



Pennsylvania Public School Employees' Retirement System

June 30, 2022 Valuation
Board Presentation
December 16, 2022



Disclosures

The information contained herein is developed for the Board of Trustees and Staff of the Pennsylvania Public School Employees' Retirement System (PSERS) by Buck Global, LLC (Buck) using actuarial principles and techniques in accordance with all applicable Actuarial Standards of Practice (ASOPs). This document provides key results of the June 30, 2022 actuarial valuation. Interested parties may refer to the full June 30, 2022 Actuary's Report, which is scheduled to be released in 2023, for a detailed explanation regarding data, assumptions, methods, and System provisions that underlie the valuation results. In the interim, interested parties may refer to the full Actuary's Report on the June 30, 2021 actuarial valuation for a detailed explanation regarding assumptions, methods, System provisions, and certain risks that underlie the valuation.

The material contained herein is based on census and financial data, actuarial assumptions and methods, and System provisions applicable to the June 30, 2022 actuarial valuation of PSERS. Where presented, historical information is based on the parameters of the corresponding actuarial valuation. No third-party recipient of Buck's work product should rely upon Buck's work product absent involvement of Buck or without our approval.

Future actuarial measurements may differ significantly from current measurements due to System 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 System provisions or applicable law. An analysis of the potential range of future results is beyond the scope of this valuation.

Where presented, references to "funded ratio" and "unfunded accrued liability" are to measurements made on the basis of the actuarial value of assets. It should be noted that the same measurements made using the market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratios presented are appropriate for evaluating the need for and level of future contributions but provide no indication of the funded status of the System if the System were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

Disclosures

Actuarial Standard of Practice No. 56 (“ASOP 56”) provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses the following:

- Third-party software in the performance of annual actuarial valuations and projections to calculate the liabilities associated with the provisions of the System using data and assumptions as of the measurement date under the funding methods specified in this report.
- An internally developed model that applies applicable funding methods and policies to the liabilities derived from the output of the third-party software and other inputs, such as System assets and contributions, to generate many of the exhibits found in this report.

Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant deviations from expectations are investigated. Other outputs and the internal model are similarly reviewed in detail and at a high level for accuracy, reasonability and consistency with prior results. Buck also reviews the third-party model when significant changes are made to the software or model. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output. If significant changes are made to the internal model, extra checking and review are completed. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked and reviewed by multiple experts within the company who are familiar with the details of the required changes.

David L. Driscoll and Maria E. Simmers are Fellows of the Society of Actuaries and Members 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.

Agenda

- Overview of 2021/2022 fiscal year
- Report on June 30, 2022 valuation results
- Actuarial Standard of Practice No. 51
- Actuarial Standards of Practice Nos. 27 & 35

Overview of 2021/2022 Fiscal Year

- The time-weighted rate of return on the market value of assets was 2.28% (per Aon)
 - Expected return for the period July 1, 2021 to June 30, 2022 was 7.00%
 - Due to the asset smoothing method approach for determining the Actuarial Value of Assets (AVA), the AVA rate of return for the year was approximately 6.77%, which reflects continued recognition of past investment gains and losses
- The proportion of eligible participants who are assumed to elect Premium Assistance coverage for determination of the Premium Assistance contribution rate is 62% for fiscal year 2022/2023 and 61% for fiscal year 2023/2024 and thereafter.
- The assumed proportions of membership elections under Act 5 among new System members in fiscal year 2022/2023 and thereafter is unchanged and are:
 - 98% elect Class T-G membership,
 - 1% elect Class T-H membership and
 - 1% elect DC-only participation

Note: As discussed with PSERS staff, these assumptions are based on the distribution of new member class elections as of June 30, 2022.

Overview of 2021/2022 Fiscal Year

- An overview of the economic assumptions since their adoption effective with the June 30, 2021 actuarial valuation
 - Expected rate of return on assets (EROA) of 7.00% - Based on Aon's third quarter Capital Market Assumptions, the expected return is 7.84%. Based on Verus' Capital Market Assumptions, the expected return is 7.7%. Based on Buck's second quarter Capital Market Assumptions, an expected return of approximately 8.2% was developed. All the rates exceed the current 7.0% EROA.
 - Payroll growth assumption of 3.25% - The assumption for the fiscal year 2022/2023 appropriation payroll was \$14.497 billion. The assumption for the fiscal year 2023/2024 appropriation payroll is \$15.260 billion, which is an increase of 5.3%.
 - Salary increase assumption of an average of 4.5% - The actual average salary increase among continuing actives for the fiscal year 2021/2022 was 5.01%
 - While we recognize the System's policy of completing an experience study every five years, we believe that these assumptions should continue to be monitored and determine they do not significantly differ from what the actuary deems reasonable for the purpose of the measurement.
 - We have reviewed these assumptions along with recent experience and have determined that these assumptions do not significantly conflict with what, in our professional judgement, are reasonable for the purpose of the measurement.

Results of Actuarial Valuation

- Employer contribution rate
 - The fiscal year 2023/2024 actuarially required employer contribution rate is 34.00%
 - 33.09% Pension plus
 - 0.64% Premium Assistance plus
 - 0.27% Act 5 DC contribution*
 - The Act 120 minimum employer pension rate is the employer normal cost rate of 5.86%
 - The fiscal year 2022/2023 actuarially required employer contribution rate is 35.26%
 - 34.31% Pension plus
 - 0.75% Premium Assistance plus
 - 0.20% Act 5 DC contribution*

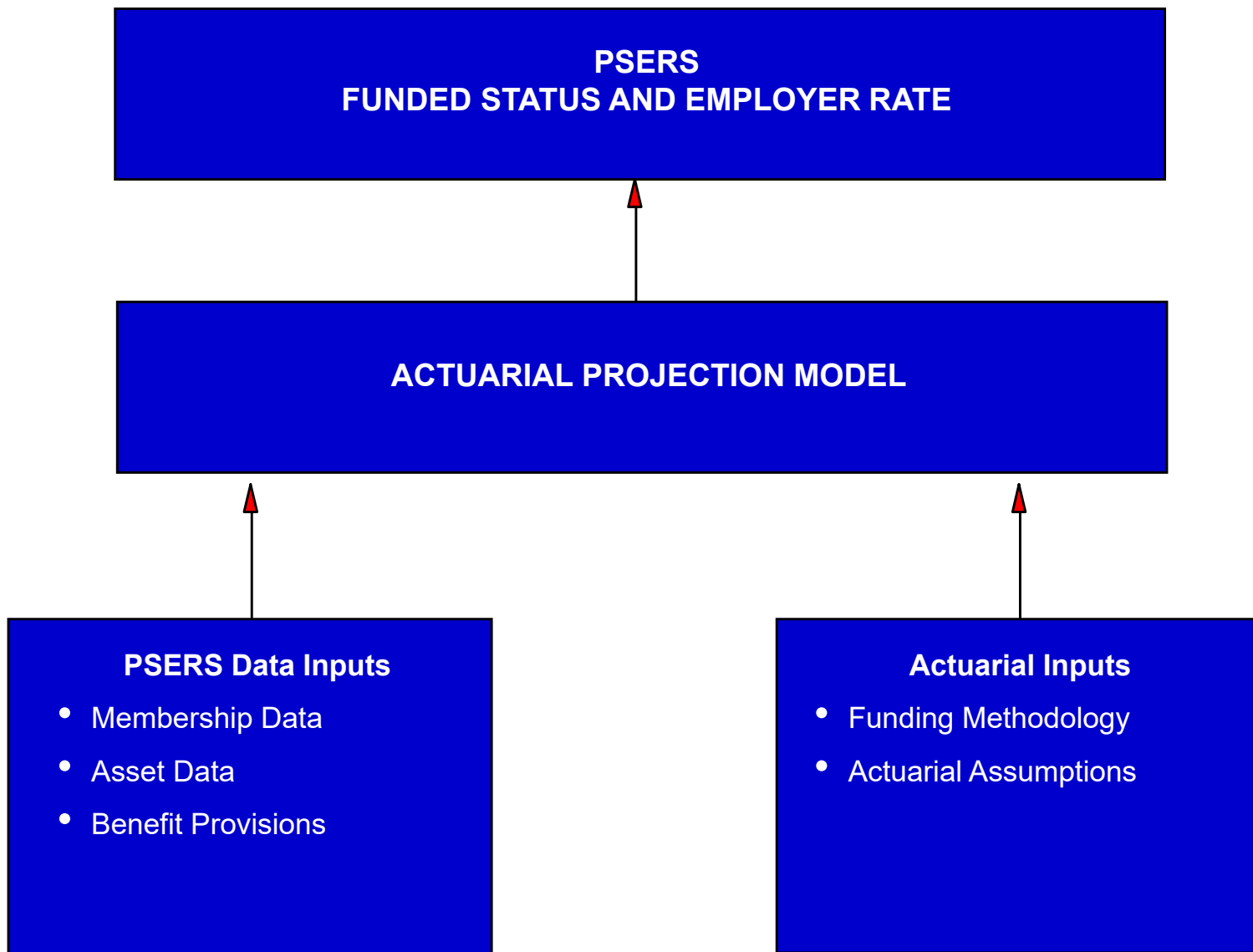
* Estimated average DC contribution rate. The actual employer DC contribution rate will be based on each employer's Class T-G, Class T-H and DC-only membership/participation.

Results of Actuarial Valuation

- Security of promised benefits
 - Accrued liability exceeds actuarial value of assets by \$44.0 billion
 - As of June 30, 2021, the accrued liability exceeded actuarial value of assets by \$45.5 billion
 - Funded status based on the System's actuarial value of assets is 61.6%
 - Funded status as of June 30, 2021 based on the System's actuarial value of assets was 59.6%

Note: The above funded ratios have no relationship to the possible funded position on a settlement-of-liabilities basis.

- Decrease of Unfunded Actuarial Accrued Liability due to 2022 Net Actuarial Gain
 - Comparison of actual experience to expected
 - Experience gain for fiscal year ended June 30, 2022 is \$1.037 billion
 - Actuarial value of assets loss of \$0.151 billion
 - Actuarial liability gain of \$0.866 billion
 - The fiscal year 2022 actuarially required employer contribution rate was received. However, greater than anticipated contribution amounts were actually credited to the System resulting in an over-contribution gain of \$0.322 billion



Active Membership Statistics

<u>Item</u>	<u>June 2022</u>	<u>June 2021</u>
Class T - C	2,391	2,635
Class T - D	139,161	148,546
Class T - E	53,374	57,944
Class T - F	13,082	13,766
Class T - G	39,655	25,061
Class T - H	<u>210</u>	<u>139</u>
Total Number*	247,873	248,091
	-0.09 %	
Annualized salaries (Total salaries)	\$ 14.397 Bil +2.42 %	\$ 14.057 Bil
Average compensation	\$ 58,082 +2.50 %	\$ 56,663
Average age	45.4 Yrs.	45.5 Yrs.
Average service	12.1 Yrs.	12.1 Yrs.
<hr/>		
Funding year	2023-2024	2022-2023
Total employer payroll (est.)	\$ 15.260 Billion	\$ 14.497 Billion

* Excludes 520 DC-only participants in 2022 and 319 DC-only in 2021. Based on discussions with PSERS staff, the 2021 amount has been updated from 54.

Annuitant Membership Statistics

<u>Item</u>	<u>June 2022</u>	<u>June 2021</u>
Number		
Annuitants	225,081	221,277
Survivors and beneficiaries*	13,100	12,704
Disabled annuitants	<u>8,720</u>	<u>8,858</u>
Total	246,901	242,839
	+1.67 %	
Annual annuities		
Annuitants	\$ 6.042 Bil	\$ 5.927 Bil
Survivors and beneficiaries	0.209	0.197
Disabled annuitants	<u>0.188</u>	<u>0.188</u>
Total	\$ 6.439 Bil	\$ 6.312 Bil
	+2.01 %	
Average annuities		
Annuitants	\$ 26,842	\$ 26,783
Survivors and beneficiaries	\$ 15,982	\$ 15,529
Disabled annuitants	\$ 21,526	\$ 21,218
Total	\$ 26,078	\$ 25,992
	+0.33 %	

* Excludes 1,776 beneficiaries in 2022 and 1,678 beneficiaries in 2021 who are only entitled to a lump sum distribution.

Market Value of Assets

<u>Item</u>	<u>June 2022</u>	<u>June 2021</u>
Beginning of year	\$ 72.100 Bil	\$ 58.687 Bil
Contributions	6.249	5.956
Benefits	(7.368)	(7.248)
Investment income*	<u>(0.317)</u>	<u>14.705</u>
End of year	\$ 70.664 Bil	\$ 72.100 Bil
Rate of return	2.28 % (per Aon)	24.58 % (per Aon)
Expected rate of return**	7.00 %	7.25 %

* Net of administrative and investment expenses

** Based on prior year's valuation interest rate

Actuarial Value of Assets

Ten-year asset smoothing method

1. Market value of assets June 30, 2022 \$ 70.664 Bil

2. Determination of deferred gain (loss)

Fiscal Year	Gain (Loss)	Recognized Amount – FY21/22	Percent Deferred	Deferred Amount
2021/2022	\$ (4.985) Bil	\$ (0.499) Bil	90.00 %	\$ (4.487) Bil
2020/2021	10.116	1.012	80.00	8.093
2019/2020	(3.440)	(0.344)	70.00	(2.408)
2018/2019	(0.600)	(0.060)	60.00	(0.360)
2017/2018	0.551	0.055	50.00	0.275
2016/2017	0.847	0.085	40.00	0.339
2015/2016	(3.794)	(0.379)	30.00	(1.138)
2014/2015	(2.918)	(0.292)	20.00	(0.583)
2013/2014	2.864	0.286	10.00	0.286
2012/2013	<u>(0.153)</u>	<u>(0.015)</u>	0.00	<u>(0.000)</u>
	\$ (1.512) Bil	\$ (0.151) Bil		\$ 0.017 Bil

3. Preliminary actuarial value of assets June 30, 2022: (1) – (2) \$ 70.647 Bil

Actuarial Value of Assets

Ten-year asset smoothing method

4. Per Act 5 of 2017, the Actuarial Value of Assets must be in a 30% range of the Market Value of Assets:
 - a. Preliminary Actuarial Value of Assets = \$70.647 Billion
 - b. 70% of the Market Value of Assets = $0.70 \times \$70.664 \text{ Billion} = \49.465 Billion
 - c. 130% of the Market Value of Assets = $1.30 \times \$70.664 \text{ Billion} = \91.863 Billion
 - d. Actuarial Value of Assets = (a) not less than (b) nor greater than (c) = \$70.647 Billion

Notes:

- The 30% corridor limits how far the 10-year asset smoothing method can depart from market value of assets.
- The corridor will (decrease)/increase the unfunded accrued liability contribution rate if the actuarial value of assets is (less than 70%)/greater than 130% of the market value of assets.

Actuarial Cost Method

- PSERS Cost Method
 - Entry Age Normal
 - Required by Code
- Entry age normal method: allocation of reserve over members' working lifetimes
 - Pension benefit earned during year (normal cost)
 - Payment toward unfunded accrued liability
- Goal: full reserve at retirement

Accrued Liability

	<u>June 2022</u>	<u>June 2021</u>
Annuitants and Inactives	\$ 64.803 Billion	\$ 63.996 Billion
Active members	<u>49.674</u>	<u>48.655</u>
Accrued Liability Pension	\$ 114.477	\$ 112.651
Healthcare payments	<u>0.135</u>	<u>0.132</u>
Total Accrued liability	\$ 114.612 Billion	\$ 112.783 Billion

Unfunded Accrued Liability and Funded Status

<u>Item</u>	<u>June 2022</u>	<u>June 2021</u>
Accrued Liability Pension	\$114.477 Bil	\$112.651 Bil
Healthcare Payments	<u>0.135</u>	<u>0.132</u>
Total Accrued liability	\$114.612 Bil	\$112.783 Bil
<u>Assets</u>		
Market value of assets	\$70.664 Bil	\$72.100 Bil
Actuarial value of assets	\$70.647 Bil	\$67.249 Bil
<u>Unfunded accrued liability</u>		
Market value of assets*	\$43.948 Bil	\$40.683 Bil
Actuarial value of assets**	\$43.965 Bil	\$45.534 Bil
<u>Funded status</u>		
Market value of assets	61.7%	63.9%
Actuarial value of assets	61.6%	59.6%

* Similar to GASB 67 Net Pension Liability.

** Act 120 amortization is over a period of 24 years with amounts increasing as a level percent of compensation.

Employer Contribution Rate

<u>Item</u>	<u>June 2022 (FY23/24)</u>	<u>June 2021 (FY22/23)</u>
Normal cost rate	13.30%	13.59%
Member rate (average)	<u>(7.44)</u>	<u>(7.52)</u>
Employer normal cost rate	5.86%	6.07%
Unfunded accrued liability rate	<u>27.23</u>	<u>28.24</u>
Total pension rate*	33.09%	34.31%
Health insurance rate	0.64	0.75
Act 5 DC contribution rate**	<u>0.27</u>	<u>0.20</u>
Total***	34.00%	35.26%

* The total pension rate cannot be less than the employer normal cost rate .

** Estimated average DC contribution rate. The actual employer DC contribution rate will be based on each employer's Class T-G, Class T-H and DC-only membership/participation.

*** The total employer contribution rate is the sum of the final pension rate, health insurance rate and Act 5 DC contribution rate.

Funding Methodology

Goal - Full Reserve at Retirement

Benefit	Annual Cost	Rate Component
Projected Retirement Benefit	Level % Pay	Normal Cost Rate
Accrued Benefit:		
(1) Unfunded accrued liability as of the June 30, 2010 valuation	24-Year Amortization Level % Pay	Accrued Liability Rate
(2) Legislation that increases liability (e.g. COLAs or ERI windows)	10-Year Amortization Level % Pay	Supplemental Liability Rate
(3) Annual Actuarial Gains/Losses and Assumption Changes	24-Year Amortization Level % Pay	Experience Adjustment Factor

Unfunded Accrued Liability Rate

<u>Rate Component</u>	<u>June 2022 (FY23/24)</u>	<u>June 2021 (FY22/23)</u>
Accrued liability rate	11.48%	11.70%
Supplemental liability rate	0.00	0.00
Experience adjustment factor	<u>15.75</u>	<u>16.54</u>
Unfunded accrued liability rate	27.23%	28.24%

2022 Net Actuarial Gain

1. Investment return loss ¹	\$ 151 Mil
2. Accrued liability experience (gains) and losses ²	
- New entrants and pickups	98
- Individual salary increases	(182)
- Mortality	(86)
- Retirement/disability/terminations	(483)
- Miscellaneous	<u>(213)</u>
- Total	\$ (866) Mil
3. Actual contributions greater than expected	\$ (322) Mil
4. Net actuarial experience gain: (1) + (2) + (3)	\$ (1,037) Mil

1 6.77% actual rate of return on the Actuarial Value of Assets vs. the assumed 7.00% rate of return.

2 Experience (gains) reduce the System's unfunded accrued liability and experience losses increase the System's unfunded accrued liability.

Health Insurance Account 2023/2024 Employer Rate

Estimated number of eligible annuitants in FY 2024/2025	159,800
Estimated number of eligible annuitants who elect coverage	97,478
1. Estimated balance at 6/30/2023	\$ 138.1 Mil
2. Disbursements FY 2023/2024	\$ 117.0
3. Disbursements FY 2024/2025	\$ 118.1
4. Required contribution: (2) + (3) – (1)	\$ 97.0
5. FY 2023/2024 membership payroll	\$ 15,260 Mil
6. Health insurance employer rate: (4) ÷ (5) (rounded up)	0.64%

Notes:

1. 62% for fiscal years 2022/2023 and 61% thereafter of eligible annuitants are assumed to elect coverage.
2. Total OPEB Liability (Actuarial Accrued Liability) disclosed under GASB 74 as of June 30, 2022 is \$1,976 million, based on a discount rate of 4.09%.
3. Estimated balance as of 6/30/2023 is based on a FY 2022/2023 appropriation payroll of \$15,072 Mil.

ASOP 51 Disclosures

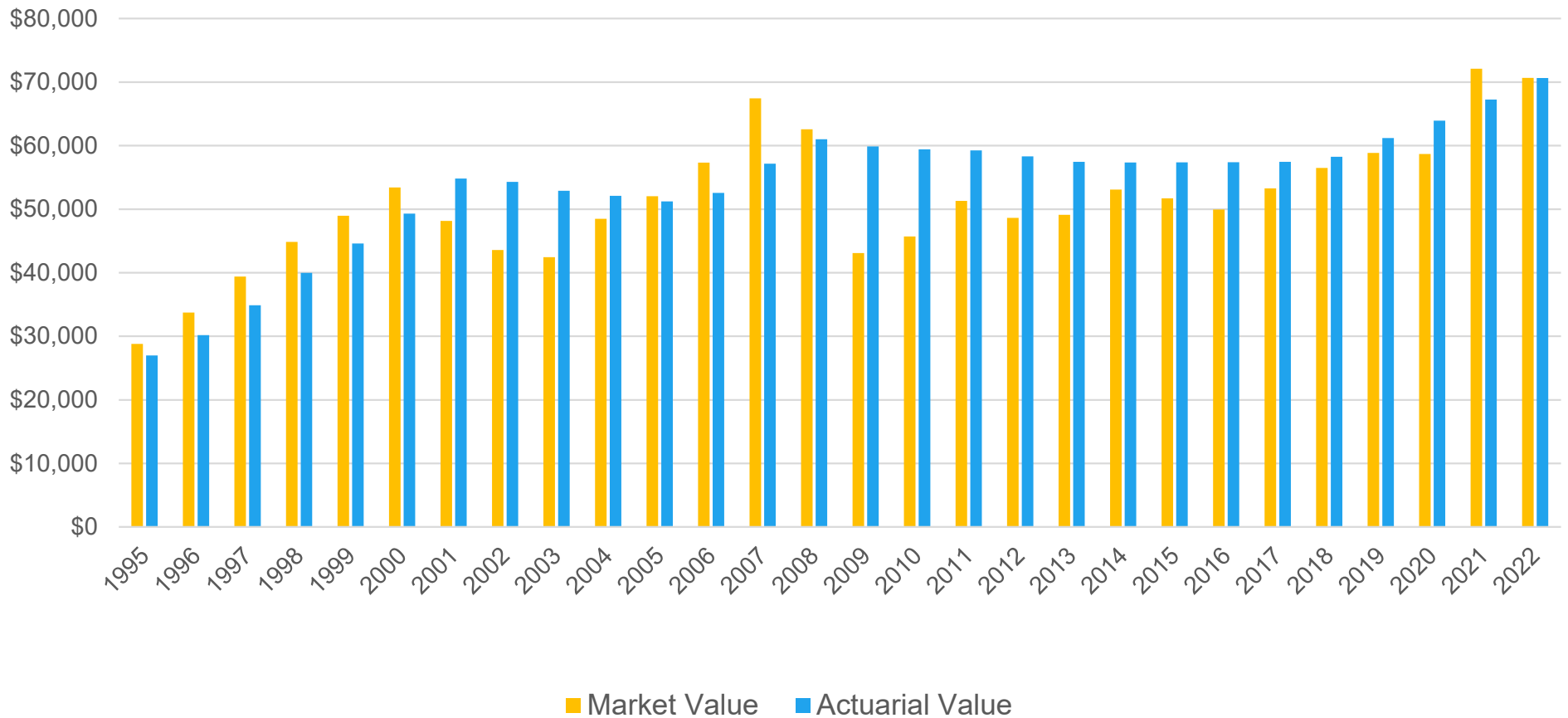
- **Investment Risk** – Asset returns less than expected would lead to lower assets, higher unfunded liabilities and larger employer contributions
 - 10-year asset averaging helps to smooth out volatility due to the above-mentioned investment risk
 - Aon performs an annual stress test, in accordance with the Act 2020-128 requirement for annual 20-year projections, sensitivity analysis and simulations.
- **Salary increases** – In general, salaries greater than expected would lead to higher liabilities, larger unfunded liabilities and larger employer contributions. Conversely, salaries less than expected would lead to lower liabilities but may increase employer contribution rates due to lower employer payroll.
- **Longevity risks** – Members living longer than expected would increase the System’s liabilities, the unfunded liability and the employer contributions
 - The mortality assumption uses a mortality improvement scale that mitigates some of the risk associated with members living longer
- **Declining active workforce** - Employer contributions are based on a percentage of members’ and DC-only participants’ salaries. If the required dollar amount of contributions remain level or increase, a declining active workforce will result in higher contribution rates in order to meet required contribution levels
- **Contribution risk** – Risk of not contributing an actuarially determined contribution. If future contributions are at levels below those presented in this report, the System may not be expected to achieve a fully funded position over the 24-year time horizon as contemplated in the statute based on the data, assumptions and methods used in the valuation

ASOPs 27 & 35 Disclosures

- Actuarial Standards of Practice Nos. 27 and 35 require the actuary to identify the economic and demographic assumptions that have a significant effect on the measurement and, for those that the actuary has not selected, to provide the information and analysis the actuary performed to determine that the assumption does not significantly differ from what the actuary deems reasonable for the purpose of the measurement.
- The material demographic assumptions were based on the recommendations outlined our five-year experience study for the period July 1, 2015 to June 30, 2020, which were adopted by the Board effective with the June 30, 2021 actuarial valuation. We reviewed the assumptions along with recent experience and the assumptions are still reasonable for the current measurement.
- The material economic assumptions include the salary scale, payroll growth and expected return on assets (“EROA”). The current assumptions were based on the recommendations outlined in our five-year experience study for the period July 1, 2015 to June 30, 2020, which were adopted by the Board effective with the June 30, 2021 actuarial valuation.
 - We reviewed the salary scale and payroll growth assumptions along with recent experience and the assumptions are still reasonable for the current measurement.
 - In the case of the EROA:
 - We reviewed the analysis provided by Aon and Verus, the System’s investment advisors
 - We analyzed the economic information using tools provided by Buck’s Financial Risk Management (“FRM”) practice
 - We have determined the EROA assumption is reasonable for the current measurement.

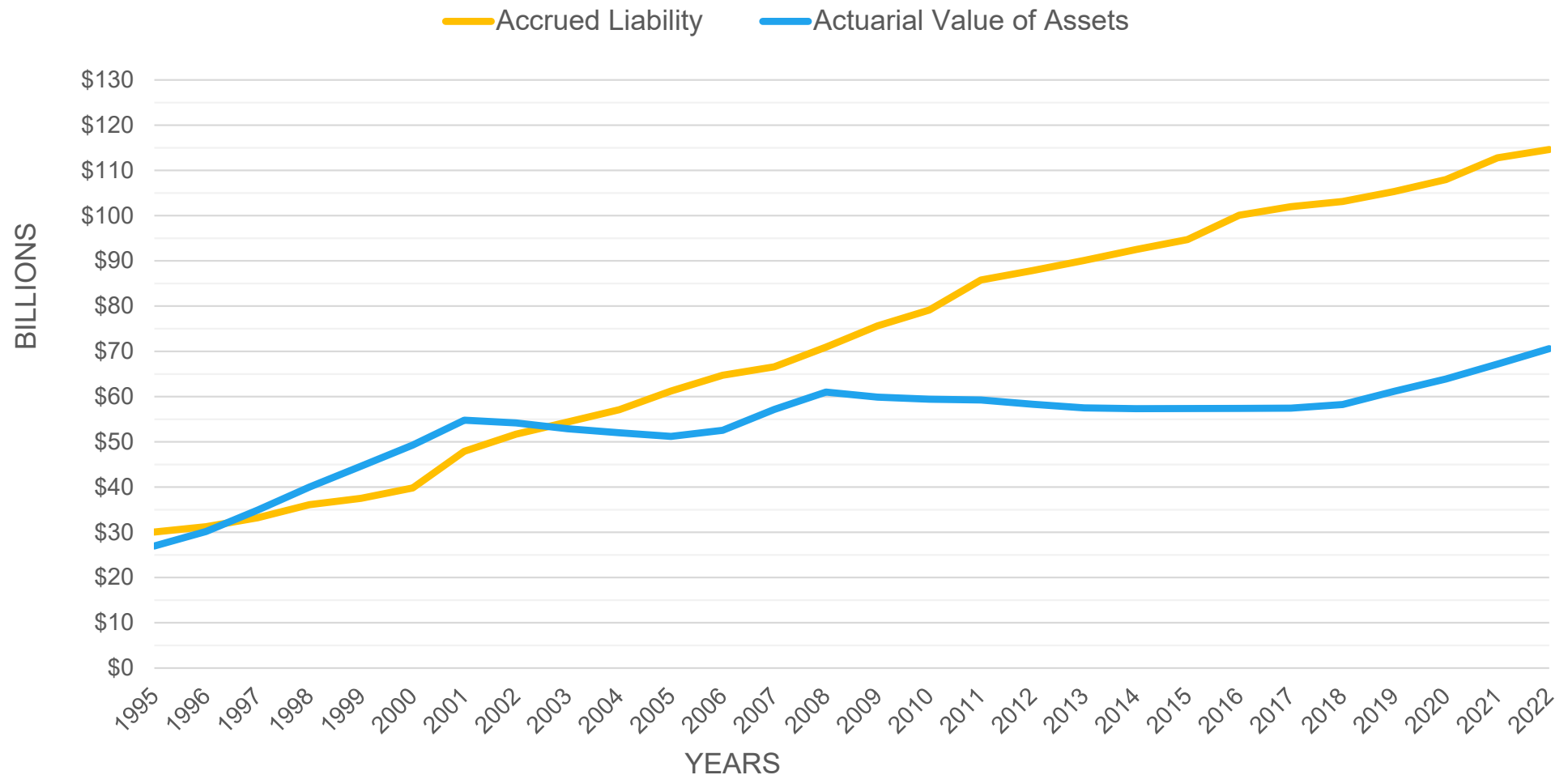
Appendices

Comparison of Asset Values (\$ Millions)



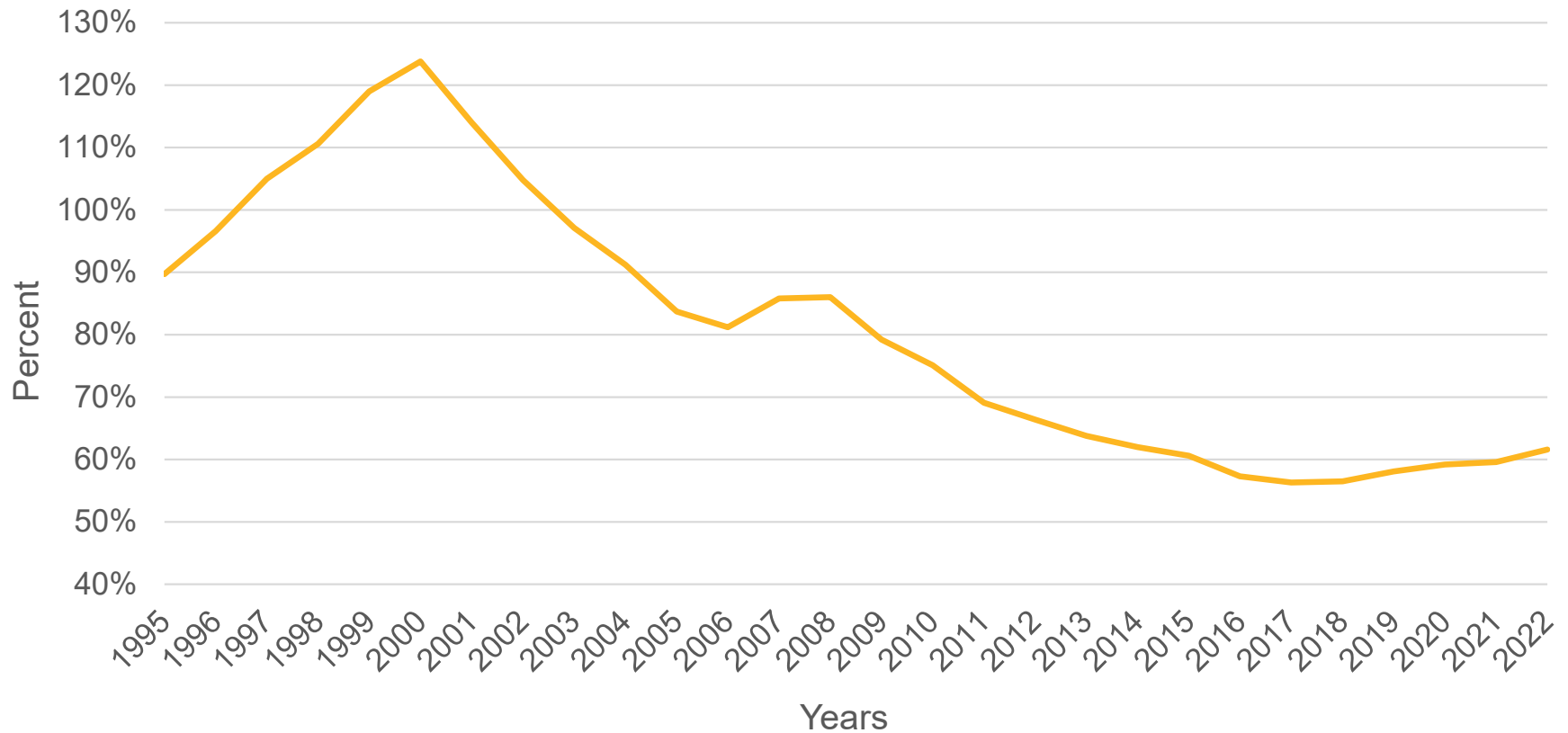
Note: Beginning with the 2010 valuation, the actuarial value of assets reflects the 10-year asset smoothing method enacted by Act 120.

Accrued Liability and Actuarial Value of Assets: 1995 – 2022



Financial Position Funded Status

Actuarial Value of Assets as a % of Accrued Liability: 1995 - 2022



Total Contribution Rate

Fiscal Year	Normal Cost	Unfunded Accrued Liability	Health Care Contribution	DC Contribution (Average) ⁴	Total Employer	Member Contribution (Average) ¹	Total Contribution Rate
23/24	5.86%	27.23%	.64%	.27%	34.00%	7.44%	41.44%
22/23	6.07	28.24	.75	.20	35.26	7.52	42.78
21/22	7.20	26.79	.80	.15	34.94	7.56	42.50
20/21	7.37	26.14	.82	.18	34.51	7.61	42.12
19/20	7.49	25.87	.84	.09	34.29	7.59	41.88
18/19	7.59	25.01	.83	N/A	33.43	7.57	41.00
17/18	7.70	24.04	.83	N/A	32.57	7.54	40.11
16/17	8.31	20.89	.83	N/A	30.03	7.52	37.55
15/16	8.38	19.44	.84	N/A	25.84 ²	7.49	33.33
14/15	8.46	17.51	.90	N/A	21.40 ²	7.46	28.86
13/14	8.57	15.25	.93	N/A	16.93 ²	7.43	24.36
12/13	8.66	12.99	.86	N/A	12.36 ²	7.40	19.76
11/12	8.12	10.15	.65	N/A	8.65 ²	7.37	16.02
10/11	8.08	(0.50)	.64	N/A	5.64 ³	7.34	12.98
09/10	7.35	(3.72)	.78	N/A	4.78	7.32	12.10
08/09	6.68	(3.37)	.76	N/A	4.76	7.29	12.05
07/08	6.68	(.24)	.69	N/A	7.13	7.25	14.38
06/07	6.62	(.95)	.74	N/A	6.46	7.21	13.67
05/06	7.61	(4.28)	.69	N/A	4.69	7.16	11.85
04/05	7.48	(7.10)	.23	N/A	4.23	7.12	11.35
03/04	7.25	(4.27)	.79	N/A	3.77	7.08	10.85
02/03	7.20	(10.03)	.97	N/A	1.15	7.10	8.25
01/02	5.63	(6.05)	1.09	N/A	1.09	6.43	7.52
00/01	6.29	(4.65)	.30	N/A	1.94	5.77	7.71
99/00	6.40	(2.04)	.25	N/A	4.61	5.72	10.33
98/99	6.33	(.44)	.15	N/A	6.04	5.69	11.73

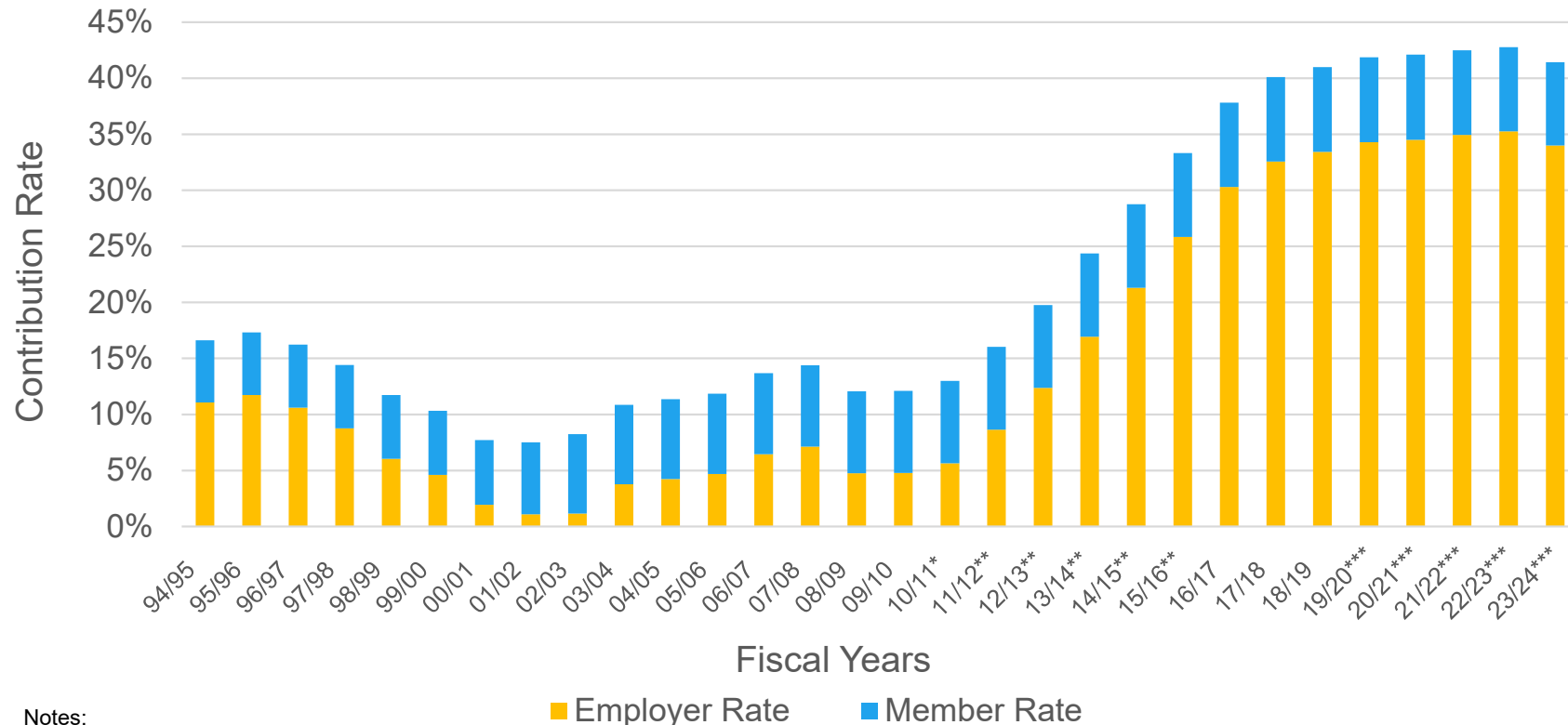
1. Act 9 member rate change took effect January 1, 2002. Act 120 member rate change took effect July 1, 2011.

2. Act 120 limited the employer pension contribution of 27.82% to 25.00% for Fiscal Year 15/16 (prior rate of 20.50% + 4.50% collar), 25.97% to 20.50% for Fiscal Year 14/15 (prior rate of 16.00% + 4.50% collar), 23.82% to 16.00% for Fiscal Year 13/14 (prior rate of 11.50% + 4.50% collar), 21.65% to 11.50% for Fiscal Year 12/13 (prior rate of 8.00% + 3.50% collar) and 18.27% to 8.00% for Fiscal Year 11/12 (prior rate of 5.00% + 3.00% collar).

3. Act 46 reduced the employer pension contribution from 7.58% to 5.00% for Fiscal Year 10/11.

4. Under Act 5, employers contribute 2.25% of pay for Class T-G members, 2.00% of pay for Class T-H members and 2.00% of pay for DC-only participants to the DC plan.

30-Year History of Member and Employer Contribution Rates



Notes:

* Act 46 reduced the employer pension contribution from 7.58% to 5.00% for Fiscal Year 10/11.

** Act 120 limited the employer pension contribution of 27.82% to 25.00% for Fiscal Year 15/16 (prior rate of 20.50% + 4.50 collar), 25.97% to 20.50% for Fiscal Year 14/15 (prior rate of 16.00% + 4.50% collar), 23.82% to 16.00% for Fiscal Year 13/14 (prior rate of 11.50% + 4.50% collar), 21.65% to 11.50% for Fiscal Year 12/13 (prior rate of 8.00% + 3.50% collar) and 18.27% to 8.00% for Fiscal Year 11/12 (prior rate of 5.00% + 3.00% collar).

*** Fiscal Years 2019/2020 and 2020/2021 include the anticipated Act 5 DC contribution based on the following new System Act 5 membership election: 65% elect Class T-G membership, 30% elect Class T-H membership and 5% elect DC-only participation. Fiscal Years 2021/2022 through 2023/2024 include the anticipated Act 5 DC contribution based on the following new System Act 5 membership election: 98% elect Class T-G membership, 1% elect Class T-H membership and 1% elect DC-only participation.

