Teachers' Retirement System
of the State of Illinois

Summary Review of June 30, 2022 Actuarial Valuation Results

October 21, 2022

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This document has been prepared by Segal for the benefit of the Board of Trustees of the Teachers' Retirement System of the State of Illinois and is not complete without the presentation provided at the October 21, 2022, meeting. The actuarial valuation report has information on the plan provisions, data, methods and assumptions used in the valuation. Use of the information in this presentation is subject to the caveats described in that document. The measurements in this presentation may not be appropriate for purposes other than those described in the actuarial valuation report. The actuarial calculations were completed under the supervision of Matt Strom, FSA, MAAA, EA and Tanya Dybal, FSA, MAAA, EA.

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Agenda

Overview of the Valuation Process

Summary of Valuation Highlights

Membership and Demographics

Valuation Results

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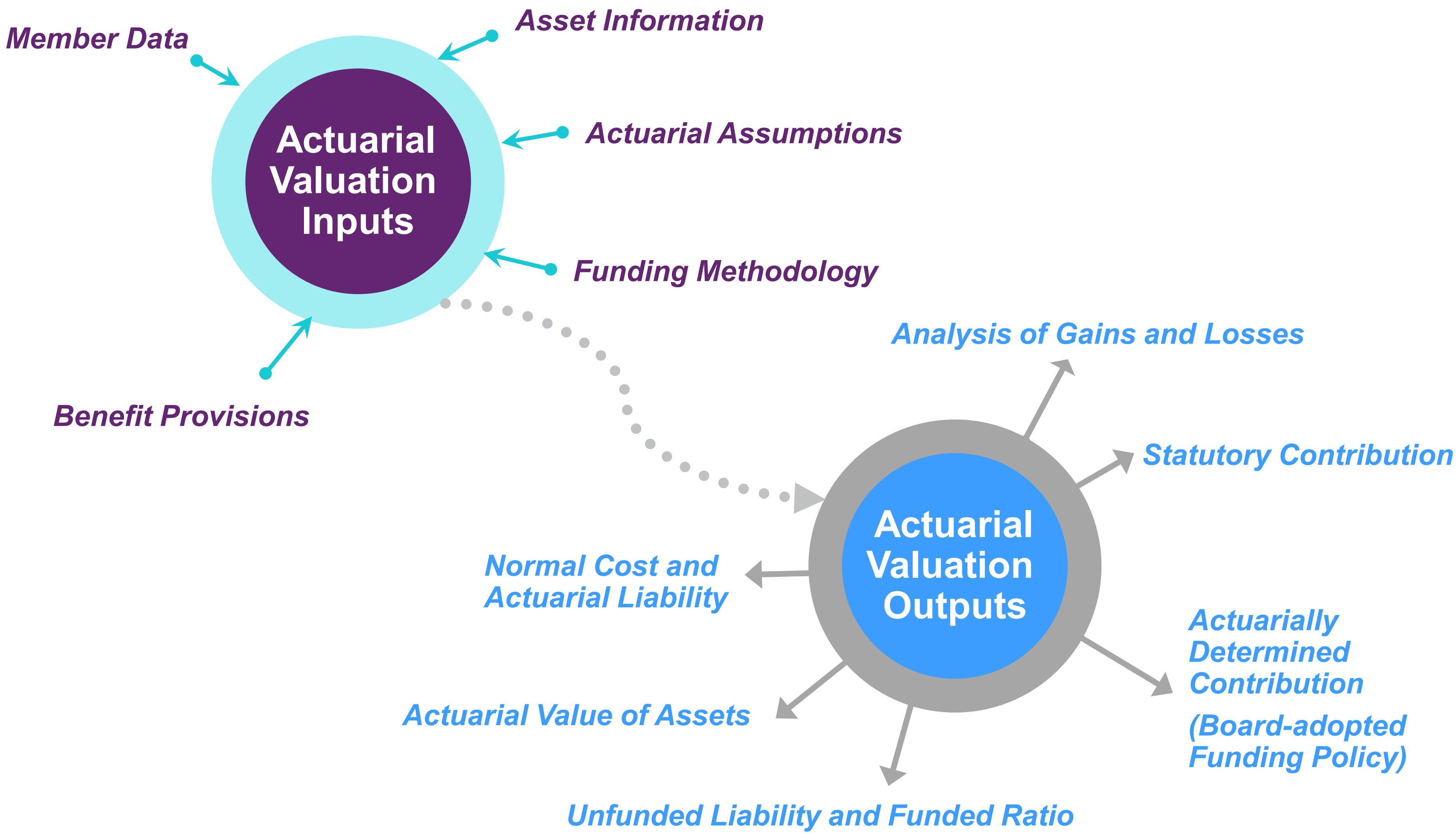
The Valuation Process



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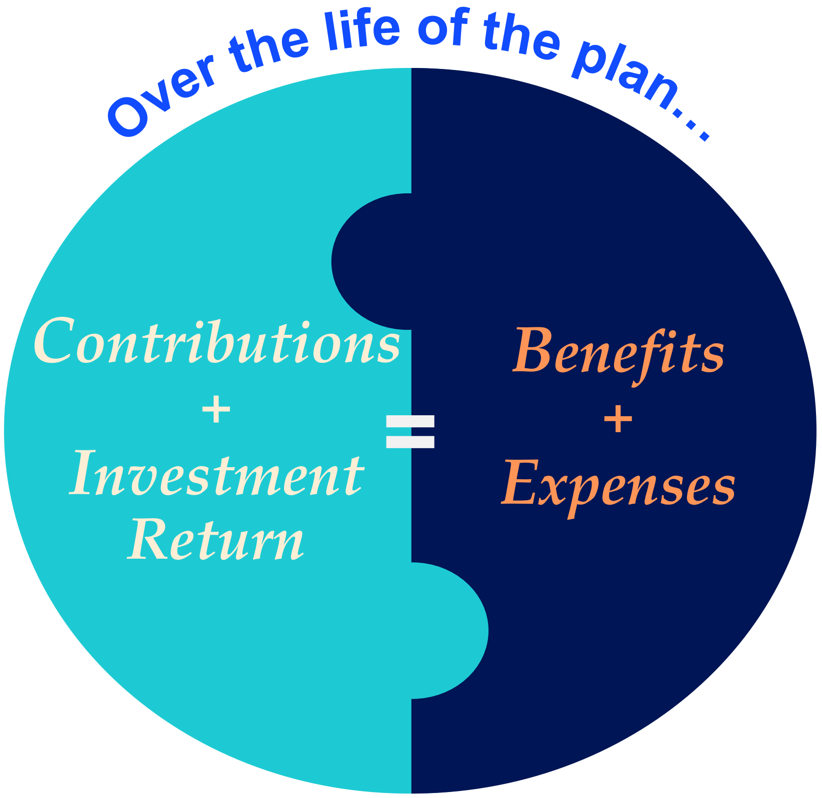
Actuarial Balance



Or: *Contributions* = *Benefits* + *Expenses* – *Investment Return*

Actuarial Assumptions

Demographic

- Retirement
- Disability
- Withdrawal
- Mortality

Economic

- Inflation: 2.50%
- Investment return: 7.00%
- Salary increases: 8.75% for new members to 3.75% for members with 20+ years of service
- Payroll growth – based on open group projection with a level active population and new entrants similar to newly hired employees

Actuaries make assumptions as to when and why a member will leave active service and estimate the amount and duration of the pension benefits paid.

*Economic assumptions are reviewed annually, most recently at the August 2022 Board meeting where the inflation assumption of 2.50% was adopted effective for the June 30, 2022, valuation.

Actuarial Methods

Asset Valuation Method

- Investment gains and losses recognized over a number of years
- TRS recognizes 20% of the difference between expected and actual returns in the current year (a 5-year smoothing period)
- A 20% market value corridor is applied – actuarial value of assets must fall within 80% to 120% of market value

Actuarial Cost Method

- Allocation of liability to past and future service
- TRS uses the Projected Unit Credit cost method for the **Statutory Contribution**
  – Current year's cost based on value of benefit earned that year, using projected salary
  – Results in back-loading of normal cost
- Entry Age Normal used for the **Board-Adopted Actuarial Funding Policy**
  – Allocates cost of member's benefit over expected career as a level % of salary
  – Commonly used method

Amortization Method

- **Statutory Contribution**
  – No explicit method to amortize the UAAL; the total contribution less the normal cost is the payment toward the UAAL
- **Board-Adopted Actuarial Funding Policy**
  – Layered amortization with new UAAL amortized over 20 years
  – Amortization payments increase at the rate of future State revenue growth, assumed to be 2%

Actuarially Determined vs. Statutory Contribution

The Actuarially Determined Contribution is compared to the Statutory Contribution as a measure of the inadequacy of the Statutory Contribution.

Actuarially Determined Contribution (Board-Adopted Actuarial Funding Policy)

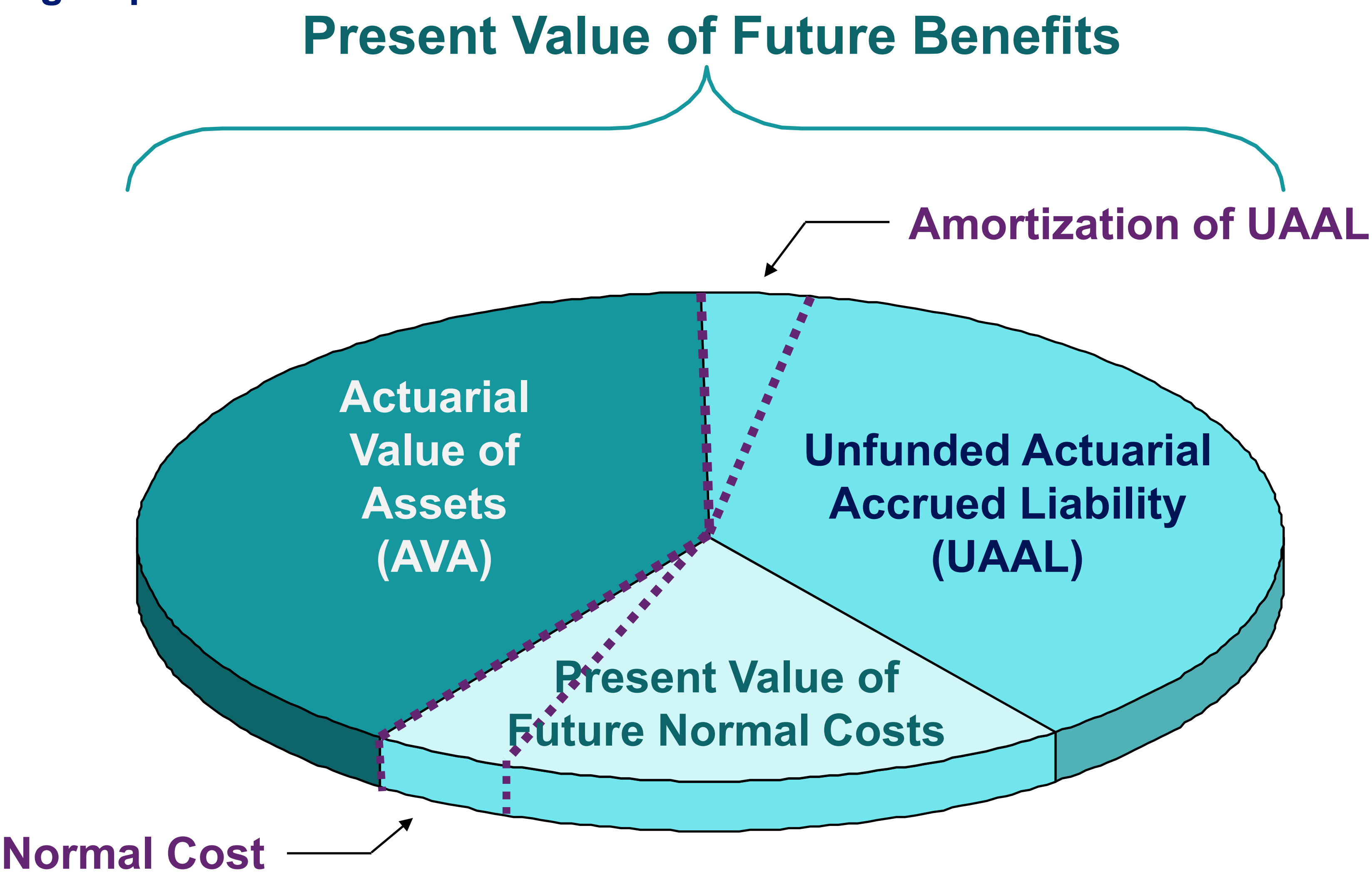
- Equal to the normal cost plus amortization of the unfunded actuarial accrued liability (UAAL)
- Benefits:
  - Entry age normal cost method
  - 100% funding target
  - Reflects appropriate tier of benefits of those in TRS, not those to be hired

Statutory Contribution under Illinois Funding Policy

- Equal to amount determined as a level percentage of payroll necessary to achieve a projected funded percentage of 90% by 2045
- Shortcomings:
  - Projected unit credit cost method
  - 90% funding target
  - Reflects effect of Tier II provisions for members who have not yet been hired

Actuarially Determined Contribution

Entire group:



Changes Since Last Year's Valuation

- ***Assumption Changes***
  - The following assumption changes are reflected in the June 30, 2022, actuarial valuation:
    - As approved by the Board on August 12, 2022, the inflation assumption was increased from 2.25% to 2.50%. The Tier 2 salary cap increase, Tier 2 COLA, rates of individual salary increases, and new entrant pay increase assumptions were modified to reflect the change in assumed inflation.
    - The inactive vested buyout assumption was changed from 5% of current inactive vested members to 10% of future active terminations electing to receive a lump sum buyout in lieu of an annuity at retirement, to better reflect actual experience.
    - The assumed buyout period was changed from fiscal 2024 to fiscal 2026 to reflect the extension of the buyout programs per Public Act 102-0718
  - The impact of these assumption changes increased the actuarial accrued liability as of June 30, 2022, by $**404 million** and decreased the FY 2024 State Contribution by $**14 million***

** Primarily due to the change in the new entrant pay increase assumption to reflect the change in the assumed inflation. Reflects the 5-year phase-in of the effect of assumption.*

Summary of Valuation Highlights

- ***State Contribution***
  - Required State contribution for fiscal 2024 is **$6.04 billion**, a 2.55% increase from the fiscal 2023 contribution of $5.89 billion
  - The fiscal 2024 State contribution under the Board-Adopted Actuarial Funding Policy is **$9.59 billion**
    - Statutory contribution is approximately 63% of the Board funding policy amount
    - The $3.55 billion contribution shortfall increases future contribution requirements
- ***Asset Experience***
  - Fair value of assets returned **-1.16%** for year ending 6/30/22 (Segal calculation)
    - Gradual recognition of deferred gains and losses resulted in a 7.8% return on actuarial assets, compared to 7.0% expected
    - Gain on actuarial value of assets is $460.0 million
    - Total deferred investment loss as of June 30, 2022 is $76.8 million
  - This valuation reflect an additional one-time contribution of $172,823,300 appropriated to TRS during fiscal 2022 per Public Act 102-0696
- ***Demographic Experience***
  - Demographic and liability experience resulted in a loss of $125.1 million, or 0.1% of actuarial accrued liability

Summary of Valuation Highlights (continued)

- ***Funded Percentage***
  - Funded ratio based on the actuarial value of assets increased from 42.5% in 2021 to **43.8%** in 2022
- ***Unfunded Actuarial Accrued Liability (UAAL)***
  - The actuarial accrued liability increased from $138.9 billion (as of June 30, 2021) to **$143.5 billion** (as of June 30, 2022)
  - The actuarial value of assets increased from $59.0 billion (as of June 30, 2021) to **$62.9 billion** (as of June 30, 2022)
  - The UAAL increased from $79.9 billion to **$80.6 billion**
    - $0.7 billion increase results from net experience gain ($0.3 billion), loss from assumption changes ($0.4 billion), and loss from inadequate State contributions ($0.6 billion)
- ***Buyout Experience***
  - As of August 31, 2022, there have been $680 million of buyout payments paid since the commencement of the AAI and IV buyout programs
  - Approximately $563 million and $477 million of liability has been settled as a result of the AAI and IV buyout experience, respectively
  - The required State contribution for fiscal 2024 is approximately $80 million lower due as a result of the buyout programs

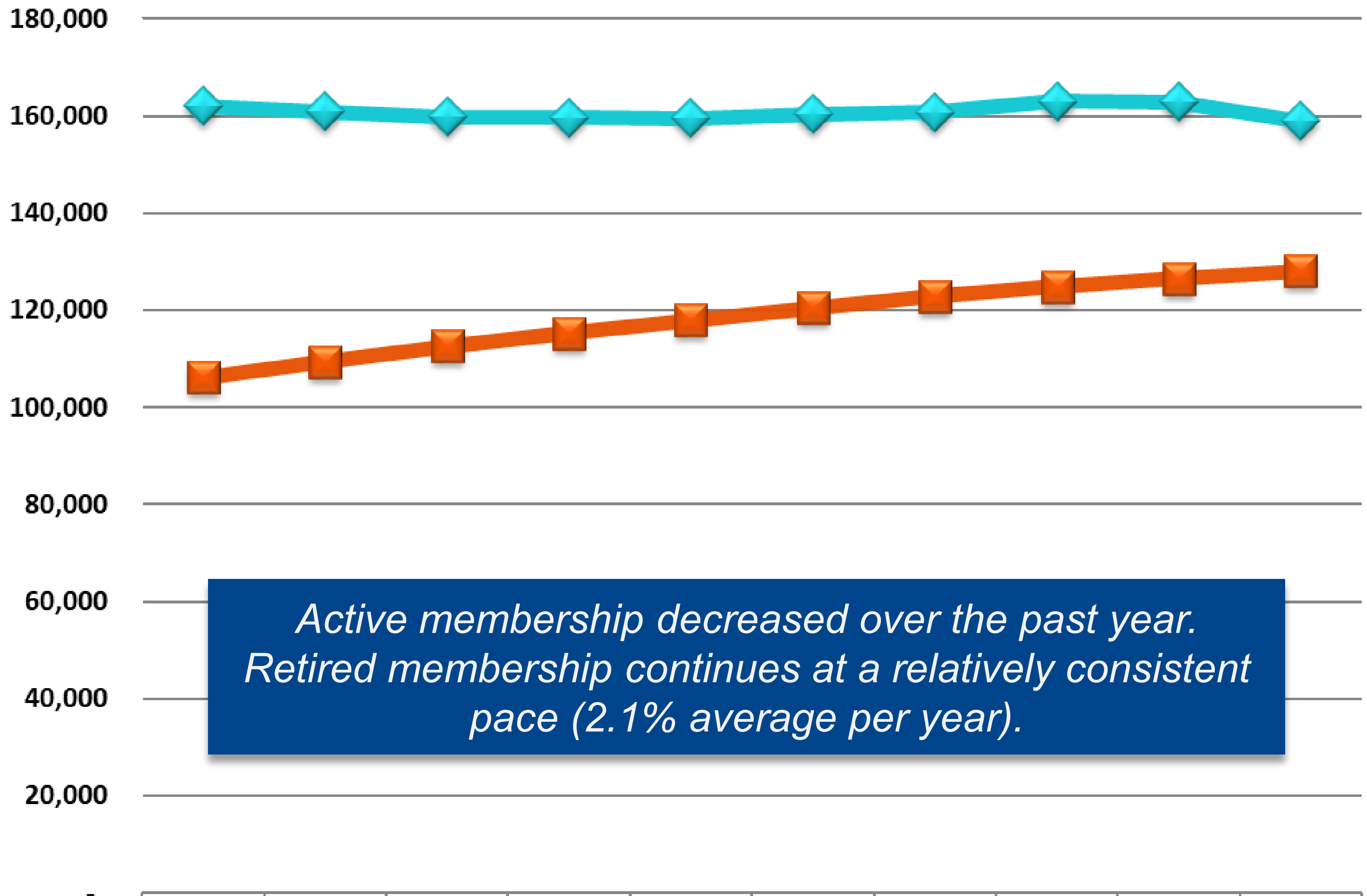
Membership

Membership information as of the valuation date June 30

	2022	2021	Change
Actives			
Tier 1			
• Number	105,590	112,214	−5.9%
• Payroll (annualized)	$8.455 bil	$8.435 bil	+0.2%
Tier 2			
• Number	53,315	50,735	+5.1%
• Payroll (annualized)	$2.353 mil	$2.016 mil	+16.7%
Average Age	42.7 years	43.0 years	−0.3 years
Average Service	12.1 years	11.6 years	+0.5 years
Retirees and Beneficiaries			
• Number	128,116	126,594	+1.2%
• Total Annual Benefits	$7.478 bil	$7.206 bil	+3.8%
• Average Monthly Benefit	$4,864	$4,743	+2.6%

Member data used in the valuation is as of the prior valuation date.

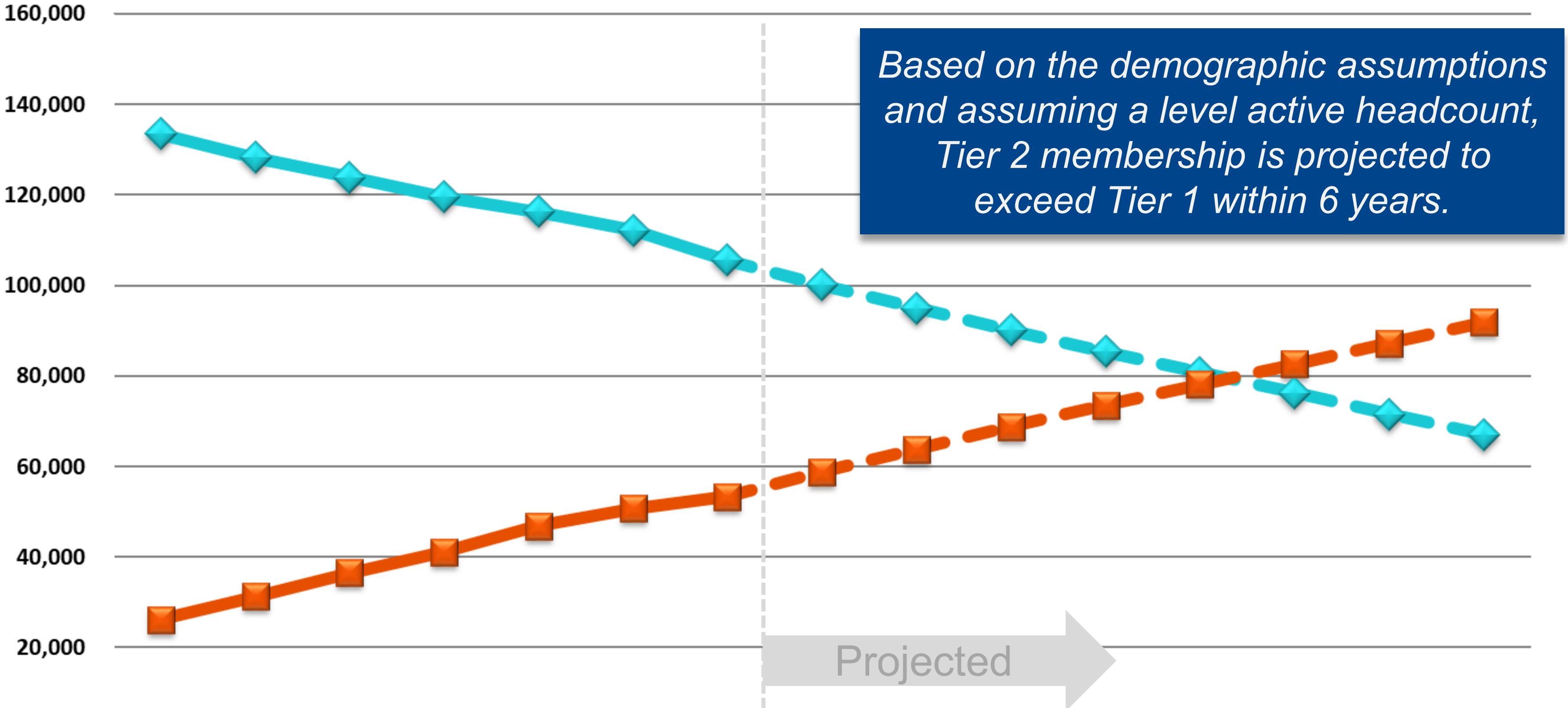
Active and Retired Membership



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Active Members	162,029	160,990	159,836	159,684	159,585	160,425	160,752	163,075	162,949	158,905
Retirees & Beneficiaries	106,102	109,448	112,682	115,273	117,990	120,453	122,895	124,791	126,594	128,116

Active member and annuitant data used in the valuation is as of the prior valuation date.

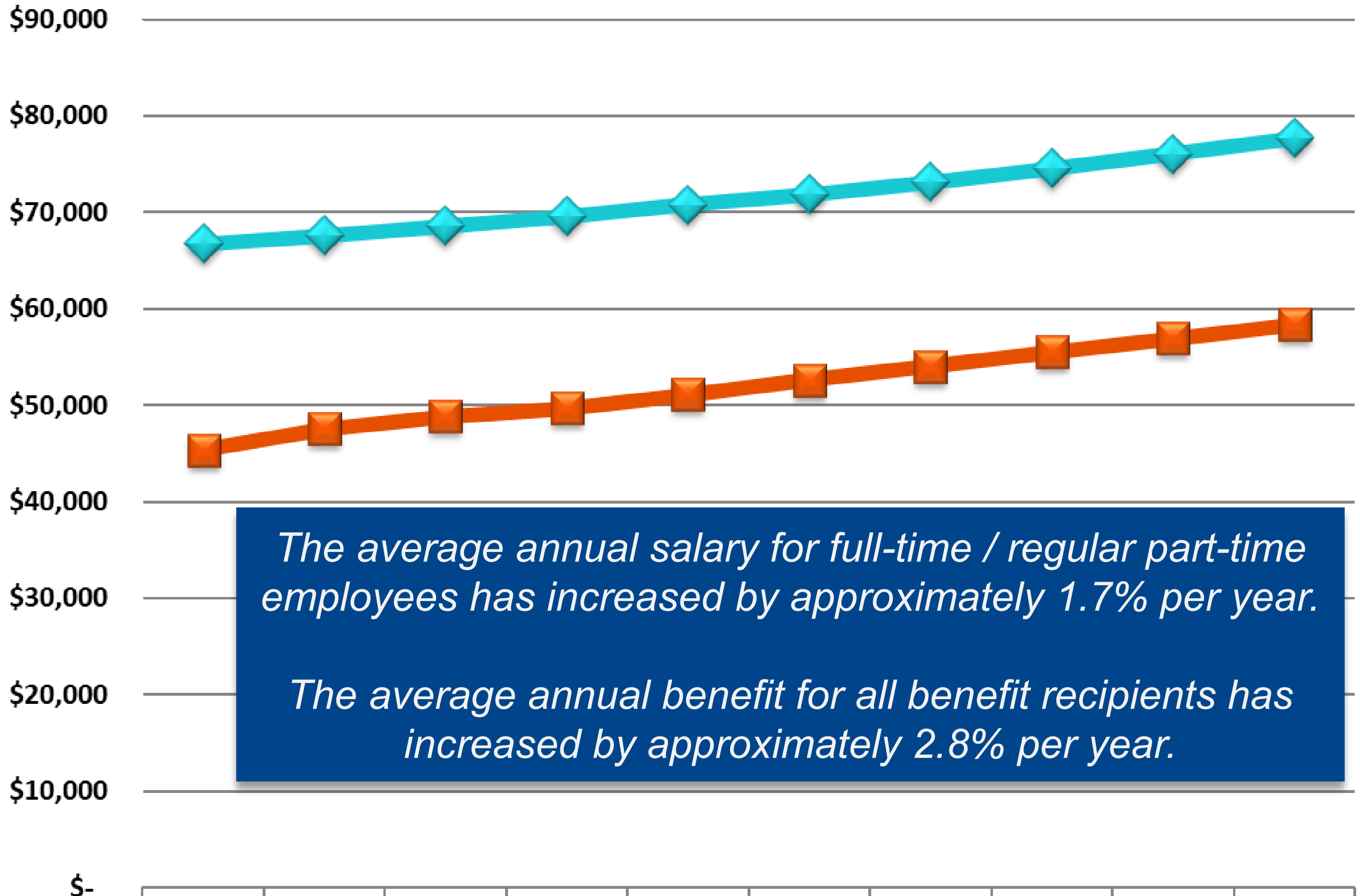
Projection of Active Membership by Tier



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Tier 1	133,498	128,262	123,933	119,572	116,261	112,214	105,590	100,063	95,035	90,135	85,407	80,801	76,244	71,604	67,015
Tier 2	26,186	31,323	36,492	41,180	46,814	50,735	53,315	58,842	63,870	68,770	73,498	78,104	82,661	87,301	91,890

Active member data used in the valuation is as of the prior valuation date.
Dashed lines represent a projection of membership, assuming total active count remains at the current level

Average Salary and Average Benefit



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Average Annual Salary	$66,746	$67,613	$68,581	$69,576	$70,789	$71,845	$73,106	$74,550	$76,061	$77,674
Average Annual Benefit	$45,347	$47,552	$48,861	$49,692	$51,132	$52,605	$54,030	$55,513	$56,919	$58,366

Average salaries shown are for full-time / regular part-time employees only

Assets

- The fair value of assets decreased from $64.2 billion (as of June 30, 2021) to $62.8 billion (as of June 30, 2022)
  - Segal determined the investment return was −1.2%, net of investment expenses
- The actuarial value of assets – which smoothes unexpected investment gains and losses over five years – increased from $59.0 billion (as of June 30, 2021) to $62.9 billion (as of June 30, 2022)
  - Return of 7.8%, net of investment expenses
  - Actuarial value is 100.1% of fair value
  - There is a total of $0.1 billion of deferred investment losses that will be recognized in future years
- Average annual returns are:

	Fair Value	Actuarial Value
5-year average	7.2%	7.2%
10-year average	8.1%	7.8%
15-year average	5.5%	5.5%
20-year average	7.2%	7.2%

As noted in our August 12, 2022, presentation, the current investment return assumption of 7.00% results in a confidence level greater than 50% of meeting or exceeding 7.00%.

Assets

Fair Value of Assets as of June 30 (in millions)

	2022	2021
Beginning of Year	$64,213	$52,316
Contributions		
• State	$5,867*	$5,141
• Employers	121	97
• Members	1,072	1,024
• Total	$7,060	$6,262
Benefits Paid	(7,669)	(7,388)
Administrative Expenses	(27)	(24)
Investment Income (net)	(743)	13,047
End of Year	$62,834	$64,213
Rate of Return	−1.2%	+25.2%

*Includes an additional, one-time contribution of $172,823,300 appropriated to TRS during fiscal year 2022 per Public Act 102-0696

Assets

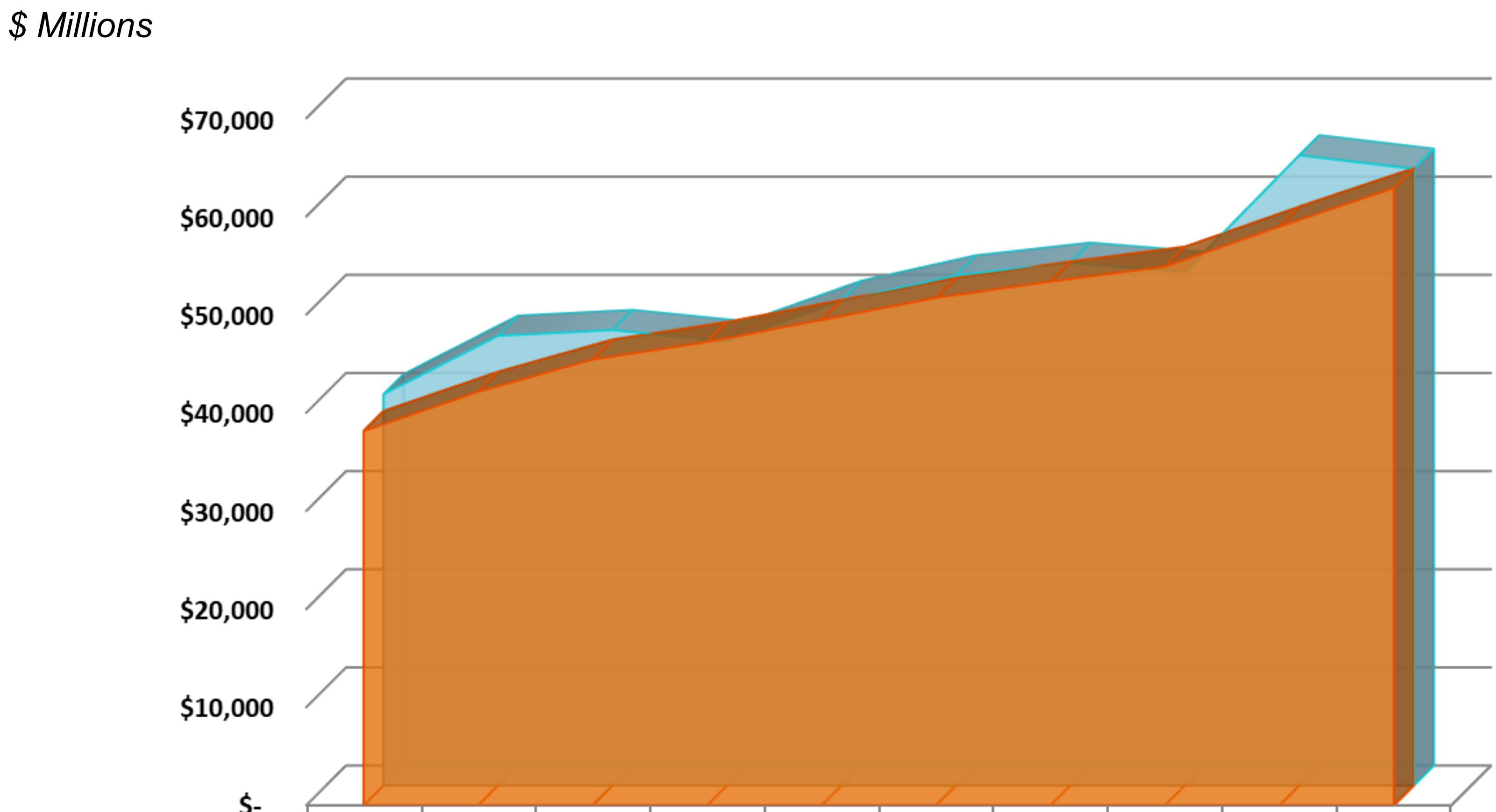
Actuarial Value of Pension Assets* (in millions)

Fair Value of Pension Assets as of June 30, 2022			$62,834
Gain or (Loss) on Assets	Original Amount	% Deferred	Deferred Amount
Year ended June 30, 2022	($5,216)	80%	($4,173)
Year ended June 30, 2021	9,424	60%	5,655
Year ended June 30, 2020	(3,410)	40%	(1,364)
Year ended June 30, 2019	(974)	20%	(195)
Year ended June 30, 2018	644	0%	0
Total			($77)
Actuarial Value as of June 30, 2022			$62,910**
Actuarial Value as a Percent of Fair Value			100.1%
Rate of Return			7.8%

* Includes value of Pension Obligation Bonds (POB)

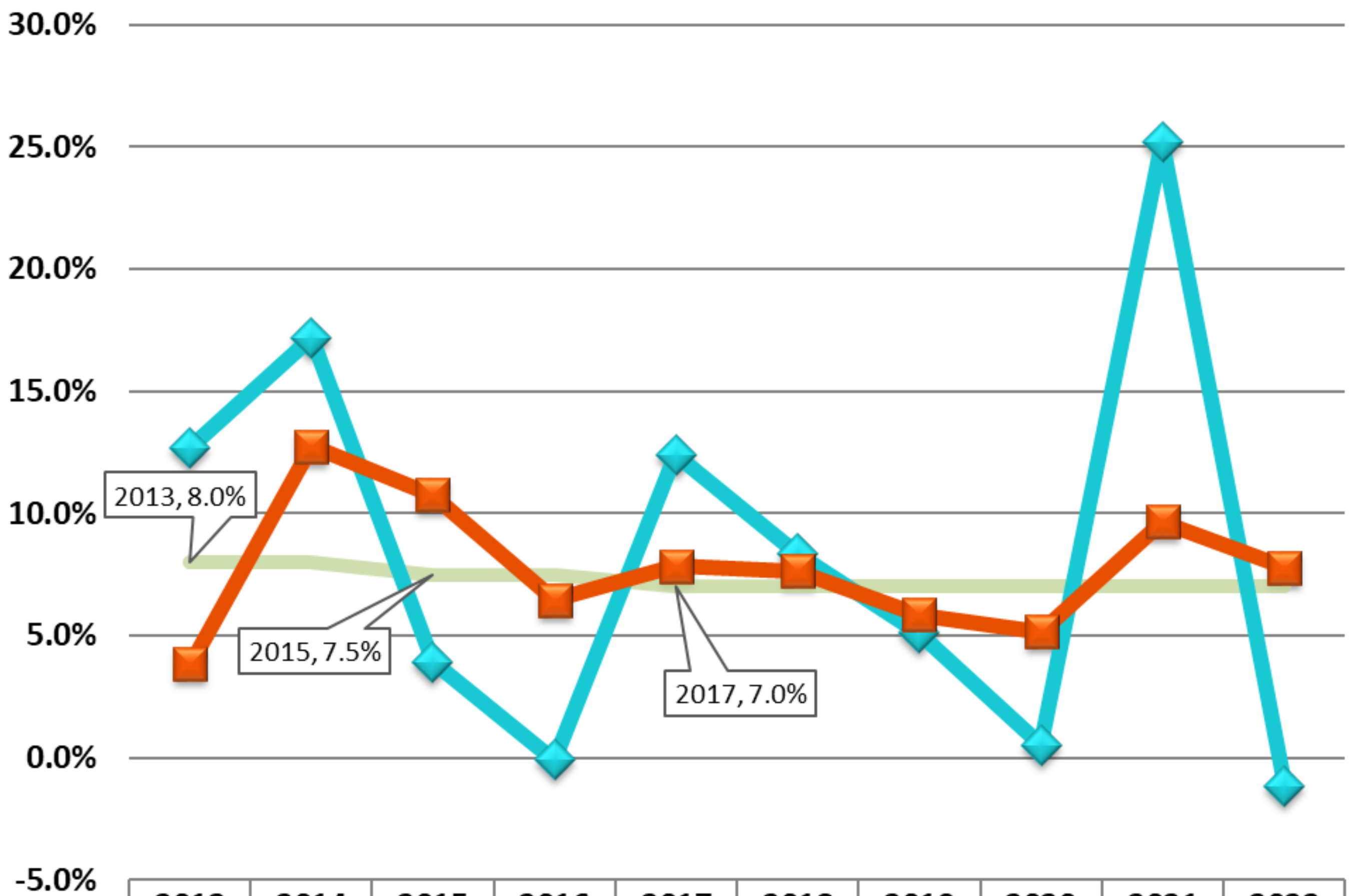
** Doesn't add to the dollar due to rounding

Fair and Actuarial Values of Assets



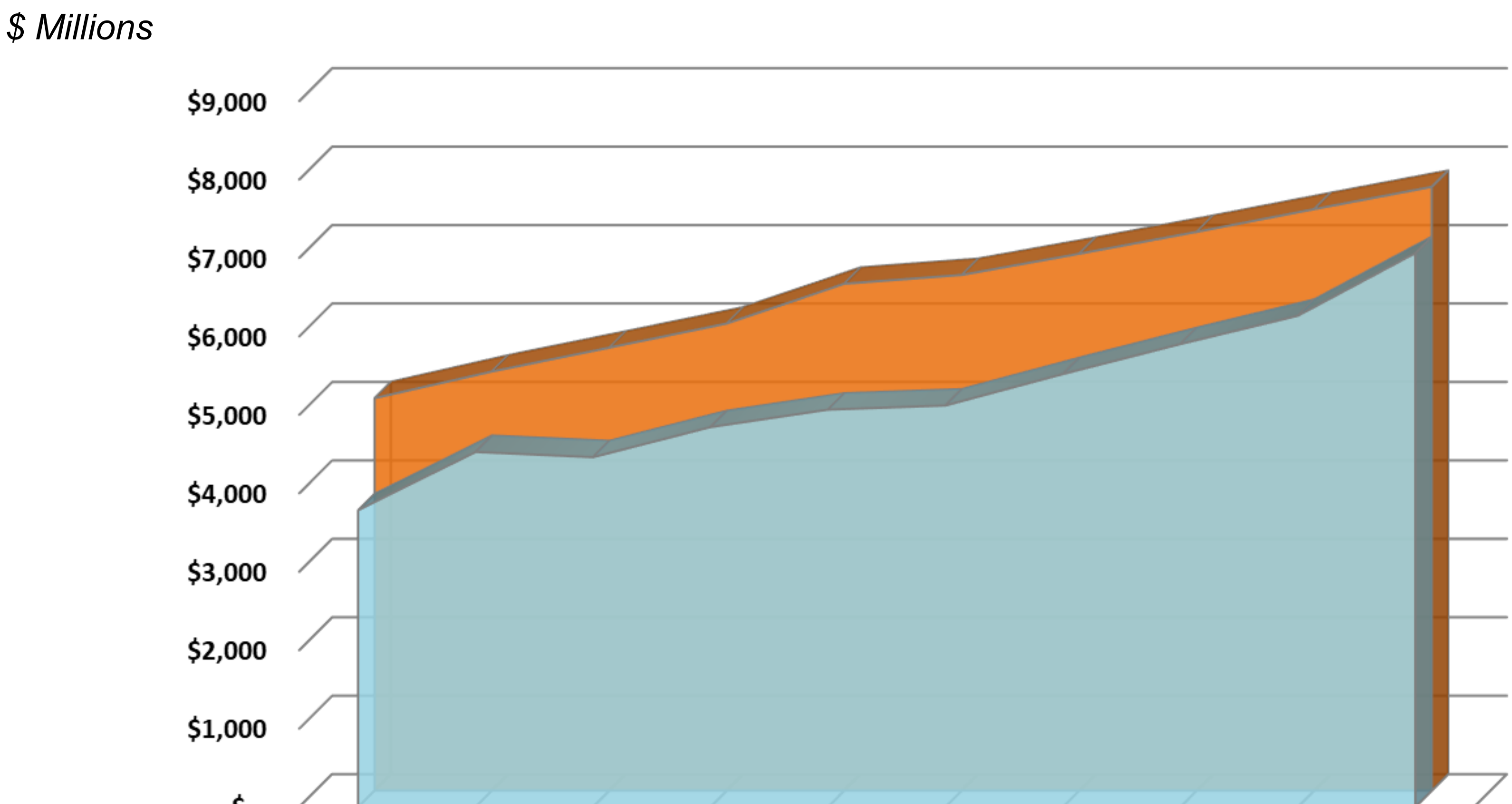
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Actuarial Value of Assets	$38,155	$42,151	$45,435	$47,222	$49,468	$51,731	$53,391	$54,891	$58,980	$62,910
Fair Value of Assets	$39,859	$45,824	$46,407	$45,251	$49,376	$51,970	$53,262	$52,316	$64,213	$62,834

Asset Returns



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Assumed Rate of Return	8.0%	8.0%	7.5%	7.5%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Fair Value of Assets	12.7%	17.2%	3.9%	-0.1%	12.4%	8.3%	5.1%	0.5%	25.2%	-1.2%
Actuarial Value of Assets	3.8%	12.8%	10.8%	6.5%	7.8%	7.6%	5.8%	5.2%	9.7%	7.8%

Contributions vs Disbursements

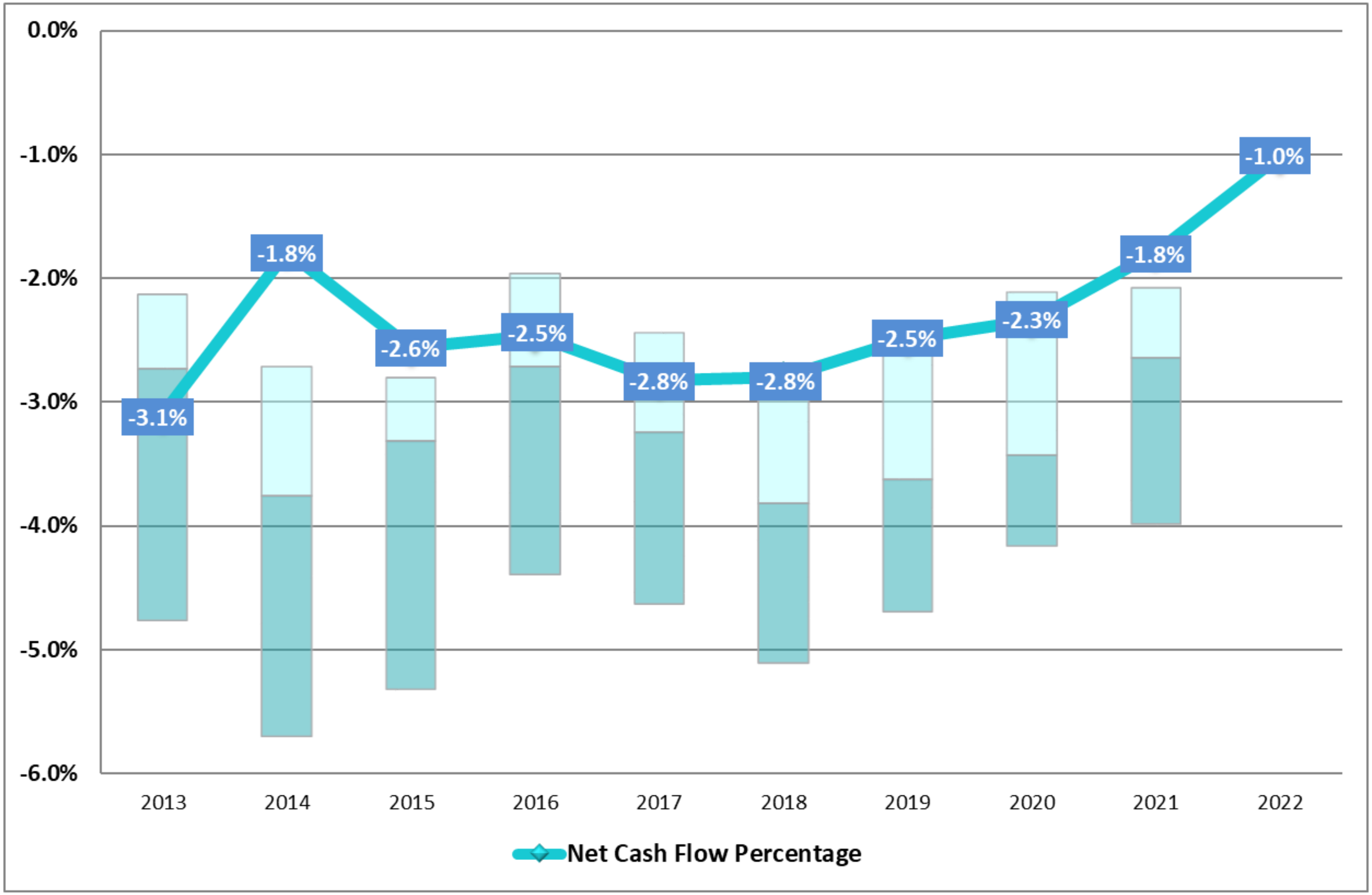


	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Contributions*	$3,782	$4,525	$4,459	$4,842	$5,065	$5,118	$5,519	$5,901	$6,262	$7,060
Benefits & Refunds**	$5,002	$5,342	$5,647	$5,954	$6,461	$6,573	$6,843	$7,123	$7,412	$7,696

** Includes member, employer and state contributions*

*** Includes benefit payments, refunds and administrative expenses*

Net Cash Flow as a % of Market Value



For context, historical data is compared to 38 systems in the Public Plans Data* that primarily cover teachers. The top marker represents the 2nd quartile (50th to 75th percentile) and the lower marker represents the 3rd quartile (25th to 50th percentile), where the middle line indicates the median.

* Public Plans Data. 2001-2021. Center for Retirement Research at Boston College, MissionSquare Research Institute, and National Association of State Retirement Administrators.

Valuation Results

Comparison of current year to prior year (in millions)

	June 30, 2022	June 30, 2021
Actuarial Accrued Liability:		
• Active Members	$48,738	$46,208
• Retirees and Beneficiaries	90,535	88,789
• Inactive Members with Deferred Benefits	4,251	3,917
Total	$143,524	$138,914
Actuarial Assets	62,910	58,980
Unfunded Accrued Liability	$80,613*	$79,964
Funded Ratio	43.8%	42.5%

* Doesn't add to the dollar due to rounding

Valuation Results

Summary of State Contribution for Fiscal Year (in millions)

	FY 2024	FY 2023
Based on Statutory Funding Plan	$6,043	$5,894
Based on Board-Adopted Actuarial Funding Policy	9,590	9,101
Difference Between Statutory Amount and Board-Adopted Actuarial Funding Policy	$3,547	$3,207
Statutory Amount as a Percentage of Board-Adopted Actuarial Funding Policy	63%	65%

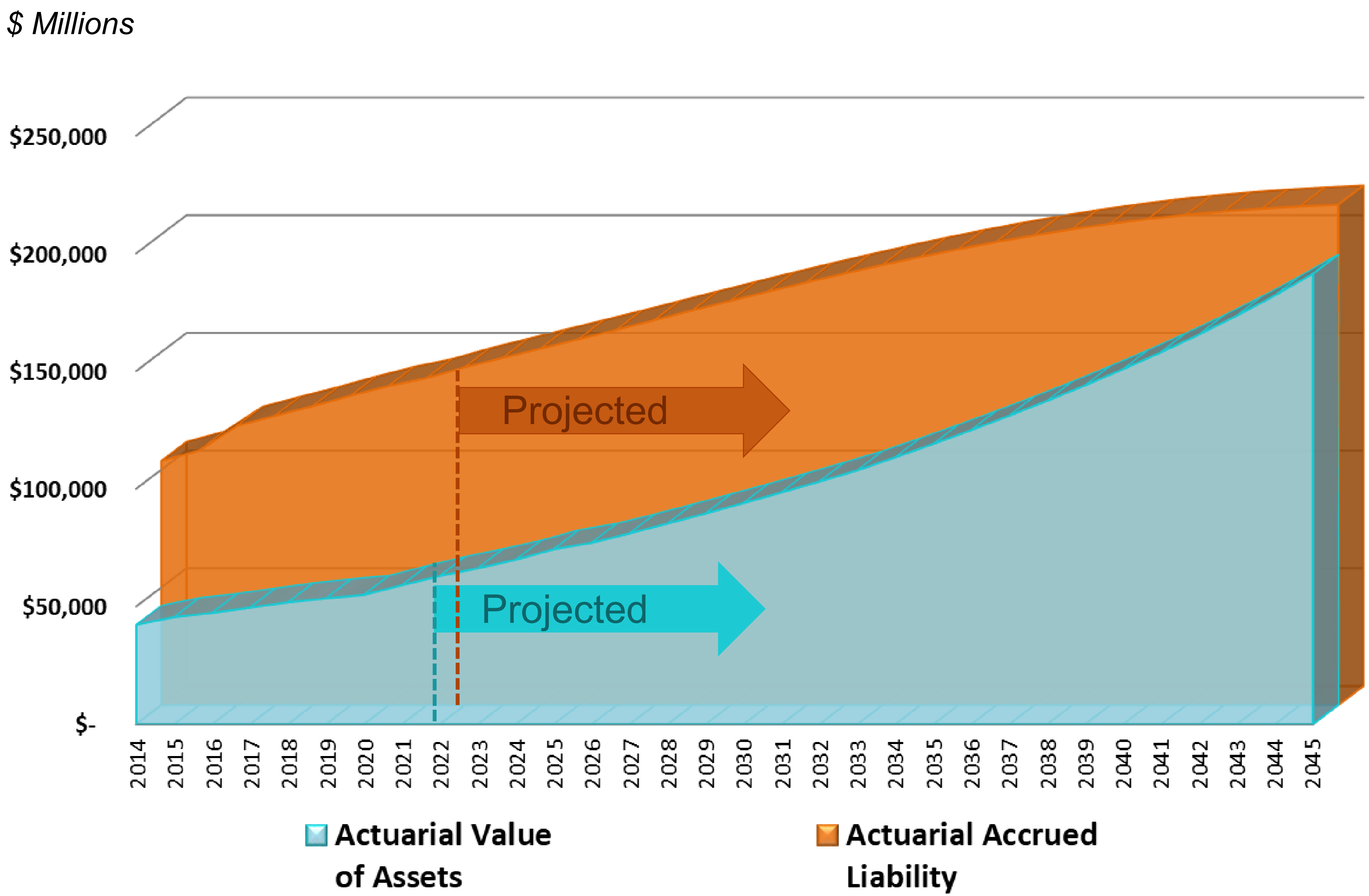
Valuation Results

Reconciliation of State Statutory Funding Plan Contribution from Fiscal Year 2023 to 2024 (in millions)

	Statutory Funding Contribution
FY 2023 State Contribution	$5,894
Expected Increase	86
Investment Loss (FVA Basis)	76
Assumption Changes	(14)
All Other Net Actuarial Factors	1
FY 2024 State Contribution	$6,043

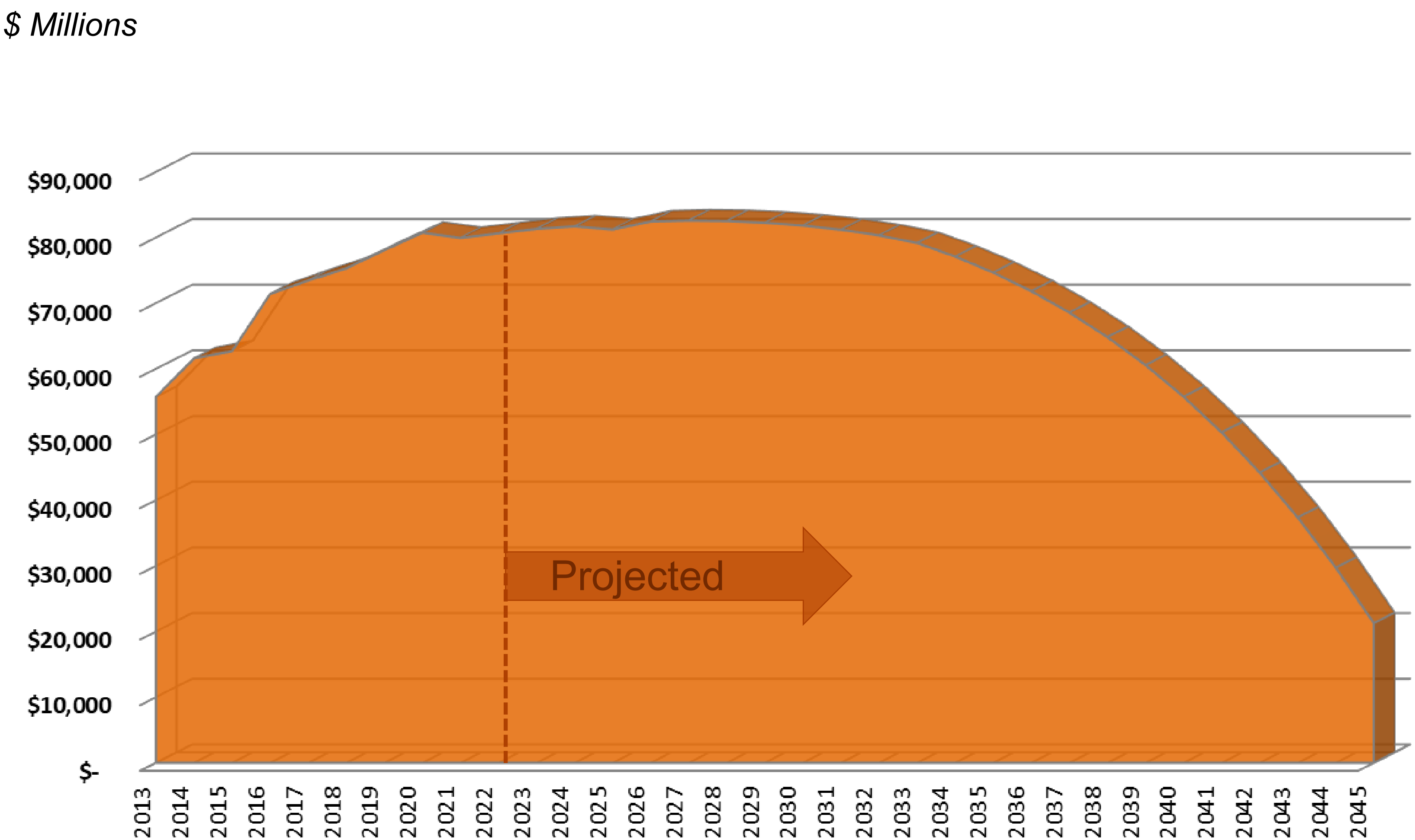
Note that results in the table above could be observed to be slightly different based upon the order that the factors are observed. For this purpose, we have performed this reconciliation in the order as shown above.

Assets and Liabilities



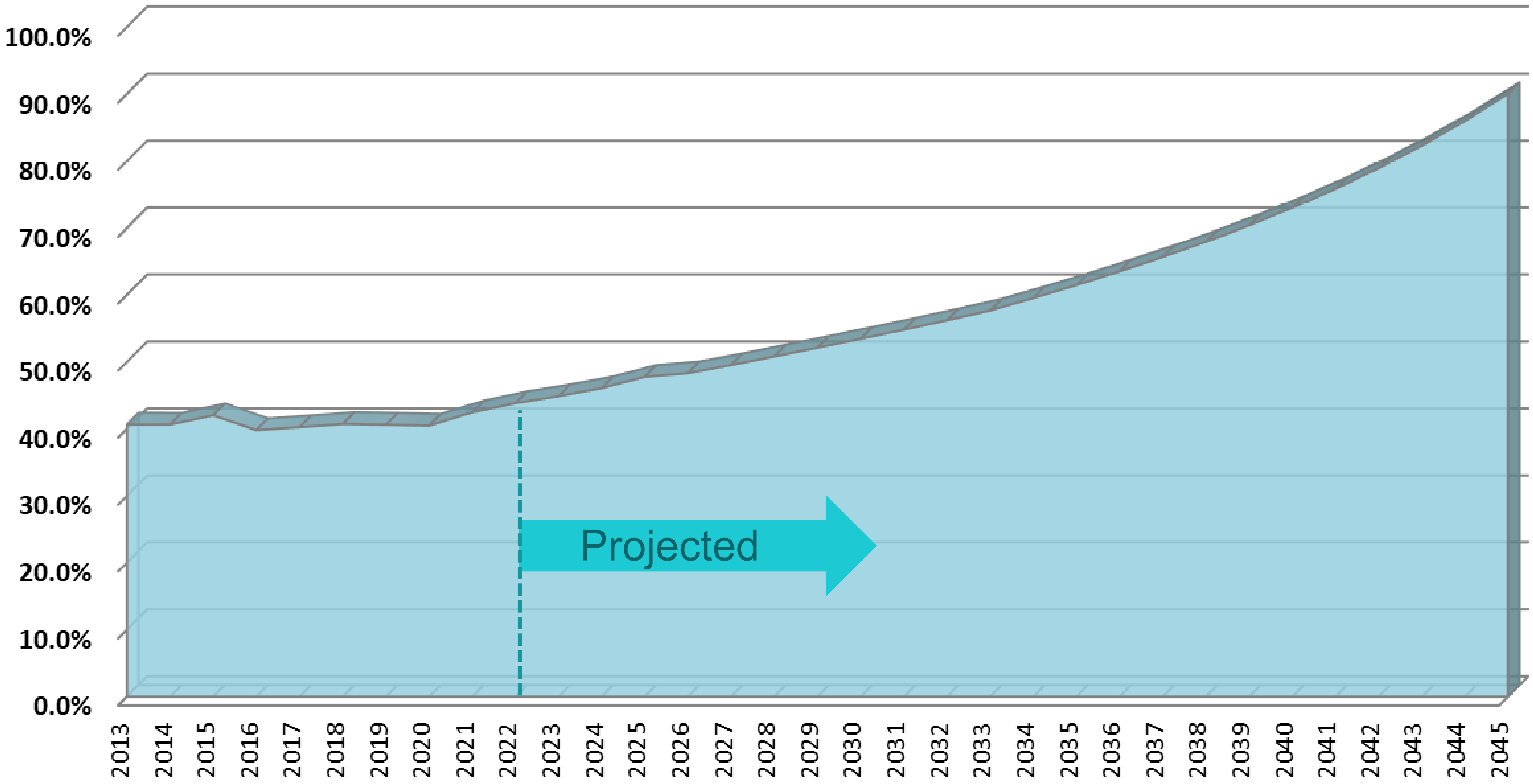
Projected results are based on current assumptions used for the June 30, 2022 valuation, including a level active population.

Unfunded Actuarial Accrued Liability



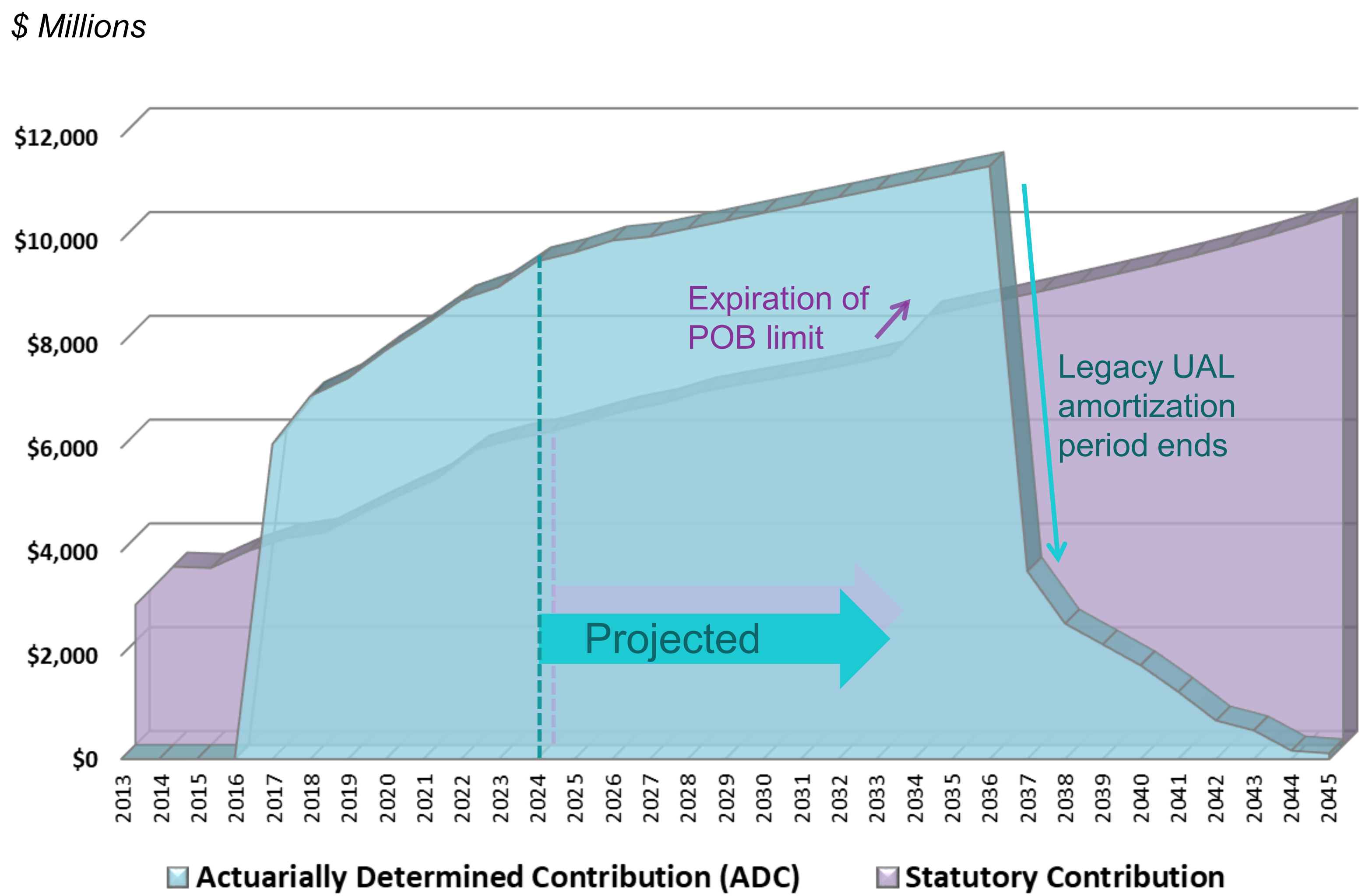
Projected results are based on current assumptions used for the June 30, 2022, valuation, including a level active population.

Funded Ratio



Projected results are based on current assumptions used for the June 30, 2022 valuation, including a level active population.

State Contributions

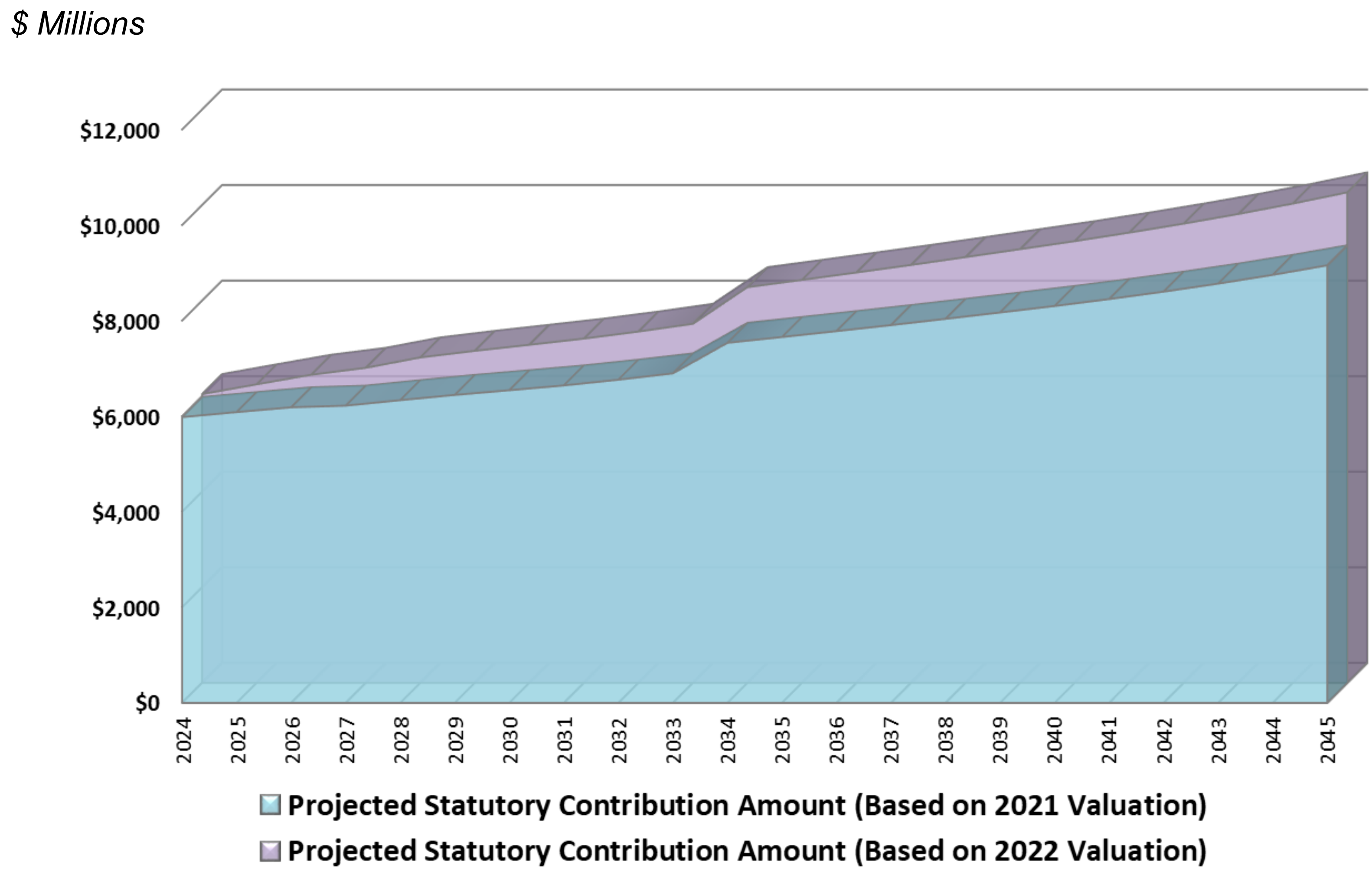


Note: The Board-Adopted Actuarial Funding Policy is the ADC

- The cumulative Statutory contribution from FY 2024 through FY 2045 is $179 billion
- The cumulative ADC contribution from FY 2024 through FY 2045 is $150 billion

Projected results are based on current assumptions used for the June 30, 2022, valuation, including a level active population.

Comparison of FY24-FY45 State Contributions ($) Current Year vs. Prior Year Valuation



Projected results are based on assumptions used for the respective June 30, 2021 and June 30, 2022 valuations, including a level active population.

Summary of GASB Accounting Results

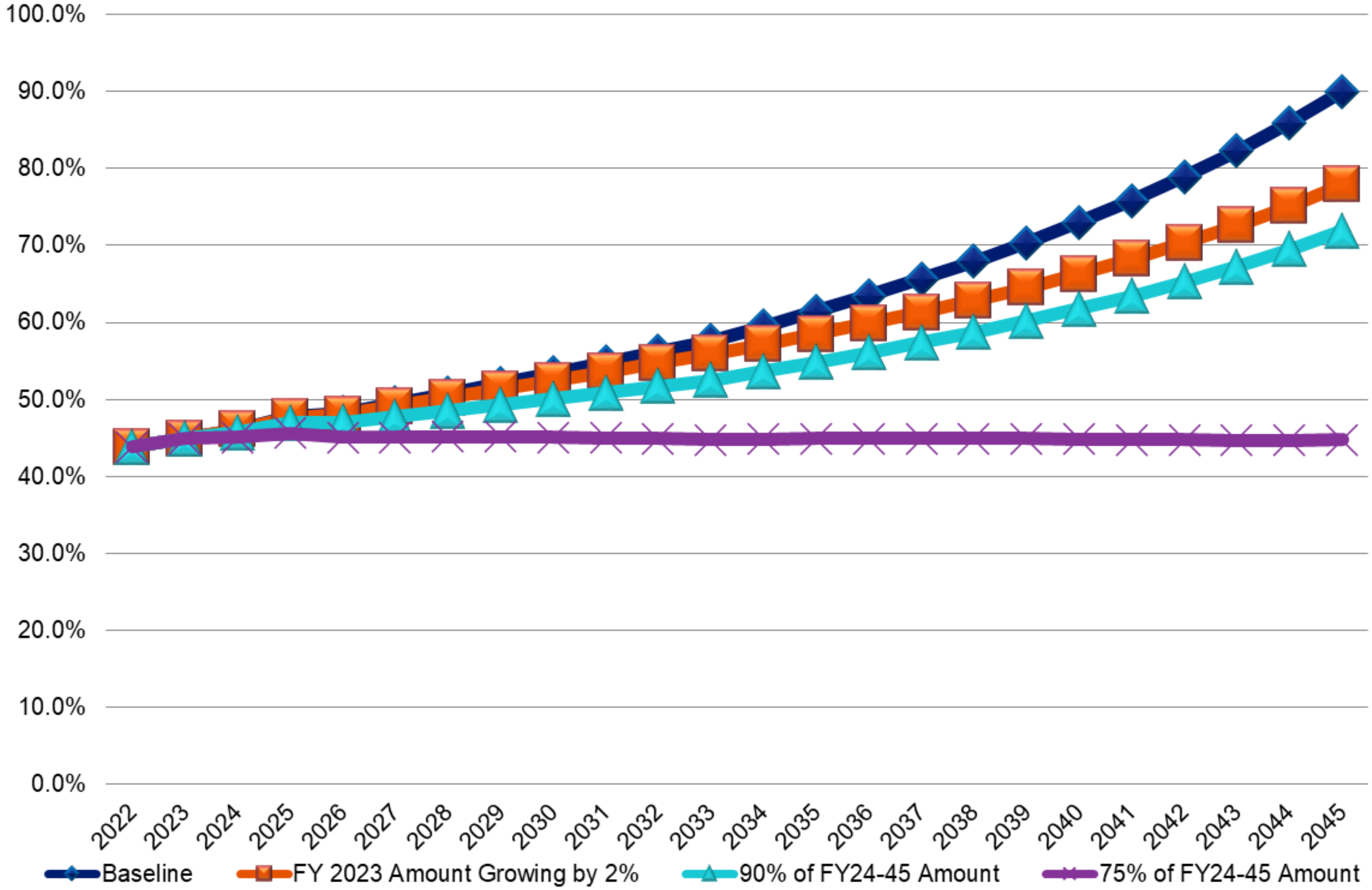
GASB Information as of June 30 ($ in millions)

	2022	2021
Long-Term Expected Rate of Return	7.00%	7.00%
Municipal Bond Index	3.54%	2.16%
Single Equivalent Discount Rate	7.00%	7.00%
Total Pension Liability	$146,674	$142,224
Plan Fiduciary Net Position	62,834	64,213
Net Pension Liability	$83,840	$78,011
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	42.8%	45.1%
Total Pension Expense	$6,349	$5,328

Sensitivity Projections

- The projected Statutory State contributions are determined based on an underlying assumption that the State will contribute the required amounts for all future years
  - The required contribution amounts are projected to increase by 2.6% per year, on average
  - The estimated increase in future State revenue growth, used in determining the Actuarially Determined Contribution, is 2.00% per year
  - Baseline projections of State contributions are also based on future investment returns of 7.00% per year
- To test the sensitivity of this assumption, we created projections based on the following contribution scenarios:
  - The FY 2023 amount is contributed, and future contributions increase by 2%
  - 90% of the FY 2024-2045 amounts are contributed
  - 75% of the FY 2024-2045 amounts are contributed
- We have also tested the sensitivity of the 7% return assumption by creating projections based on the State contribution scenario of the FY 2023 amount increasing by 2% using the following actual investment returns in each future year:
  - Actual returns of 6% per year
  - Actual returns of 4% per year
- Projected results reflect an assumed level active population through FY 2045

Sensitivity Projection #1



- If the FY 2023 State contribution is made, and future contributions increase by 2%, TRS is projected to remain solvent, but the funded ratio is projected to be 78% in 2045
- If 90% of the FY 2024-2045 State contributions are made, the funded ratio is projected to be 72% in 2045
- If 75% of the FY 2024-2045 State contributions are made, the funded ratio is projected to be 45% in 2045

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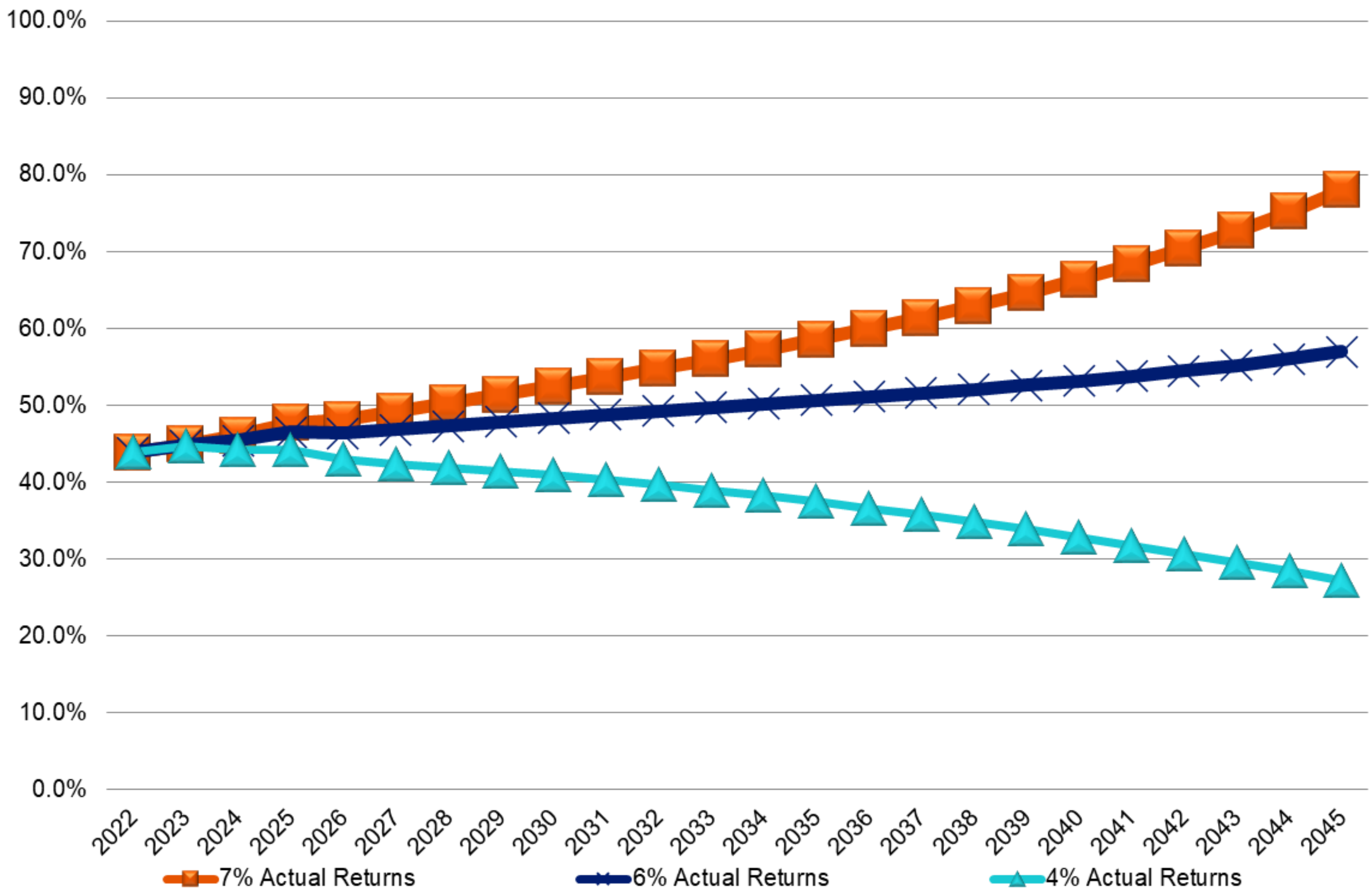
Sensitivity Projection #2



- If the FY 2023 State contribution is made, future contributions increase by 2%, and actual investment returns are 6% rather than 7%, the funded ratio is projected to be 57% in 2045
- If the FY 2023 State contribution is made, future contributions increase by 2%, and actual investment returns are 4% rather than 7%, the funded ratio is projected to be 27% in 2045

Stochastic Modeling

- **Given a certain set of assumptions:**
  - What is the range of possible results?
  - What is the probability of achieving certain metrics (e.g., funded percentage)?
  - What are the chances of a declining funded percentage over time?
  - Alternatively, what is the likelihood of long-term “success?”
- **What are metrics for success?**
  - Probability that State contributions will decrease as a percentage of State budget?
  - Probability of avoiding insolvency?
  - Other?
- **More than one metric can be modeled**
  - Stochastically model investment returns and overlay the results on various State contribution scenarios

Segal performed a stochastic modeling study for TRS based on the June 30, 2016, actuarial valuation. We are prepared to update this stochastic modeling based on the June 30, 2022, valuation as noted in our proposal dated April 8, 2022.

Update on Public Sector Topics

- Revision to Actuarial Standard of Practice (ASOP) No. 4 will be effective for measurement dates after February 15, 2023
  - For TRS, this will be the June 30, 2023, actuarial valuation report
  - Or potentially other actuarial communication between February 2023 and January 2024 (when the final June 30, 2023, actuarial valuation report will be issued)
- Primary ASOP 4 revision for public sector plans is a requirement to disclose a “Low-Default-Risk Obligation Measure,” or LDROM, in valuations
  - Can be based on Entry Age Normal actuarial cost method
  - Discount rate have a non-prescriptive list of examples
- Allows interpretation as what the ongoing funding liability would be if the plan actually invested in low default risk securities
  - Difference between LDROM and AAL measures reduction in taxpayer liability from investing in a diversified portfolio
- Financial Economics crowd will say LDROM shows the true cost of the pension promise
  - Potential for confusion as nearly all public sector valuation reports are in the public domain

Appendix

- FY 2024 State Contribution Certification Exhibit A
- FY 2024 THIS Fund Certification Exhibit B

Exhibit A

Summary of State Contributions under Illinois Pension Code and Board-Adopted Actuarial Funding Policy	Fiscal Year 2024
1. Based on Statutory Funding Plan	
Total State Contribution for fiscal year 2024:	
a. Benefit Trust Reserve*:	
i. 51.62% of membership payroll	$ 6,264,059,062
ii. Minus School Districts Contributions:	
(0.58% of membership payroll)	(70,388,515)
(6% FAS cap increases)	(4,164,720)
(10.60% of membership payroll above the Governor's salary)	(4,682,961)
iii. Minus Federal Funds Contribution	
(10.60% of membership payroll from federal funds)	(25,728,216)
iv. Minus phase-in of the effect of assumption changes	(115,940,000)
v. State Contribution	$ 6,043,154,650
b. Guaranteed Minimum Annuity Reserve	300,000
c. Total State Contribution (current law)	$ 6,043,454,650
2. Based on Board-Adopted Actuarial Funding Policy**	
a. Benefit Trust Reserve*:	
i. Normal cost plus amortization	$ 9,694,780,499
ii. Minus School Districts Contributions	
(0.58% of membership payroll)	(70,388,515)
(6% FAS cap increases)	(4,164,720)
(10.60% of membership payroll above the Governor's salary)	(4,682,961)
iii. Minus Federal Funds Contribution	
(10.60% of membership payroll from federal funds)	(25,728,216)
iv. State Contribution	$ 9,589,816,087
b. Guaranteed Minimum Annuity Reserve	300,000
c. Total State Contribution	$ 9,590,116,087
3. Total Normal Cost and Employer Normal Cost Rate for Fiscal Year 2024	
a. Total Normal Cost Rate (including administrative expenses)	19.60%
b. Member Rate	-9.00%
c. Employer Normal Cost Rate	10.60%
4. Federal Contribution Rate (Employer Normal Cost Rate, per PA 100-0340)	10.60%

* Expected fiscal year 2024 membership payroll is $12,135,950,790

** Board-Adopted Actuarial Funding Policy is based on the entry age normal actuarial cost method, current asset valuatior method and an amortization policy as follows:
- 20-year closed amortization of Unfunded Actuarial Accrued Liability (UAAL) beginning with Fiscal Year 2017
- Use layered amortization, with new UAAL after Fiscal Year 2017 being amortized over 20 years regardless of sourc
- Amortization payment increase at the rate of future State revenue growth (assumed to be 2.0%)
- Minimum total contribution is no less than the normal cost in any given year

Exhibit B

Teacher Health Insurance Security Fund Contribution Amount to be Certified by the Board for Fiscal Year 2024	Fiscal Year 2024
Expected State Contribution for Fiscal Year 2024 to THIS Fund:	
1. Fiscal Year 2024 membership payroll:	
a. Total	$ 12,135,950,790
b. Minus members who do not contribute to THIS Fund	(65,849,905)
c. Members who do contribute to THIS Fund	$ 12,070,100,885
2. Member contribution rate (actual, from CMS)	0.90%
3. Matching State contribution: 1.c. x 2.	$ 108,630,908
4. Adjustment to THIS Fund for underestimating Fiscal Year 2022 member THIS Fund contributions	(43,237,321)
5. Total THIS Fund State contribution*	$ 65,393,587

* This certification does not include other State contributions to THIS Fund, which are not part of the statutory certification requiren

- Illinois Statute requires the TRS Board to certify the THIS Fund State contribution amount by November 15 each year
- State contribution amount is based on the projected fiscal 2024 payroll from the June 30, 2022 valuation