

$123,022/3 = $41,007

- ASSUMED at valuation date:

at Retirement	
Age 57	$ 64,799
Age 58	67,228
Age 59	69,750
Total	$201,777

Projected 3-Year FAS

$201,777/3 = $67,259

Note: Example is for a Class T-D member.

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Things That Happen to Money (Economic Assumptions)

- **KNOWN at valuation date:**

  1. Market value of System assets
  2. Composition of System assets
     - Stocks
     - Bonds
     - Short term
     - Long term
     - International
     - Real estate
     - Alternative investments

- **ASSUMED at valuation date:**

  1. Future rates of investment return
  2. Future rates of inflation

Selection of Assumptions*

What Assumption	Who Recommends to the Board
► Economic:	
• Investment return • Inflation	• PSERS staff, Investment Consultant and Actuary
• Individual salary increases	• PSERS staff and Actuary
► Demographic:	
• Retirement • Disability • Withdrawal • Mortality	• Actuary
• Optional forms of payment elections	• PSERS staff and Actuary

* Recent revisions to the ASOPs require the actuary to evaluate assumptions adopted by the Board for reasonableness unless the actuary feels he/she cannot make such an evaluation (which conclusion must be disclosed). Silence on assumptions is taken to indicate their acceptance as reasonable by the actuary.

Actuarial Assumptions - Demographic

- Death After Retirement
- Death in Active Service
- Disability with at least 5 years
- Withdrawal
  - Members enrolled prior to enactment of Act 120 (Classes T-C and T-D)
    - Non-Vested with less than 5 years
    - Vested with at least 5 years but less than 10 years
    - Vested with at least 10 years
  - Members enrolled after enactment of Act 120 (Classes T-E and T-F)
    - Non-Vested with less than 5 years
    - Non-Vested with at least 5 years but less than 10 years
    - Vested with at least 10 years
- Early Retirement
  - Age 55 with 25 Years
- Superannuation Retirement
  - Members enrolled prior to enactment of Act 120 (Classes T-C and T-D)
    - Age 62
    - Age 60 with 30 years
    - 35 years
  - Members enrolled after enactment of Act 120 (Classes T-E and T-F)
    - Age 65 with 3 years
    - Any combination of age and service that totals 92 with at least 35 years of service
- Optional forms of payment elections – Refund of accumulated deductions at retirement and/or form of payment elected by member.

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Actuarial Assumptions – Economic

Current Assumptions

- Rate of Return - 7.50%
  - Components:
    - Inflation - 3.00%
    - Real Rate of Return - 4.50%

- Annual Salary Increase - 5.50% (Effective Average)
  - Components:
    - Inflation - 3.00%
    - Real Wage Growth & Career Scale - 2.50%

- PSERS Assumptions Shown in Table 12 of Valuation Report

Setting Demographic Assumptions

- Based on 5-year Experience Review
- Full review covers July 1, 2010 - June 30, 2015
- Compare past experience (“actual”) with assumptions (“expected”)
- Determine trends
- Make judgments about future

Setting Demographic Assumptions

- The expected number of separations from service on account of withdrawal, death, disability and service retirement is calculated by multiplying the rates of separation used as a basis for the active service tables by the number of those exposed to risk.
- The actual number of those who had separated from service is then compared with the expected number.
- If the ratio of actual to expected is 100%, the table has exactly predicted what actually occurred. If the ratio of actual to expected is greater than 100%, then the table has underestimated actual experience. If the ratio is less than 100%, then the table has overstated actual experience.
- The ideal adjustment to the current non-mortality related rates is to produce an expected number that falls between the current expected number caused by the assumption and the actual number of separations.
- For mortality related separations, mortality trends among the general population are examined in combination with the relationship of current expected deaths versus the actual number of deaths.
  - In general, mortality has continually been improving over the last decade and is expected to improve in the future.
  - ASOP No. 35 states that the actuary should “include an assumption as to expected mortality improvement after the measurement date.”

Actuarial Cost Methods

- Cost method: Entry age normal
  - Required by PSERS Code

- Actuarial asset valuation method: 10-year moving average
  - Required by PSERS Code

Post-Retirement Mortality

Number of Deaths
Males

Type of Retirement	Actual	Expected Current	Expected Proposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Age & Service	9,026	8,408	9,124	107%	99%
Disability	411	414	380	99%	108%

Number of Deaths
Females

Type of Retirement	Actual	Expected Current	Expected Proposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Age & Service	16,437	15,053	16,489	109%	100%
Disability	685	660	683	104%	100%

Post-Retirement Mortality

- Mortality has continually been improving over the last decade
- Mortality expected to improve in the future
- ASOP No. 35 states that the actuary should “include an assumption as to expected mortality improvement after the measurement date.”
- PSERS is large enough to generate statistically credible mortality experience. This enables Buck to adjust the probabilities found in a standard table to reflect the experience of the System, where necessary.
- Recommendations
  - Update the male annuitant mortality table to the RP-2014 male mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale and projected to the valuation date with the Buck Modified 2015 projection scale. This base mortality table will then be projected on a generational basis using the Buck Modified 2015 projection scale from the valuation date.
  - Update the female annuitant mortality table to the RP-2014 female mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale, projected to 2013 with the Buck Modified 2015 projection scale and adjusted by, approximately, 93% for credibility. This base mortality table will then be projected on a generational basis using the Buck Modified 2015 projection scale to the valuation date and further projected using the Buck Modified 2015 projection scale.
  - Update the male and female disabled annuitant mortality tables to the RP-2014 disabled mortality tables adjusted backward to 2006 with the MP-2014 mortality improvement scale and projected to the valuation date with the Buck Modified 2015 projection scale. These base mortality tables will then be projected on a generational basis using the Buck Modified 2015 projection scale from the valuation date.
- The recommended assumptions are appropriate for purposes of the valuation and are reasonably related to the experience of the System and to reasonable long-term expectations.
- The recommended assumptions are in compliance with ASOP No. 35.

Post-Retirement Life Expectancy

	Current		Proposed		Increase	
Age	Male	Female	Male	Female	Male	Female
60	24.4	27.1	23.9	26.6	(0.5)	(0.5)
65	20.0	22.6	19.8	22.3	(0.2)	(0.3)

Current: RP-2000 Combined Healthy Male Table set back 3 years
RP-2000 Combined Healthy Female Table set back 3 years

Proposed: Male annuitants: RP-2014 male mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale and projected to the 2015 valuation date with the Buck Modified 2015 projection scale.

Female annuitants: RP-2014 female mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale, projected to 2013 with the Buck Modified 2015 projection scale and adjusted for credibility. This base mortality table will then be projected on a generational basis using the Buck Modified 2015 projection scale to the 2015 valuation date.

Deaths in Active Service

Number of Deaths – All Ages

Sex	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Males	594	641	616	368,091	93%	96%
Females	820	860	860	976,252	95%	95%
Total	1,414	1,501	1,476	1,344,343	94%	96%

Current: RP-2000 Employee Pre-retirement Mortality Tables. The Male table set back 3 years and the Female table set back 8 years.

Proposed: Male annuitants: RP-2014 male employee mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale, projected to 2013 with the Buck Modified 2015 projection scale and adjusted by, approximately, 81% for credibility.

Female annuitants: RP-2014 female employee mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale, projected to 2013 with the Buck Modified 2015 projection scale and adjusted by, approximately, 78% for credibility.

These base mortality tables will then be projected on a generational basis using the Buck Modified 2015 projection scale to the valuation date and further projected using the Buck Modified 2015 projection scale.

Disability Retirement – Male

With at Least 5 Years of Service

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Under 33	6	10	8	27,639	60%	75%
35	6	37	21	36,472	16	29
40	20	68	44	40,050	29	46
45	56	72	64	37,668	78	88
50	108	105	107	36,718	103	101
55	185	175	180	40,719	106	103
60	151	150	151	31,345	101	100
65	14	19	17	12,409	74	82
70	10	5	10	7,389	200	100
Total	556	641	602	270,409	87%	92%

Recommendation: Decrease rates since the incidence of actual disability retirements is less than expected.

Disability Retirement – Female

With at Least 5 Years of Service

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Under 33	5	29	17	73,985	17%	29%
35	39	47	43	78,574	83	91
40	81	88	84	87,550	92	96
45	119	150	135	99,997	79	88
50	301	234	267	117,012	129	113
55	428	456	442	133,859	94	97
60	310	347	329	102,706	89	94
65	11	42	26	31,990	26	42
70	13	11	13	11,303	118	100
Total	1,307	1,404	1,356	736,976	93%	96%

Recommendation: Decrease rates, except for age 50, since the incidence of actual disability retirements is less than expected. Actual experience at age 50 is higher than expected, increase rates at age 50.

Non-Vested Withdrawals - Male

With Less Than 5 Years of Service

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
20	1,011	445	728	3,178	227%	139%
25	4,244	3,084	3,664	24,672	138	116
30	2,739	1,921	2,331	18,296	143	118
35	1,617	1,128	1,373	10,254	143	118
40	1,373	1,118	1,246	8,597	123	110
45	1,410	1,156	1,283	8,896	122	110
50	1,460	1,215	1,338	9,348	120	109
55	1,225	1,010	1,117	8,671	121	110
60	871	637	754	6,216	137	116
Total	15,950	11,714	13,834	98,128	136%	115%

Recommendation: Increase the rates since the total incidence of actual non-vested withdrawals is more than expected.

Non-Vested Withdrawals – Female

With Less Than 5 Years of Service

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
20	849	378	614	2,683	225%	138%
25	8,954	8,427	8,693	64,821	106	103
30	5,956	5,300	5,631	40,773	112	106
35	3,720	3,133	3,427	24,174	119	109
40	3,903	3,352	3,626	29,858	116	108
45	4,223	3,779	4,001	34,672	112	106
50	3,527	3,095	3,311	28,393	114	107
55	2,431	2,104	2,268	19,299	116	107
60	1,383	1,109	1,246	10,171	125	111
Total	34,946	30,677	32,817	254,844	114%	106%

Recommendation: Increase the rates since the total incidence of actual non-vested withdrawals is more than expected.

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Vested Withdrawals

Terminations With 5 or More Years of Service but
Before Age 55 with 25 Years of Service and
Before Eligible for Superannuation
Can Elect Immediate Retirement with an Actuarial Reduction
or Deferred Retirement

- Currently, we apply one set of assumed probabilities to members with less than 10 years of service, and a different set of assumed probabilities to members with at least 10 years of service
- Significant differences in withdrawal rates between the two service groups warrant continuation of separate assumption sets
- Class T-E and Class T-F members vest after 10 years of service.
  - There is insufficient Class T-E and Class T-F data to establish withdrawal probabilities in the interval after 5 but before 10 years of service for these groups separately.
  - Continue to apply the same probability used for Classes T-C and T-D to Classes T-E and T-F until enough experience data is accumulated to develop separate decrements for these classes. Will be reviewed in the next scheduled study.

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Vested Withdrawals – Male

With at Least 5 but Less Than 10 Years of Service
Can Elect Immediate Retirement or Deferred Retirement

Average Age	Number of Separations: Actual	Expected: Current	Expected: Proposed	Exposed	Actual ÷ Expected: Current	Actual ÷ Expected: Proposed
Under 28	128	119	123	2,164	108%	104%
30	816	736	775	22,996	111	105
35	545	479	513	15,975	114	106
40	398	314	356	8,971	127	112
45	366	231	299	6,593	158	122
50	360	234	297	6,672	154	121
55	370	242	306	6,909	153	121
60	391	179	285	5,107	218	137
Total	3,374	2,534	2,954	75,387	133%	114%

Recommendation: Actual withdrawals were higher than expected for all ages and we recommend increasing the rates.

Vested Withdrawals – Female

With at Least 5 but Less Than 10 Years of Service
Can Elect Immediate Retirement or Deferred Retirement

Average Age	Number of Separations: Actual	Expected: Current	Expected: Proposed	Exposed	Actual ÷ Expected: Current	Actual ÷ Expected: Proposed
Under 28	344	455	400	5,348	76%	86%
30	3,560	4,136	3,849	63,628	86	92
35	2,023	2,000	2,011	36,362	101	101
40	1,352	1,162	1,257	25,812	116	108
45	1,597	1,273	1,435	31,813	125	111
50	1,812	1,328	1,569	35,414	136	115
55	1,319	988	1,153	26,333	134	114
60	942	570	757	12,672	165	124
Total	12,949	11,912	12,431	237,382	109%	104%

Recommendation: Actual withdrawals were less than expected for all ages up to age 30 and we recommend decreasing the rates at these ages. Actual withdrawals after age 30 were higher than expected and we recommend increasing the rates.

Vested Withdrawals - Male

With at Least 10 Years of Service
Can Elect Immediate Retirement or Deferred Retirement

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Under 33	49	31	40	1,565	158%	123%
35	293	299	299	19,948	98	98
40	435	382	410	30,754	114	106
45	456	381	417	30,474	120	109
50	629	498	563	29,317	126	112
55	680	543	612	22,939	125	111
60	896	608	752	11,609	147	119
Total	3,438	2,742	3,093	146,426	125%	111%

Recommendation: Actual total withdrawals were higher than expected for all ages, except age 35, and we recommend increasing the rate at these ages. Actual experience at age 35 is within an acceptable range and no change is recommended.

Vested Withdrawals - Female

With at Least 10 Years of Service
Can Elect Immediate Retirement or Deferred Retirement

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Under 33	126	125	125	3,121	101%	101%
35	1,101	1,226	1,165	40,874	90	95
40	1,009	887	946	59,133	114	107
45	1,151	959	1,054	63,908	120	109
50	1,820	1,349	1,588	77,077	135	115
55	2,607	2,424	2,515	83,370	108	104
60	3,834	2,889	3,361	49,612	133	114
Total	11,648	9,859	10,754	377,095	118%	108%

Recommendation: Actual total withdrawals were higher than expected, for all ages after age 35. We recommend an increase to the rates from age 40. Actual experience under age 33 is within an acceptable range and no change is recommended. Actual withdrawals at age 35 were lower than expected and we recommend decreasing the rate.

Early Retirement – Male

Age 55 with at Least 25 Years Service, but
Not Eligible for Superannuation
Immediate Retirement with 3% per annum Early Retirement Reduction from Superannuation

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
55	751	509	630	3,393	148%	119%
56	570	466	518	3,004	122	110
57	458	383	420	2,469	120	109
58	382	311	346	2,004	123	110
59	436	309	373	1,719	141	117
60	127	90	109	754	141	117
61	224	174	199	695	129	113
Total	2,948	2,242	2,595	14,038	131%	114%

Recommendation: Actual retirements were higher than expected for all ages and we recommend increasing the rates.

Early Retirement – Female

Age 55 with at Least 25 Years Service, but
Not Eligible for Superannuation
Immediate Retirement with 3% per annum Early Retirement Reduction from Superannuation

Average	Number of Separations					
		Expected			Actual ÷ Expected	
Age	Actual	Current	Proposed	Exposed	Current	Proposed
55	1,505	1,018	1,262	6,788	148%	119%
56	1,170	1,000	1,085	6,451	117	108
57	1,086	907	996	5,849	120	109
58	1,022	822	922	5,306	124	111
59	1,263	835	1,049	4,912	151	120
60	529	416	472	2,770	127	112
61	907	648	778	2,593	140	117
Total	7,482	5,646	6,564	34,669	133%	114%

Recommendation: Actual retirements were higher than expected for all ages and we recommend increasing the rates.

Normal Retirement (Superannuation) - Male

Classes T-C & T-D: Age 62, Age 60 with 30 Years, or 35 Years
Classes T-E & T-F: Age 65 with 3 Years

Average Age	Number of Separations				Actual ÷ Expected	
	Actual	Expected Current	Expected Proposed	Exposed	Current	Proposed
Under 53	2	4	3	15	50%	67%
55	397	352	375	1,205	113	106
60	2,989	2,825	2,907	9,703	106	103
65	3,387	2,974	3,180	15,289	114	107
68	334	291	312	1,615	115	107
69	288	250	269	1,391	115	107
Subtotal under 70	7,397	6,696	7,046	29,218	110	105
70+	812	681	732	3,784	119	111
Total All Ages	8,209	7,377	7,778	33,002	111%	106%

Recommendation: Actual retirements after age 53 were higher than expected and we recommend an increase to the rates for these ages. Actual retirements prior to age 55 were less than expected and we recommend a decrease to these rates.

Normal Retirement (Superannuation) - Female

Classes T-C & T-D: Age 62, Age 60 with 30 Years, or 35 Years
Classes T-E & T-F: Age 65 with 3 Years

Number of Separations

Average Age	Actual	Expected Current	Expected Proposed	Exposed	Actual ÷ Expected Current	Actual ÷ Expected Proposed
Under 53	0	5	2	15	0%	0%
55	533	531	532	1,717	100	100
60	7,647	7,322	7,483	24,204	104	102
65	9,030	7,381	8,204	35,264	122	110
68	680	532	606	2,659	128	112
69	486	413	449	2,063	118	108
Subtotal under 70	18,376	16,184	17,276	65,922	114%	106%
70+	1,186	1,040	1,133	5,201	114	105
Total All Ages	19,562	17,224	18,409	71,123	114%	106%

Recommendation: Actual retirements after age 53 were higher than expected and we recommend an increase to the rates for these ages. There were no actual retirements prior to age 55 and we recommend a decrease to these rates.

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Optional Forms of Benefit Payment at Retirement: Annuity Payments

- Members, upon retirement, may elect to receive the Maximum Single Life Annuity (MSLA), or one of the following annuity payment options that is actuarially equivalent to the MSLA:
  - Option 1 - Guarantee of total payments equal to maximum single life annuity reserve
  - Option 2 - 100% Joint and Survivor annuity
  - Option 3 - 50% Joint and Survivor annuity
  - Option 4 - Some other form of annuity payment that is actuarially equivalent to the MSLA (subject to the System's Code restrictions)
- The System's optional forms of payment factors are based on a 4% interest rate.
  - Presents a reduction in liability to the System's annual valuation which, currently, uses a 7.50% rate of investment return.
- During the examination period, the distribution of optional forms of annuity payment elected by retiring members were:
  - 51.5% elected MSLA
  - 20.8% elected Option 1
  - 18.8% elected Option 2
  - 7.8% elected Option 3
  - 1.1% elected Option 4

Optional Forms of Benefit Payment at Retirement: Annuity Payments (continued)

- Current valuation assumption: Assume 100% of all eligible retirements will elect the MSLA form of payment.
- Recommendation: Assume the following distribution of optional forms of annuity payment elections upon retirement from active status.
  - 50% will elect MSLA
  - 20% will elect Option 1
  - 20% will elect Option 2 (assuming males are 3 years older than females)
  - 10% will elect Option 3 (assuming males are 3 years older than females)
  - 0% will elect Option 4

Optional Forms of Benefit Payment at Retirement : Option 4 – Withdrawal of Accumulated Deductions at Retirement

- Classes T-C and T-D members may elect to receive a lump sum that is less than or equal to the member's Accumulated Deductions at retirement. In addition, the member receives a reduced annuity.
- The System's optional forms of payment factors are based on a 4% interest rate.
  - Presents an additional liability to the System's annual valuation which, currently, uses a 7.50% rate of investment return.
- Current valuation assumption: Assume 100% of all eligible retirements will elect an Option 4 form of payment - withdrawing all accumulated deductions.
- Recommendation: Assume 80% of all eligible retirements will elect an Option 4 form of payment - withdrawing all accumulated deductions.
  - PSERS staff communicated that in-house data shows:
    - 87% of recent retirements elect to receive a partial or full withdrawal of the member's accumulated deductions.
    - Approximately, 80% of recent retirements elect to withdraw 100% of the accumulated deductions.
  - Annual valuation data provided to Buck:
    - Does not contain information on withdrawal of accumulated deductions upon retirement.
    - Retired data provides information on the balance of a member's accumulated deductions: 77% of 2015 actuarial valuation retired member records report no remaining balance for the accumulated deductions.

Cost Impact of Demographic Assumption Changes

Item	June 30, 2015 Actuarial Valuation				
	Unfunded Accrued Liability[1]	Funded Ratio[1]	Normal Cost Rate	Employer Pension Rate[2]	Employer Pension Contribution[2 3]
BEFORE CHANGES	**$37,336 Mil**	**60.6%**	**8.31%**	**29.20%**	**$3,956 Mil**
Demographic Assumptions					
(1) Post-retirement mortality	1,104	(0.7)	.21	.80	109
(2) Death in-service	(15)	0.0	(.01)	(.02)	(2)
(3) Disability retirement	(1)	0.0	(.01)	(.01)	(1)
(4) Withdrawal prior to Retirement	94	(0.1)	(.16)	(.11)	(15)
(5) Retirement (Early, Superannuation and Late)	623	(0.4)	.18	.51	69
(6) Optional forms of benefit payment	(704)	0.5	(.26)	(.64)	(88)
TOTAL DEMOGRAPHIC CHANGES	**$1,101 Mil**	**(0.7)%**	**.05%**	**.53%**	**$72 Mil**
AFTER REFLECTING CHANGES	**$38,437 Mil**	**59.9%**	**8.26%**	**29.73%**	**$4,028 Mil**

1. Actuarial value of assets basis.
2. Without regard to the Act 120 pension collar.
3. Based on the fiscal year 2017 appropriation pay of $ 13,549,000,000.

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Option Factor Presentation

Please refer to Buck's June 10, 2016
Update of Administrative Option Factors Presentation

Economic Assumptions

Current Assumptions

- Rate of return - 7.50%
- Annual pay increase - 5.50%

(30-year career average for member hired at age 30)

Setting Economic Assumptions

- Review past experience
- Review general practice
- Develop component parts of each assumption
  - Maintain linkage with investments
  - Maintain internal consistency
- Make judgment about future

Interest Rate and Salary Increase

Actual Past Experience			
Fiscal Year	**Increase In CPI-U**	**Return on Market Value of Assets[1]**	**Individual Salary Increases**
2010/2011	3.6%	20.40%	4.9%
2011/2012	1.7	3.40	3.2
2012/2013	1.8	8.00	3.5
2013/2014	2.1	14.90	3.6
2014/2015	0.1	3.00	3.7
Average	1.8%	9.74%	3.8%
Current Assumption	3.00%	7.50%	5.50%
Conclusion	Reconsider	Reconsider	High
Proposal	2.75%	7.375%	5.25%
		7.25%	5.00%
		7.00%	4.75%

1. Provided by PSERS' investment consultant (Aon Hewitt for fiscal years 2013/2014 and 2014/2015 and Wilshire Associates for prior years).

Salary Increase Rate

Average Age	Actual Percentage Increase					Total	Assumption	
	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015		Current	Proposal 1* (Recommended)
20	15.0%	13.1%	15.8%	18.0%	16.7%	15.6%	10.60%	10.10%
25	8.9	6.6	7.7	8.5	9.3	8.1	9.69	9.19
30	6.3	4.4	4.8	4.9	5.3	5.2	8.31	7.81
35	5.7	3.9	4.3	4.4	4.5	4.5	7.25	6.75
40	5.3	3.5	3.8	4.0	4.1	4.2	6.25	5.75
45	4.5	3.0	3.1	3.4	3.3	3.4	5.25	4.75
50	4.0	2.6	2.7	2.8	2.9	3.0	4.31	3.81
55	3.6	2.2	2.4	2.4	2.7	2.7	3.81	3.31
60	3.4	2.1	2.2	2.2	2.4	2.5	3.75	3.25
65	3.4	2.1	1.8	2.0	2.3	2.3	3.75	3.25
70+	3.4	2.1	1.8	1.7	2.2	2.3	3.75	3.25
Total	4.9%	3.2%	3.5%	3.6%	3.7%	3.8%	5.50%	5.00%

* Proposal 1: Averages to 0.50% less than Current.
Proposal 2: Averages to 0.25% less than Current.
Proposal 3: Averages to 0.75% less than Current with a minimum salary increase rate of 3.25%

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Salary Increase Rate
(continued)

Average Age	Historical Average Actual Salary Experience		
	Five Year Average (2010 – 2015)	Ten Year Average (2005 – 2015)	Fifteen Year Average (2000 – 2015)
20	15.6%	16.6%	16.3%
25	8.1%	8.9%	9.1%
30	5.2%	6.2%	6.4%
35	4.5%	5.5%	5.7%
40	4.2%	4.9%	5.2%
45	3.4%	4.2%	4.5%
50	3.0%	3.7%	3.9%
55	2.7%	3.2%	3.4%
60	2.5%	3.0%	3.2%
65	2.3%	2.8%	3.0%
70+	2.3%	3.1%	3.1%
Total	3.8%	4.5%	4.7%

Historical Rate of Investment Return Assumption

June 30 Valuation	Rate of Investment Return Assumption
Before 2008	8.50%
2008	8.25%
2009 - 2010	8.00%
2011 - 2015	7.50%
2016	7.25% Recommended

Asset Return History

(1) Investment performance of the fund over the 25 year period ending June 30, 2015 is 8.45%[1]

(2) Investment performance of the fund over the 30 year period ending June 30, 2015 is 8.98%[1]

Actual Past Experience – 2000 to 2015	
	Return on Assets
Fiscal Year	Market Value[2]
2000/2001	(7.4)%
2001/2002	(5.3)
2002/2003	2.7
2003/2004	19.7
2004/2005	12.9
2005/2006	15.3
2006/2007	22.9
2007/2008	(2.8)
2008/2009	(26.5)
2009/2010	14.6
2010/2011	20.4
2011/2012	3.4
2012/2013	8.0
2013/2014	14.9
2014/2015	3.0

1. Information from October 6, 2015 PSERS press release.
2. Provided by PSERS' investment consultant and as shown in the Annual Valuation Reports.

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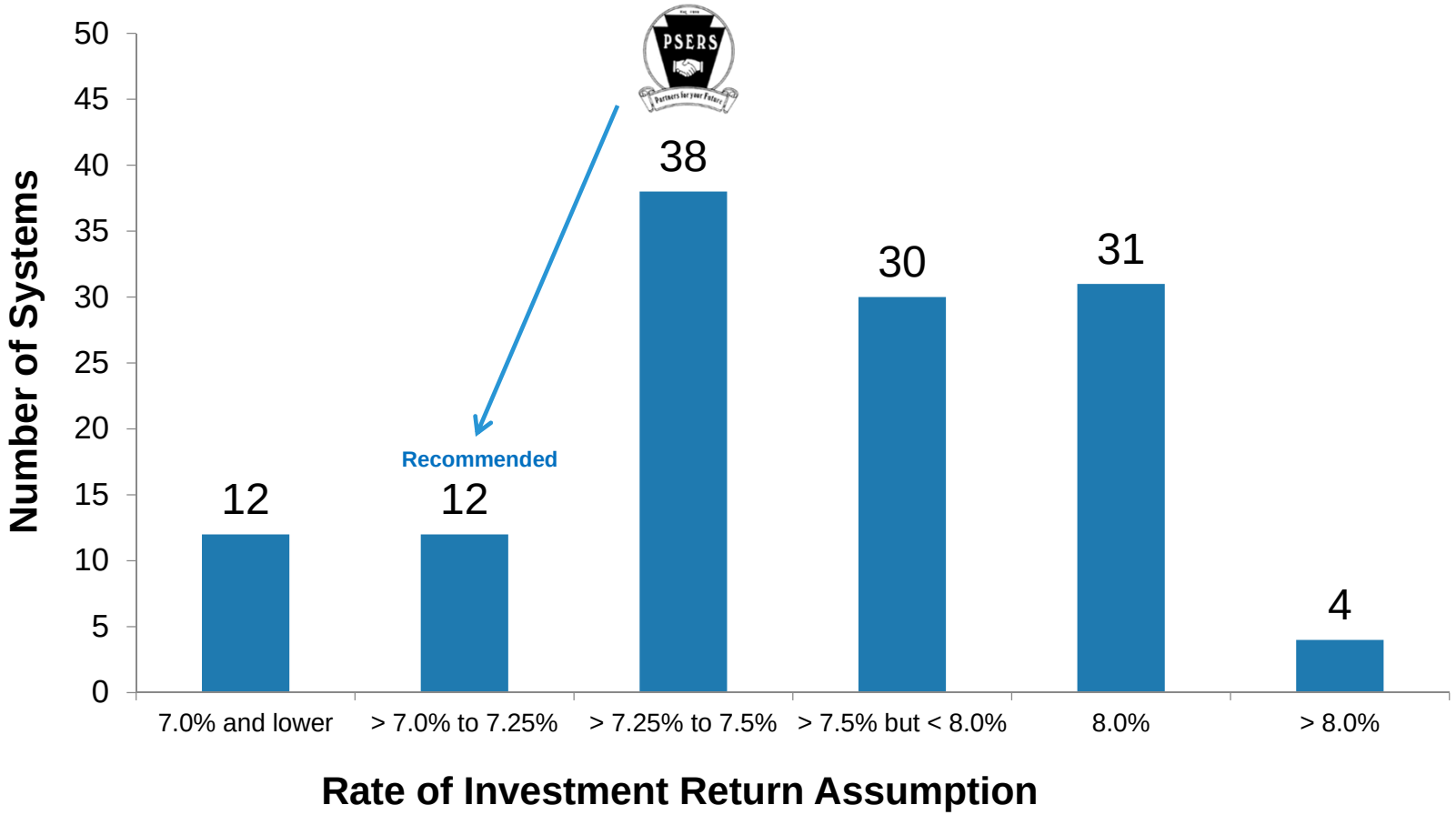
Expected Long Term Rate of Return

Please refer to page 17 of Aon's June 10, 2016 Capital Market Assumptions Presentation for their 30 Year Expected Return Forecast

Distribution of Systems and Rate of Investment Return Assumption Used for Valuation



Source: NASRA Public Pension Investment Brief, published February 2016

Economic Assumption Components

Interest Rate

	Current	Proposal 1	Proposal 2	Proposal 3
• Inflation	3.00%	2.75%	2.750%	2.75%
• Real Return	4.50	4.50	4.625	4.25
	7.50%	7.25%	7.375%	7.00%

Salary Increase

	Current	Proposal 1	Proposal 2	Proposal 3
• Inflation	3.00%	2.75%	2.75%	2.75%
• Real Wage/Growth Career Scale	2.50	2.25	2.50	2.00
	5.50%	5.00%	5.25%	4.75%

Change in Unfunded Accrued Liability[1] due to Economic Assumption Changes Only[2]

Average Annual Salary Increase Assumption	June 30, 2015 Actuarial Valuation Interest Rate Assumption			
	7.50%	**7.375%**	**7.25%**	**7.00%**
5.50% (current)	-	$1,223 Mil	$2,445 Mil	$5,019 Mil
5.25%	$(443) Mil	$772	$1,987	$4,546
5.00%	$(884)	$324	$1,531	$4,075
4.75%	$(1,138)	$66	$1,270	$3,808

1. Actuarial value of assets basis.
2. The amounts are in addition to the full cost impact of demographic assumption changes found on slide 33.

Change in Funded Ratios[1] under the Various Economic Assumptions Only[2]

Average Annual Salary Increase Assumption	June 30, 2015 Actuarial Valuation Interest Rate Assumption			
	7.50%	**7.375%**	**7.25%**	**7.00%**
5.50% (current)	-	(0.8)%	(1.5)%	(3.0)%
5.25%	0.3%	(0.5)%	(1.2)%	(2.7)%
5.00%	0.5%	(0.2)%	(1.0)%	(2.5)%
4.75%	0.7%	(0.1)%	(0.8)%	(2.3)%

1. Actuarial value of assets basis.
2. The amounts are in addition to the full cost impact of demographic assumption changes found on slide 33.

Change in Employer Pension Contribution Rates[1] due to Economic Assumption Changes Only[2]

Average Annual Salary Increase Assumption	June 30, 2015 Actuarial Valuation Interest Rate Assumption			
	7.50%	**7.375%**	**7.25%**	**7.00%**
5.50% (current)				
Normal Cost Rate		.41%	.84%	1.73%
Unfunded Liability Rate		.41%	.80%	1.60%
Employer Pension Rate		0.82%	1.64%	3.33%
5.25%				
Normal Cost Rate	(.49)%	(.09)%	.32%	1.18%
Unfunded Liability Rate	(.23)%	.18%	.57%	1.37%
Employer Pension Rate	(.72)%	.09%	.89%	2.55%
5.00%				
Normal Cost Rate	(.97)%	(.59)%	(.19)%	.64%
Unfunded Liability Rate	(.47)%	(.06)%	.33%	1.13%
Employer Pension Rate	(1.44)%	(.65)%	.14%	1.77%
4.75%				
Normal Cost Rate	(1.41)%	(1.04)%	(.66)%	.14%
Unfunded Liability Rate	(.60)%	(.19)%	.20%	1.00%
Employer Pension Rate	(2.01)%	(1.23)%	(.46)%	1.14%

1. Without regard to the Act 120 pension collar. Also assumes current payroll growth assumption of 3.5%.
2. The amounts are in addition to the full cost impact of demographic assumption changes found on slide 33.

Change in Employer Pension Contribution Amount[1] due to Economic Assumption Changes Only[2]

Average Annual Salary Increase Assumption	June 30, 2015 Actuarial Valuation Interest Rate Assumption			
	7.50%	**7.375%**	**7.25%**	**7.00%**
5.50% (current)	-	$111 Mil	$222 Mil	$451 Mil
5.25%	$(97) Mil	$12	$121	$346
5.00%	$(195)	$(88)	$19	$240
4.75%	$(272)	$(167)	$(62)	$155

1. Without regard to the Act 120 pension collar. Also assumes current payroll growth assumption of 3.5%.
2. The amounts are in addition to the full cost impact of demographic assumption changes found on slide 33.

Actuarial Cost Method

Current Method

- Each annual actuarial valuation determines the employer contribution rate for the second succeeding fiscal year
  - The June 30, 2015 valuation sets the contribution rate for fiscal 2016/2017
- One step in determining the employer rate is the calculation of an average normal contribution rate for all members active on the valuation date
- A normal contribution rate for each member is determined individually
- Calculate individual member normal contribution rates by determining a pay-weighted average normal contribution rate

Actuarial Cost Method

Recommendation

- Continue to calculate individual member normal contribution rates by determining a pay-weighted average normal contribution rate
- The cost method complies with the pension code.
- Complies with the requirements of GASB Statements 67 and 68.

Recommended Assumptions

Assumption	Recommendation
Demographics	Slides 13 to 29
Optional Forms of Annuity Payments	Slides 30 to 31
Classes T-C & T-D Option 4: Refund of Accumulated Deduction	Slide 32
Economic Assumptions	
• Rate of Investment Return	7.25%
• Salary Scale	5.00% (30-year career average for member hired at age 30)
• Inflation	2.75%
Actuarial Cost Method	Slides 49 to 50

Assumption Setting

- Actuary advises Board on adequacy of assumptions
  - Experience study
  - Judgment about future

- Board sets assumptions based on information provided

Comparison of Projected System Funded Ratio
(Based on Actuarial Value of Assets)

Fiscal Year Ending	Current Assumptions	Recommended Assumptions
2015	60.6%	60.6%
2016	57.8%	57.3%
2017	55.9%	55.6%
2018	54.7%	54.5%
2019	56.8%	55.3%
2020	57.7%	56.2%

Note: Assumes a Fiscal Year 2016 Investment Return of -1.00% and the assumed investment return thereafter.

Comparison of Projected System Unfunded Accrued Liability
(Based on Actuarial Value of Assets)

Fiscal Year Ending	Current Assumptions ($ millions)	Recommended Assumptions ($ millions)
2015	$37,335.8	$37,335.8
2016	41.034.3	42,587.2
2017	44,063.5	45,487.1
2018	46,515.9	47,765.9
2019	45,524.3	48,054.0
2020	45,647.3	48,260.9

Note: Assumes a Fiscal Year 2016 Investment Return of -1.00% and the assumed investment return thereafter.

Comparison of Projected System Appropriation Payroll

Fiscal Year Ending	Current Assumptions ($ millions)	Recommended Assumptions ($ millions)
2017	$13,549.0	$13,549.0
2018	13,658.0	13,688.4
2019	14,012.7	13,934.4
2020	14,385.4	14,204.8
2021	14,775.5	14,496.3
2022	15,181.7	14,806.8

Note: Assumes a 3.50% annual payroll growth.

Comparison of Projected System Employer Contribution Rates

Fiscal Year Ending	Current Assumptions	Recommended Assumptions
2017	30.03%	30.03%
2018	32.26%	32.25%
2019	33.72%	33.76%
2020	34.90%	35.07%
2021	34.46%	35.43%
2022	34.72%	35.58%

Note: Assumes a Fiscal Year 2016 Investment Return of -1.00% and the assumed investment return thereafter.

Comparison of Total Projected System Employer Contributions

Fiscal Year Ending	Current Assumptions ($ millions)	Recommended Assumptions ($ millions)
2017	$ 4,068.8	$ 4,068.8
2018	4,406.1	4,414.5
2019	4,725.1	4,704.3
2020	5,020.5	4,981.6
2021	5,091.6	5,136.0
2022	5,271.1	5,312.7
Total	$28,583.2	$28,617.9

Note: Assumes a Fiscal Year 2016 Investment Return of -1.00% and the assumed investment return thereafter.

Appendix

Appendix I
Current Assumptions - Projection of Contribution Rates and Funded Ratios As of June 30, 2015

Fiscal Year Ending June	Appropriation Payroll (thousands)	Fiscal Year Market Rate of Return	Pension Rate Floor	Employee Contribution Rate	Employer Normal Cost	Class T-E & T-F Members Shared Risk		Employer Unfunded Liability Rate	Preliminary Employer Pension Rate	Health Care Contribution	Total Employer Contribution Rate	Projected Total Employer Contribution (thousands)	Funded Ratio	Unfunded Accrued Liability ($ Millions)
						Appropriation Payroll ($1,000)	Additional Member Contribution							
2014	$ 13,720,000	14.91 %	4.00 %	7.43 %	8.57 %			15.25 %	23.82 %	0.93 %	16.93 %		62.0 %	$ 35,121.2
2015	13,482,000	3.04	4.00	7.46	8.46			17.51	25.97	0.90	21.40		**60.6**	**37,335.8**
2016	13,375,000	7.50	4.00	7.49	8.38	$ 1,005,828	0.00 %	19.44	27.82	0.84	25.84	$ 3,456,100	58.2	40,620.5
2017	**13,549,000**	7.50	8.31	**7.52**	**8.31**	1,374,901	0.00	**20.89**	**29.20**	**0.83**	**30.03**	**4,068,765**	56.8	43,159.9
2018	13,658,010	7.50	8.14	7.52	8.14	1,823,970	0.00	23.07	31.21	0.83	32.04	4,376,026	56.1	45,087.7
2019	14,012,675	7.50	7.98	7.52	7.98	2,264,456	0.00	24.47	32.45	0.82	33.27	4,662,017	58.6	43,551.4
2020	14,385,408	7.50	7.81	7.53	7.81	2,722,793	0.00	25.59	33.40	0.80	34.20	4,919,810	60.1	43,104.1
2021	14,775,522	7.50	7.66	7.53	7.66	3,201,938	0.00	25.06	32.72	0.79	33.51	4,951,277	61.2	43,070.0
2022	15,181,732	7.50	7.51	7.53	7.51	3,697,930	0.00	25.23	32.74	0.77	33.51	5,087,398	62.6	42,587.3
2023	15,592,952	7.50	7.36	7.53	7.36	4,207,780	0.00	25.63	32.99	0.76	33.75	5,262,621	64.1	41,893.2
2024	16,006,876	7.50	7.21	7.53	7.21	4,736,971	0.00	25.89	33.10	0.74	33.84	5,416,727	65.5	41,290.2
2025	16,425,303	7.50	7.06	7.53	7.06	5,293,556	0.00	26.16	33.22	0.72	33.94	5,574,748	67.3	40,199.8
2026	16,849,867	7.50	6.90	7.53	6.90	5,881,838	0.00	26.56	33.46	0.72	34.18	5,759,285	69.2	38,808.0
2027	17,269,991	7.50	6.74	7.53	6.74	6,500,569	0.00	26.87	33.61	0.69	34.30	5,923,607	71.2	37,123.3
2028	17,684,009	7.50	6.56	7.54	6.56	7,151,591	0.00	27.19	33.75	0.69	34.44	6,090,373	73.4	35,136.3
2029	18,092,525	7.50	6.40	7.54	6.40	7,833,482	0.00	27.52	33.92	0.69	34.61	6,261,823	75.7	32,832.9
2030	18,496,390	7.50	6.22	7.54	6.22	8,546,305	0.00	27.88	34.10	0.69	34.79	6,434,894	78.2	30,172.9
2031	18,901,232	7.50	6.04	7.54	6.04	9,295,343	0.00	28.25	34.29	0.69	34.98	6,611,651	80.8	27,122.1
2032	19,306,605	7.50	5.86	7.54	5.86	10,081,131	0.00	28.64	34.50	0.69	35.19	6,793,994	83.6	23,647.6
2033	19,711,447	7.50	5.67	7.54	5.67	10,904,526	0.00	29.04	34.71	0.69	35.40	6,977,852	86.6	19,712.1
2034	20,119,213	7.50	5.48	7.54	5.48	11,766,018	0.00	29.46	34.94	0.69	35.63	7,168,476	89.8	15,274.8
2035	20,534,465	7.50	5.28	7.54	5.28	12,664,404	0.00	29.88	35.16	0.69	35.85	7,361,606	93.3	10,293.8
2036	20,959,917	7.50	5.08	7.54	5.08	13,599,604	0.00	14.66	19.74	0.69	20.43	4,282,111	94.9	8,000.0
2037	21,392,675	7.50	4.87	7.54	4.87	14,573,742	0.00	10.91	15.78	0.69	16.47	3,523,374	96.1	6,272.1
2038	21,836,128	7.50	4.67	7.54	4.67	15,585,801	0.00	9.28	13.95	0.69	14.64	3,196,809	97.1	4,721.2
2039	22,293,310	7.50	4.46	7.54	4.46	16,630,158	0.00	7.41	11.87	0.69	12.56	2,800,040	97.9	3,426.6
2040	22,765,638	7.50	4.26	7.54	4.26	17,705,497	0.00	5.95	10.21	0.69	10.90	2,481,455	98.6	2,332.7
2041	23,256,592	7.50	4.05	7.54	4.05	18,809,555	0.00	4.65	8.70	0.69	9.39	2,183,794	99.2	1,427.6
2042	23,771,462	7.50	3.86	7.54	3.86	19,942,765	0.00	2.58	6.44	0.69	7.13	1,694,905	99.5	922.8
2043	24,320,134	7.50	3.67	7.54	3.67	21,106,223	0.00	1.04	4.71	0.69	5.40	1,313,287	99.6	740.0
2044	24,918,450	7.50	3.50	7.54	3.50	22,293,611	0.00	(0.16)	3.34	0.69	4.19	1,044,083	99.6	795.6
2045	25,575,198	7.50	3.34	7.54	3.34	23,498,506	0.00	0.79	4.13	0.69	4.82	1,232,725	99.6	653.2
2046	26,301,180	7.50	3.22	7.53	3.22	24,710,239	0.00	0.81	4.03	0.69	4.72	1,241,416	99.7	490.4
2047	27,097,844	7.50	3.11	7.53	3.11	25,915,936	0.00	0.55	3.66	0.69	4.35	1,178,756	99.8	379.5
2048	27,966,454	7.50	3.02	7.53	3.02	27,118,327	0.00	0.48	3.50	0.69	4.19	1,171,794	99.9	274.2
2049	28,911,941	7.50	2.97	7.52	2.97	28,304,513	0.00	0.42	3.39	0.69	4.08	1,179,607	99.9	174.0
											Total	141,683,205		

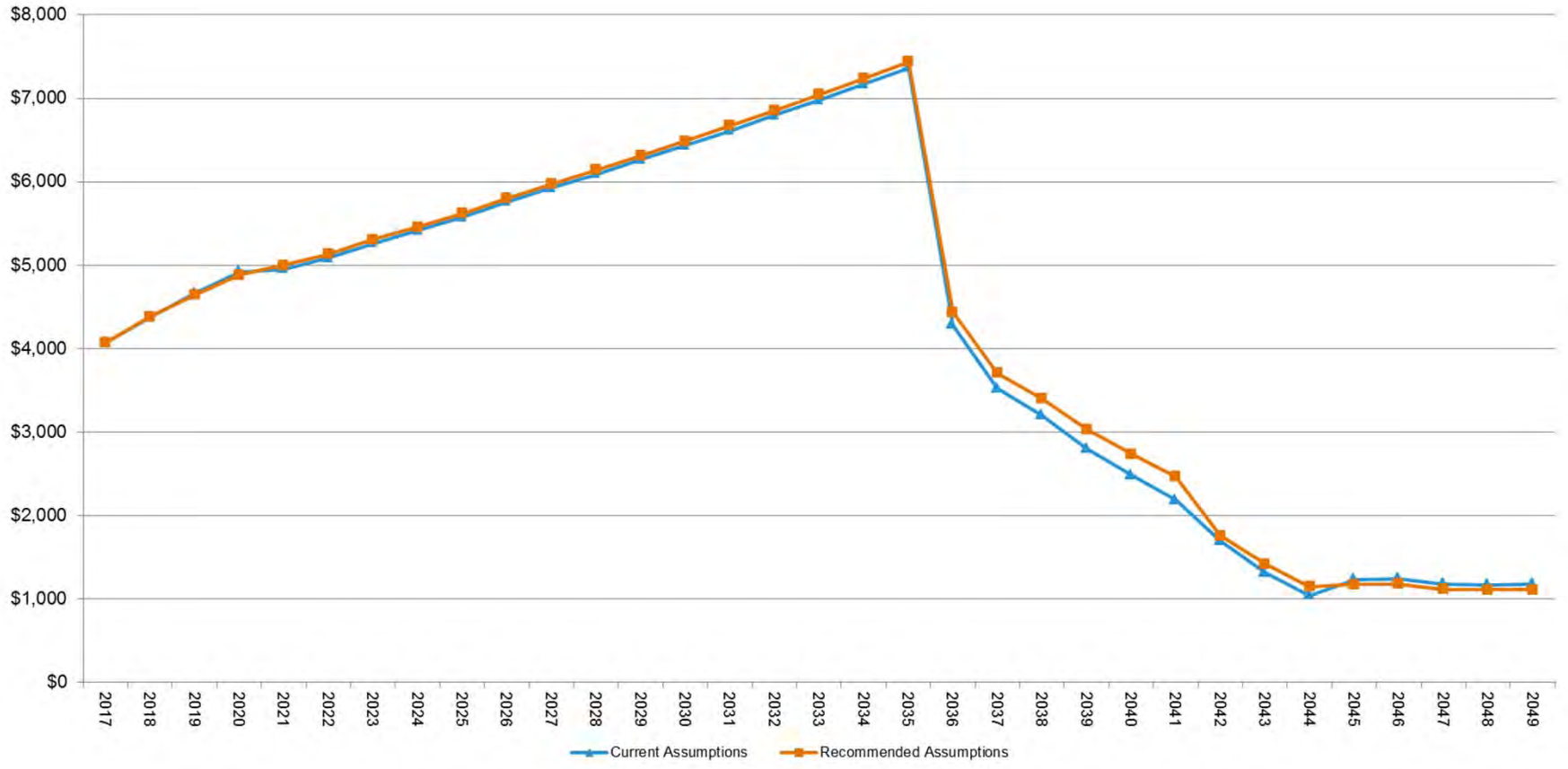
Note: Assumes an investment return of 7.50% per year for fiscal year 2016 and thereafter.

Appendix II
Recommended Assumptions - Projection of Contribution Rates and Funded Ratios As of June 30, 2015

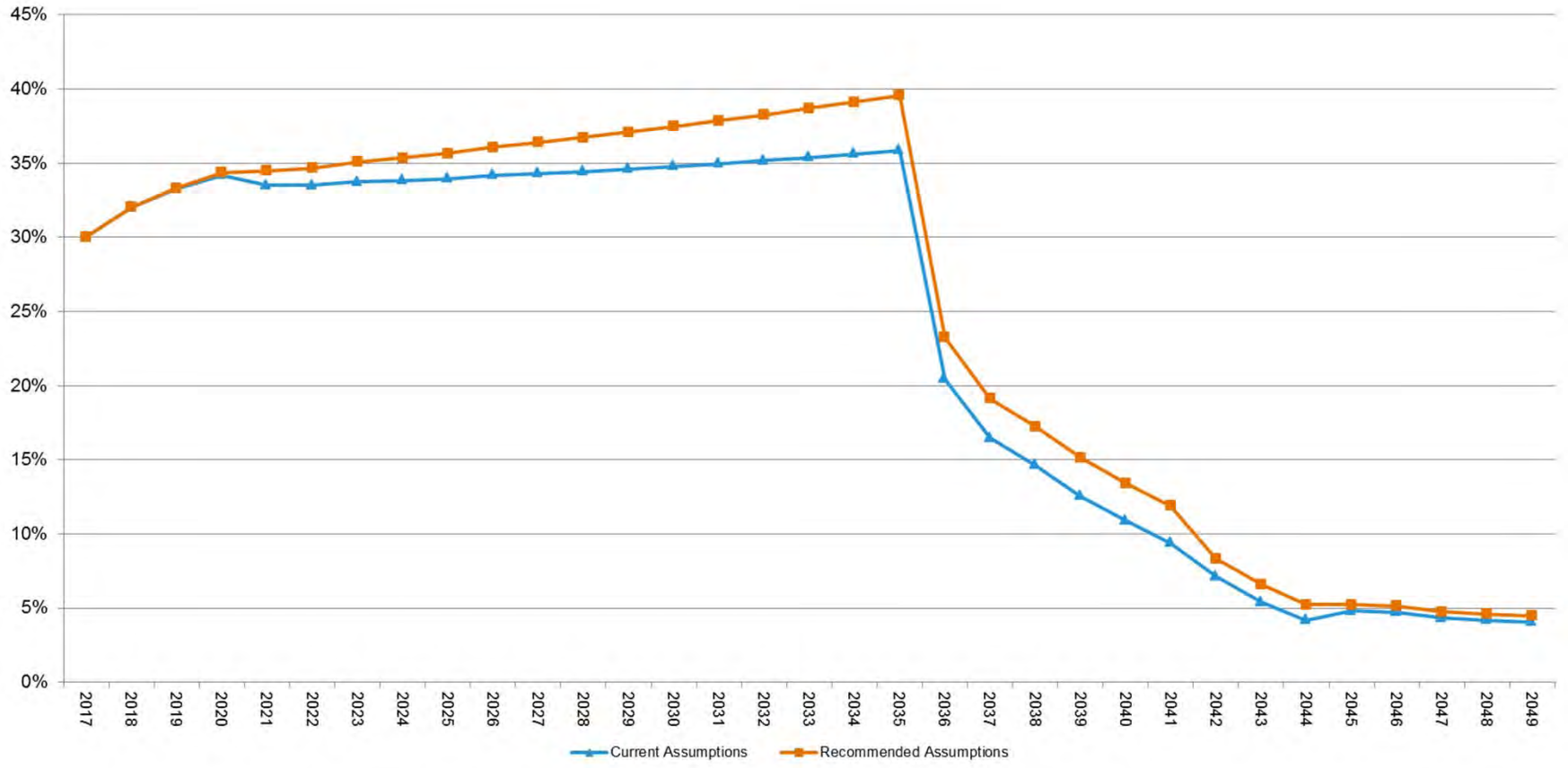
Fiscal Year Ending June	Appropriation Payroll (thousands)	Fiscal Year Market Rate of Return	Pension Rate Floor	Employee Contribution Rate	Employer Normal Cost	Class T-E & T-F Members Shared Risk		Employer Unfunded Liability Rate	Preliminary Employer Pension Rate	Health Care Contribution	Total Employer Contribution Rate	Projected Total Employer Contribution (thousands)	Funded Ratio	Unfunded Accrued Liability ($ Millions)
						Appropriation Payroll ($1,000)	Additional Member Contribution							
2014	$ 13,720,000	14.91 %	4.00 %	7.43 %	8.57 %			15.25 %	23.82 %	0.93 %	16.93 %		62.0 %	$ 35,121.2
2015	13,482,000	3.04	4.00	7.46	8.46			17.51	25.97	0.90	21.40		**60.6**	**37,335.8**
2016	13,375,000	7.50	4.00	7.49	8.38	$ 1,005,828	0.00 %	19.44	27.82	0.84	25.84	$ 3,456,100	57.7	42,173.4
2017	**13,549,000**	7.25	8.31	**7.52**	**8.31**	1,405,215	0.00	**20.89**	**29.20**	**0.83**	**30.03**	**4,068,765**	56.5	44,585.4
2018	13,688,437	7.25	7.89	7.52	7.89	1,895,542	0.00	23.28	31.17	0.87	32.04	4,385,775	55.9	46,343.2
2019	13,934,438	7.25	7.70	7.53	7.70	2,379,048	0.00	24.77	32.47	0.85	33.32	4,642,955	57.2	46,092.3
2020	14,204,767	7.25	7.54	7.53	7.54	2,867,374	0.00	25.99	33.53	0.85	34.38	4,883,599	58.5	45,736.4
2021	14,496,287	7.25	7.38	7.53	7.38	3,365,547	0.00	26.28	33.66	0.83	34.49	4,999,769	59.5	45,706.2
2022	14,806,779	7.25	7.23	7.53	7.23	3,869,197	0.00	26.63	33.86	0.82	34.68	5,134,991	60.9	45,223.1
2023	15,122,330	7.25	7.08	7.53	7.08	4,374,200	0.00	27.20	34.28	0.82	35.10	5,307,938	62.4	44,525.8
2024	15,438,999	7.25	6.93	7.53	6.93	4,887,620	0.00	27.64	34.57	0.79	35.36	5,459,230	63.8	43,915.9
2025	15,761,322	7.25	6.78	7.53	6.78	5,418,834	0.00	28.09	34.87	0.79	35.66	5,620,487	65.5	42,814.3
2026	16,086,877	7.25	6.63	7.53	6.63	5,973,263	0.00	28.67	35.30	0.77	36.07	5,802,537	67.3	41,407.8
2027	16,405,965	7.25	6.47	7.54	6.47	6,547,676	0.00	29.16	35.63	0.76	36.39	5,970,131	69.4	39,698.0
2028	16,715,494	7.25	6.31	7.54	6.31	7,145,548	0.00	29.66	35.97	0.76	36.73	6,139,601	71.6	37,672.9
2029	17,018,546	7.25	6.15	7.54	6.15	7,764,715	0.00	30.18	36.33	0.76	37.09	6,312,179	73.9	35,316.4
2030	17,318,529	7.25	5.99	7.54	5.99	8,399,842	0.00	30.72	36.71	0.76	37.47	6,489,253	76.4	32,597.5
2031	17,615,863	7.25	5.83	7.54	5.83	9,060,873	0.00	31.28	37.11	0.76	37.87	6,671,127	79.1	29,482.9
2032	17,911,105	7.25	5.66	7.54	5.66	9,747,554	0.00	31.85	37.51	0.76	38.27	6,854,580	82.0	25,940.5
2033	18,205,473	7.25	5.49	7.54	5.49	10,461,478	0.00	32.45	37.94	0.76	38.70	7,045,518	85.1	21,933.2
2034	18,498,779	7.25	5.31	7.54	5.31	11,202,296	0.00	33.06	38.37	0.76	39.13	7,238,572	88.3	17,421.4
2035	18,792,074	7.25	5.13	7.54	5.13	11,970,215	0.00	33.69	38.82	0.76	39.58	7,437,903	91.9	12,364.1
2036	19,091,455	7.25	4.95	7.54	4.95	12,762,479	0.00	17.54	22.49	0.76	23.25	4,438,763	93.6	9,920.9
2037	19,395,580	7.25	4.77	7.54	4.77	13,580,158	0.00	13.60	18.37	0.76	19.13	3,710,374	94.9	8,008.8
2038	19,709,906	7.25	4.58	7.54	4.58	14,420,653	0.00	11.92	16.50	0.76	17.26	3,401,930	96.1	6,244.3
2039	20,032,714	7.25	4.40	7.54	4.40	15,280,785	0.00	9.98	14.38	0.76	15.14	3,032,953	97.1	4,702.0
2040	20,367,773	7.25	4.22	7.54	4.22	16,157,658	0.00	8.45	12.67	0.76	13.43	2,735,392	98.0	3,324.3
2041	20,717,690	7.25	4.04	7.54	4.04	17,049,353	0.00	7.10	11.14	0.76	11.90	2,465,405	98.7	2,096.0
2042	21,085,759	7.25	3.87	7.54	3.87	17,957,241	0.00	3.71	7.58	0.76	8.34	1,758,552	99.1	1,467.8
2043	21,481,086	7.25	3.71	7.54	3.71	18,881,484	0.00	2.14	5.85	0.76	6.61	1,419,900	99.4	1,115.4
2044	21,912,963	7.25	3.55	7.54	3.55	19,818,137	0.00	0.92	4.47	0.76	5.23	1,146,048	99.4	994.7
2045	22,392,322	7.25	3.43	7.53	3.43	20,759,532	0.00	1.05	4.48	0.76	5.24	1,173,358	99.5	832.3
2046	22,925,266	7.25	3.32	7.53	3.32	21,695,417	0.00	1.07	4.39	0.76	5.15	1,180,651	99.6	648.8
2047	23,509,443	7.25	3.23	7.53	3.23	22,612,743	0.00	0.76	3.99	0.76	4.75	1,116,699	99.7	517.4
2048	24,145,251	7.25	3.17	7.52	3.17	23,517,223	0.00	0.67	3.84	0.76	4.60	1,110,682	99.8	393.1
2049	24,837,653	7.25	3.12	7.52	3.12	24,402,768	0.00	0.59	3.71	0.76	4.47	1,110,243	99.9	276.0
											Total	143,721,959		

Note: Assumes an investment return of 7.50% for fiscal year 2016 and 7.25% per year thereafter.

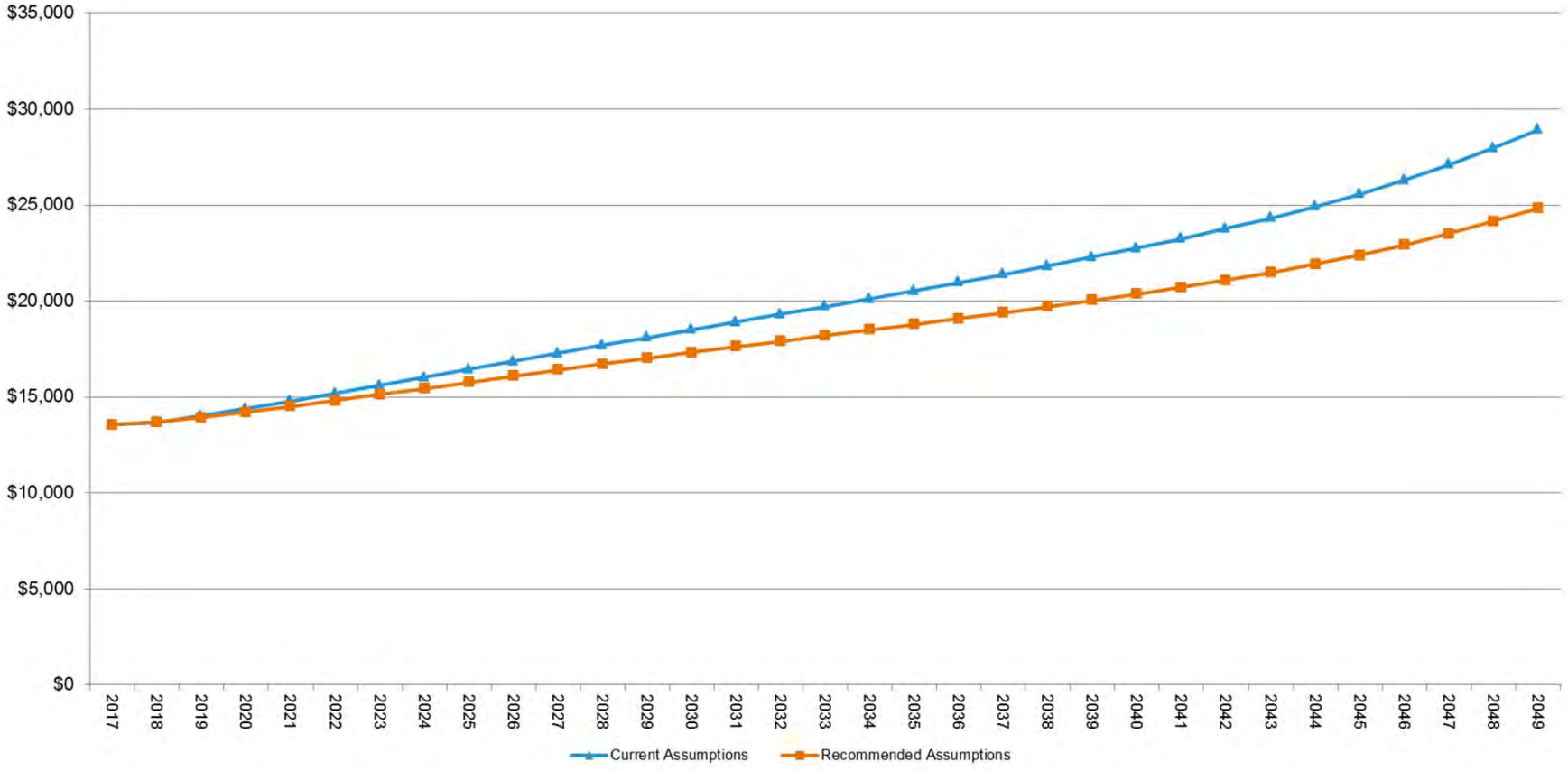
Appendix III
Comparison of Projected System Employer Contribution Amounts (Millions)



Appendix IV
Comparison of Projected System Employer Contribution Rates

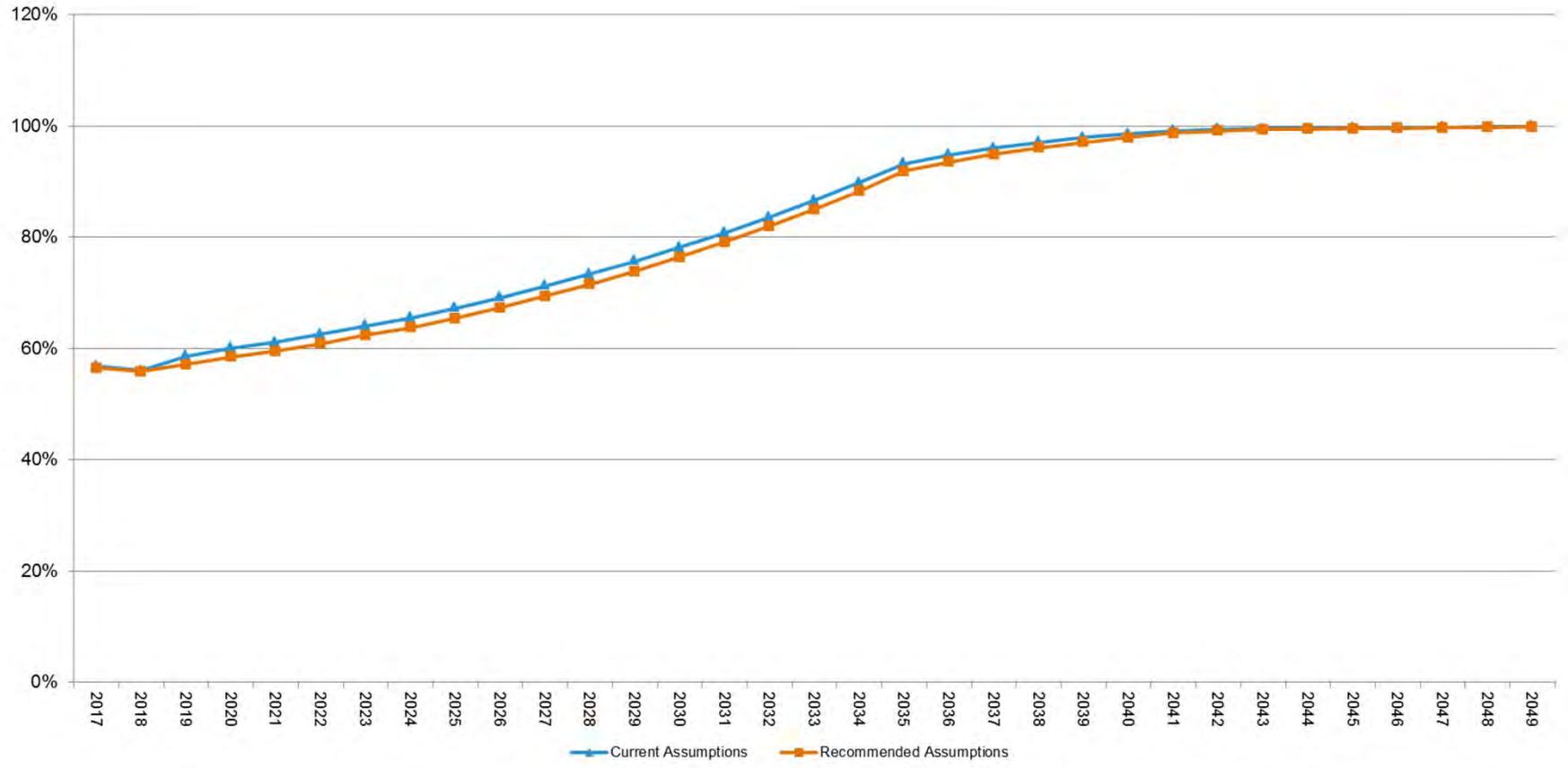


Appendix V
Comparison of Projected System Appropriation Payroll (Millions)



Note: Assumes a 3.50% annual payroll growth.

Appendix VI
Comparison of Projected System Funded Ratio
(Based on Actuarial Value of Assets)



Appendix VII
Comparison of Projected System Unfunded Accrued Liability
(Based on Actuarial Value of Assets and in Millions)