



Teachers' Pension and Annuity Fund of New Jersey

Actuarial Valuation Report as of July 1, 2020

Produced by Cheiron

March 2021

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LETTER OF TRANSMITTAL

March 31, 2021

Board of Trustees
Teachers' Pension and Annuity Fund of New Jersey
State of New Jersey
Department of the Treasury
Division of Pension and Benefits, CN 295
Trenton, New Jersey 08625-0295

Dear Board Members:

We have performed the July 1, 2020 Actuarial Valuation of the Teachers' Pension and Annuity Fund of New Jersey (TPAF or Fund).

In preparing our report, we relied on information (some oral and some written) supplied by the Division of Pensions and Benefits (DPB). This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

The results of this report are only applicable to the Fund's contribution for Fiscal Year Ending 2022. Future results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the assumptions; changes in assumptions; and changes in plan provisions or applicable law.

The actuarial assumptions are the same as those used in the July 1, 2019 valuation. The demographic and economic (other than the investment rate of return) actuarial assumptions are based on the recommended assumptions from the July 1, 2015 – June 30, 2018 Experience Study, which were approved by the Board of Trustees on February 6, 2020. The investment return assumption of 7.30% is based on the recommendation of the State Treasurer.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This actuarial valuation report was prepared exclusively for TPAF, the DPB and the Fund auditors for the purposes described herein and in preparing financial reports in accordance with applicable law and annual report requirements. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

Sincerely,

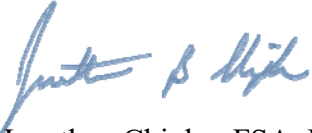
Cheiron



Janet Cranna, FSA, FCA, MAAA, EA
Principal Consulting Actuary



Anu Patel, FSA, MAAA, EA
Principal Consulting Actuary



Jonathan Chipko, FSA, MAAA, EA
Consulting Actuary

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION I – BOARD SUMMARY

The primary purpose of the actuarial valuation and this report is to disclose the following as of the valuation date:

- The financial condition of the Teachers' Pension and Annuity Fund of New Jersey,
- Past and expected future trends and risks to the Fund's financial condition, and
- The State's Statutory pension contribution for Fiscal Year End (FYE) 2022.

In this Section we present a summary of the principal valuation results. This includes the basis on which the July 1, 2020 valuation was completed and an examination of the current financial condition of the Fund. In addition, we present a review of the key historical trends as well as the Fund's projected financial outlook. The stress testing in accordance with the requirements set out in Chapter 277, P. L. 2017 follows in Section II.

This report does not include calculations under GASB Statements Nos. 67 and 68 which were provided in separate reports.

Results shown in this report for years prior to July 1, 2018 are based on the prior actuary's valuation reports.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION

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Valuation Basis

The July 1, 2020 valuation results are based on the same actuarial methods and assumptions as used in the July 1, 2019 valuation. The demographic and economic assumptions, aside from the valuation interest rate, are based on the July 1, 2015 – June 30, 2018 Experience Study, which was approved by the Board of Trustees on February 6, 2020. The valuation is based on a 7.30% interest rate, which was recommended by the State Treasurer.

This report is prepared using census data, plan provisions, and financial information as of July 1, 2020 provided by the Division of Pensions and Benefits, and does not reflect any changes in the membership, plan provisions, or assets that occur after the valuation date. Events following that date are not, and should not be, reflected in this report.

Whereas there remains a lot of uncertainty, we continue to monitor developments regarding the COVID-19 pandemic and the impact it may have on the Fund. Actual experience, both demographic and economic, will be reflected in subsequent valuations as experience emerges.

The Appropriations Act of Fiscal Year 2020 reduced the State pension contribution from the Statutory amount of \$3,244,013,909 to \$2,228,494,000. The \$2,228,494,000 includes revenue of \$789,467,000 from the Lottery Enterprise Contribution Act.

The potential impact of the Appropriations Act of 2021 reduces the State pension contribution for Fiscal Year 2021 from the Statutory amount of \$3,672,624,754 to \$2,866,241,600 (78% of the Statutory contribution less the Lottery Enterprise Contribution Offset plus expected revenue from the Lottery Enterprise Contribution Act {78% x \$3,672,624,754 - \$843,411,195 + \$845,005,487}). This valuation reflects the potential impact of the Appropriations Act of 2021. The 78% appropriation amount represents a decrease from the 80% appropriation assumed in the prior actuarial valuation report.

Chapter 83, P.L. 2016 calls for the State to make the required pension contributions on a quarterly basis in each fiscal year according to the following schedule: at least 25% by September 30, at least 50% by December 31, at least 75% by March 31, and at least 100% by June 30. As such, State contributions are assumed to be made on a quarterly basis.

In accordance with Chapter 78, P.L. 2011, a pension committee is to be established for the State when the “target funded ratio” is achieved. The “target funded ratio” is defined as the ratio of the actuarial value of assets divided by the actuarial liability expressed as a percentage that is 75% in fiscal year 2012 and increased annually by equal increments in each of the subsequent seven fiscal years, until the funded ratio equals 80% at which time it will remain at 80% for all subsequent fiscal years. The Fund has not attained the required “target funded ratio” and thus the pension committee has not been established for the Fund.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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Under Chapter 98, P.L. 2017, the Lottery Enterprise Contribution Act, the Teachers' Pension and Annuity Fund receives 77.78% of the proceeds of the Lottery Enterprise, based on their members' past or present employment in schools and institutions in the State for a term of 30 years. As of the July 1, 2020 valuation, 26 years remain. Revenues from Chapter 98, P.L. 2017, the Lottery Enterprise Contribution Act, are assumed to be contributed to the trust on a monthly basis. The Chapter 78, P.L. 2011 "target funded ratio" is based on the actuarial value of assets plus the allocable special asset value. The special asset value is the present value of the projected future lottery contributions to the retirement systems as provided by the Division of Pensions and Benefits. Effective with Fiscal Year 2018, the State's pension contribution shall be reduced by the product of the allocable percentage for such retirement system, the adjustment percentage for such retirement system and the special asset adjustment.

The valuation excludes assets and liabilities under the Non-Contributory Group Insurance Premium Fund. The Non-Contributory Group Insurance premiums are separately funded monthly, on a pay-as-you-go basis.

Key Results

The following Table I-1 summarizes the key results of the valuation with respect to the Fund's membership, assets and liabilities, and contributions. The results are presented and compared for both the current and prior year.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION I – BOARD SUMMARY

**Table I-1
Summary of Key Valuation Results**

Valuation Date Fiscal Year End	July 1, 2020 2022	July 1, 2019 2021	% Change
<u>Member Data</u>			
Contributing Actives ¹	142,283	141,795	0.3%
Non-Contributing Members ¹	14,119	14,271	-1.1%
Deferred Vested	407	432	-5.8%
Retirees and Beneficiaries ²	<u>107,890</u>	<u>106,388</u>	1.4%
Total Members	264,699	262,886	0.7%
Appropriation Payroll ³	\$ 11,338,928,538	\$ 11,061,603,138	2.5%
Annual Allowances for Retirees and Beneficiaries	\$ 4,478,447,877	\$ 4,391,260,795	2.0%
<u>Assets and Liabilities</u>			
Actuarial Liability	\$ 66,877,318,975	\$ 65,470,847,885	2.1%
Actuarial Value of Assets (AVA) ⁴	<u>26,582,892,740</u>	<u>26,375,429,936</u>	0.8%
Unfunded Actuarial Liability/(Surplus)	\$ 40,294,426,235	\$ 39,095,417,949	3.1%
Funding Ratio (AVA)	39.7%	40.3%	-0.6%
Actuarial Value of Assets ⁴ including Special Asset Value (AVA + SAV)	<u>\$ 36,358,679,516</u>	<u>\$ 36,188,020,515</u>	0.5%
Unfunded Actuarial Liability/(Surplus)	\$ 30,518,639,459	\$ 29,282,827,370	4.2%
Funded Ratio (AVA + SAV)	54.4%	55.3%	-0.9%
Market Value of Assets (MVA) ⁴	<u>\$ 24,279,469,173</u>	<u>\$ 24,877,874,495</u>	-2.4%
Unfunded Actuarial Liability/(Surplus)	\$ 42,597,849,802	\$ 40,592,973,390	4.9%
Funded Ratio (MVA)	36.3%	38.0%	-1.7%
<u>Contribution Amounts⁵</u>			
State Normal Cost at End of Year	\$ 441,919,096	\$ 426,591,302	3.6%
Amortization Payment of UAL	<u>3,379,476,336</u>	<u>3,246,033,452</u>	4.1%
Total Statutory Contribution for FYE	\$ 3,821,395,432	\$ 3,672,624,754	4.1%
Percent Appropriated	100%	78%	22.0%
State Appropriation for Pension	\$ 3,821,395,432	\$ 2,864,647,308	33.4%
Lottery Enterprise Contribution Offset	<u>(852,368,570)</u>	<u>(843,411,195)</u>	1.1%
Net State Contribution	\$ 2,969,026,862	\$ 2,021,236,113	46.9%

¹ Reflects all records for multiple members, who are employed by multiple participating employers at the same time

² QDRO recipients are excluded from member counts

³ Limited annual compensation for contributing actives only

⁴ Includes discounted State receivable contributions and Lottery proceeds as shown in Table III-2

⁵ In addition, Early Retirement Incentive (ERI) Contributions are payable by certain Local employers. See Appendix E.

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SECTION I – BOARD SUMMARY

The key results of the July 1, 2020 actuarial valuation are as follows:

- The total Statutory contribution increased from \$3,673 million for FYE 2021 to \$3,821 million for FYE 2022 prior to any adjustments for the State phase-in of contributions or the Lottery Enterprise offset.
- The funded ratio, the ratio of actuarial asset value over liabilities, decreased from 40.3% as of July 1, 2019 to 39.7% as of July 1, 2020. The funded ratio based on the actuarial value of assets plus special asset value decreased from 55.3% to 54.4%. Using the market value of assets, the funded ratio also decreased from 38.0% to 36.3%.
- The unfunded actuarial liability based on the actuarial asset value plus special asset value increased from \$29.3 billion as of July 1, 2019 to \$30.5 billion as of July 1, 2020. The unfunded actuarial liability used in determining the Statutory contributions (excess of actuarial liability over the actuarial value of assets) increased from \$39.1 billion to \$40.3 billion.
- During the year there was a total actuarial experience loss of \$660 million, consisting of an asset loss of \$590 million and a liability loss of \$70 million. The liability loss of \$70 million represents 0.10% of liabilities. The rate of return on the actuarial value of assets was 4.83% compared to the expected return of 7.30%, resulting in the \$590 million asset loss.

Recent Trends

Although most of the attention given to the valuation reflects the current computed unfunded actuarial liability, funded ratio, and contribution amounts, each valuation is merely a snapshot of the long-term progress of a pension fund. It is important to take a step back from the current year results and view them in the context of the Fund's recent history as well as trends expected into the future. Below, we present a series of graphs which display historical trends for key factors in the valuations of the last 10 years. Additionally, in Appendix D we provide the numerical values of the historical unfunded actuarial liability, funded ratio, and contribution amounts.

In reviewing the historic trends over the 10-year period, the declining funded status coupled with significant negative net cash flow highlights the potential risk of running out of assets to pay benefits unless the State consistently contributes the full amount of the Statutory required contributions.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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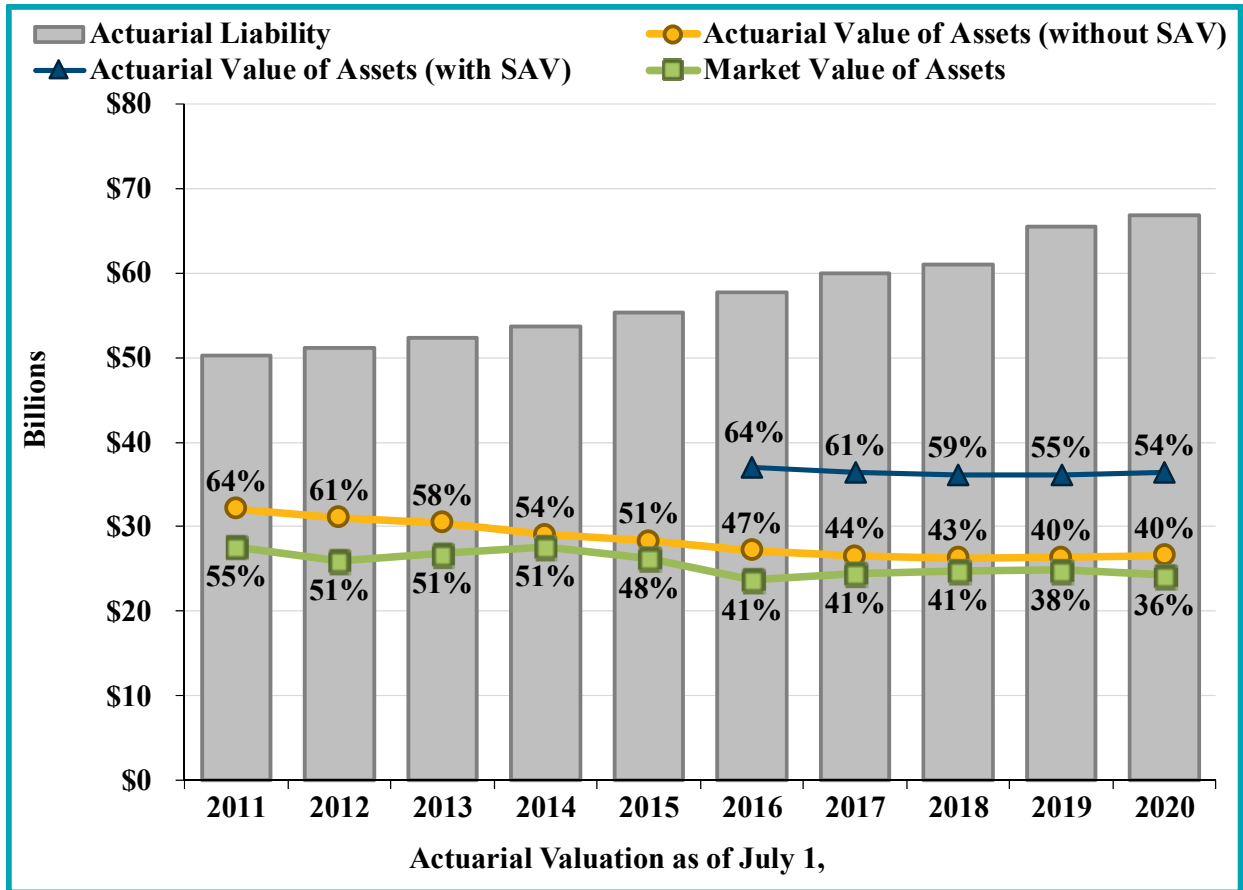
SECTION I – BOARD SUMMARY

Assets and Liabilities

The gray bars represent the Actuarial Liability (AL). The green line is the Market Value of Assets (MVA), the gold line is the Actuarial Value of Assets (AVA) and the blue line (which starts in 2016) is the AVA plus the Special Asset Value (SAV). The Fund's funded ratio (ratio of assets to actuarial liability) on the MVA, AVA basis and AVA+SAV basis, is shown next to the respective asset lines.

The liability has been increasing over time in part due to additional benefit accruals but also due to decreases in the discount rate and other assumption changes.

The funded ratio has been decreasing over time in part due to decreases in the discount rate, recognition of the 2008/2009 market losses and because the State has not been making the full Statutory contribution for the entire period shown.



The information above is based on the final actuarial valuation reports for the given years. The amounts do not reflect differences between the discounted State appropriations receivable and the actual State contribution amounts that became known after the issuance of the reports.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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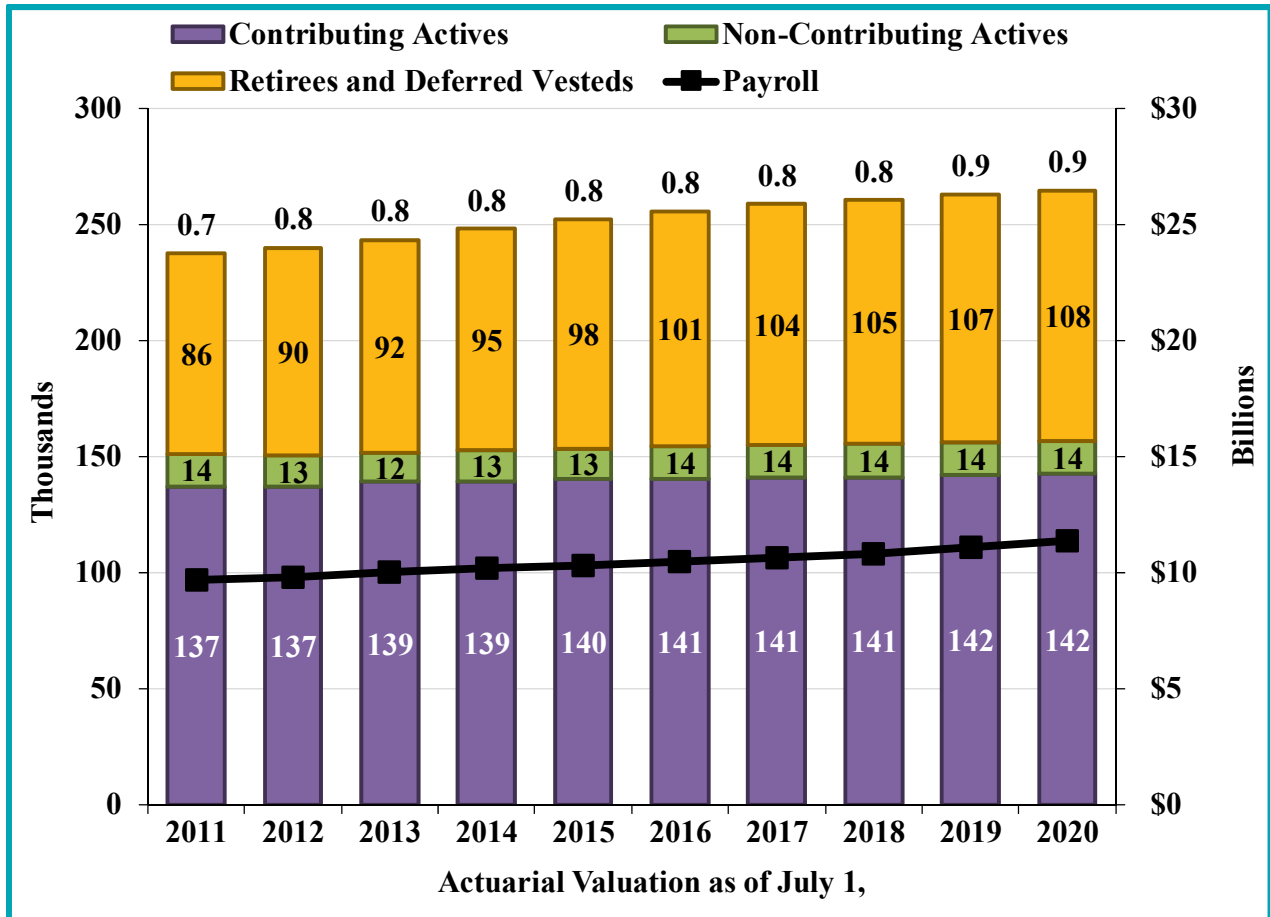
SECTION I – BOARD SUMMARY

Membership Trends

The graph below shows the membership counts of the Fund for the last ten valuations. The numbers which appear at the top of each bar represent the ratio of the number of inactive members and non-contributing active members to active contributing members at each valuation date, and provide a measure of the maturity of the Fund. We refer to this as the *support ratio*. The support ratio has increased over the period. As more of the liability moves from actives to inactive, the Fund will experience more volatility in contribution rates when actuarial gains and losses are recognized. With the current inactive-to-active ratio of 0.9, there are more active members than inactive members implying that the risk factor is not at a high level relative to other mature pension funds.

Starting with the 2018 valuation, the membership counts reflect all records for multiple members, which are active members employed by more than one participating employer at the same time.

The numbers that are shown in the middle of the bars represent the number of actives or inactive members in thousands. The black line represents the appropriation payroll for active contributing members over the period, and it corresponds with the scale on the right.



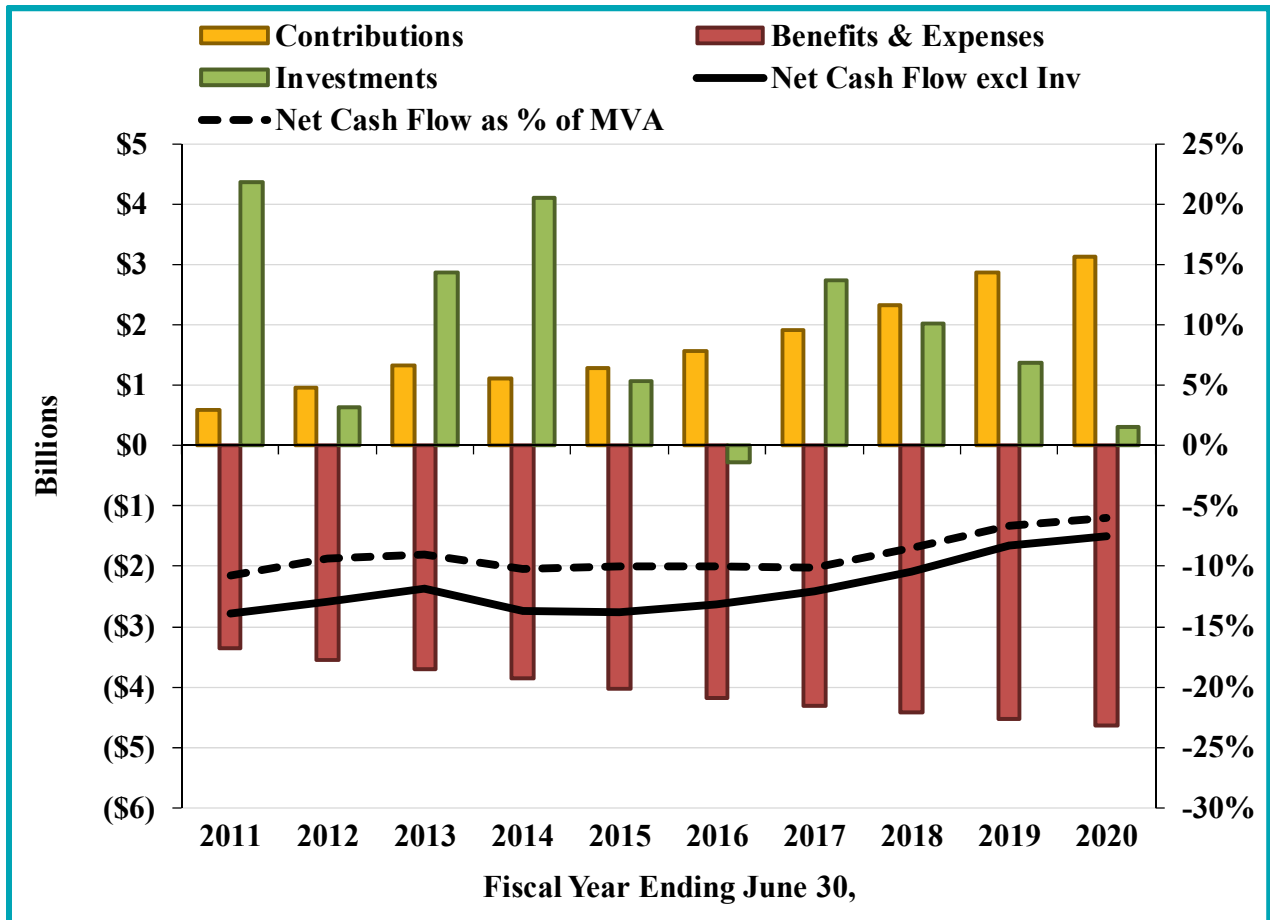
**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION I – BOARD SUMMARY

Cash Flows

The following graph shows the Fund net cash flow (contributions less benefit payments and expenses) at the end of each fiscal year. For the entire period shown, the net cash flow, which excludes investment returns, has been negative. This illustrates that contributions have not been sufficient to cover benefits and expenses in any years over the past decade. A major implication of a negative cash flow is that the difference each year must be met first from cash generated by investments and then paid out of the principal assets, representing additional risk for the Fund if investments need to be sold in a down market to cover benefit payments.

The black dotted line shows the net cash flow as a percent of the market assets and goes with the axis on the right. For the 10-year period shown the average net cash flow as a percent of assets is -9.1%, which is greater than the long-term investment return assumption. This indicates that a plan is expected to defund with an increased risk of insolvency if the contributions do not catch up to cover a higher portion of the benefit payments and expenses. For 2020, the net cash flow of -6.0% implies that the assumed investment return of 7.3%, if achieved, will cover this difference. Because the State appropriation percentages have increased by approximately 10% per year, the negative cash flow has improved since 2017.



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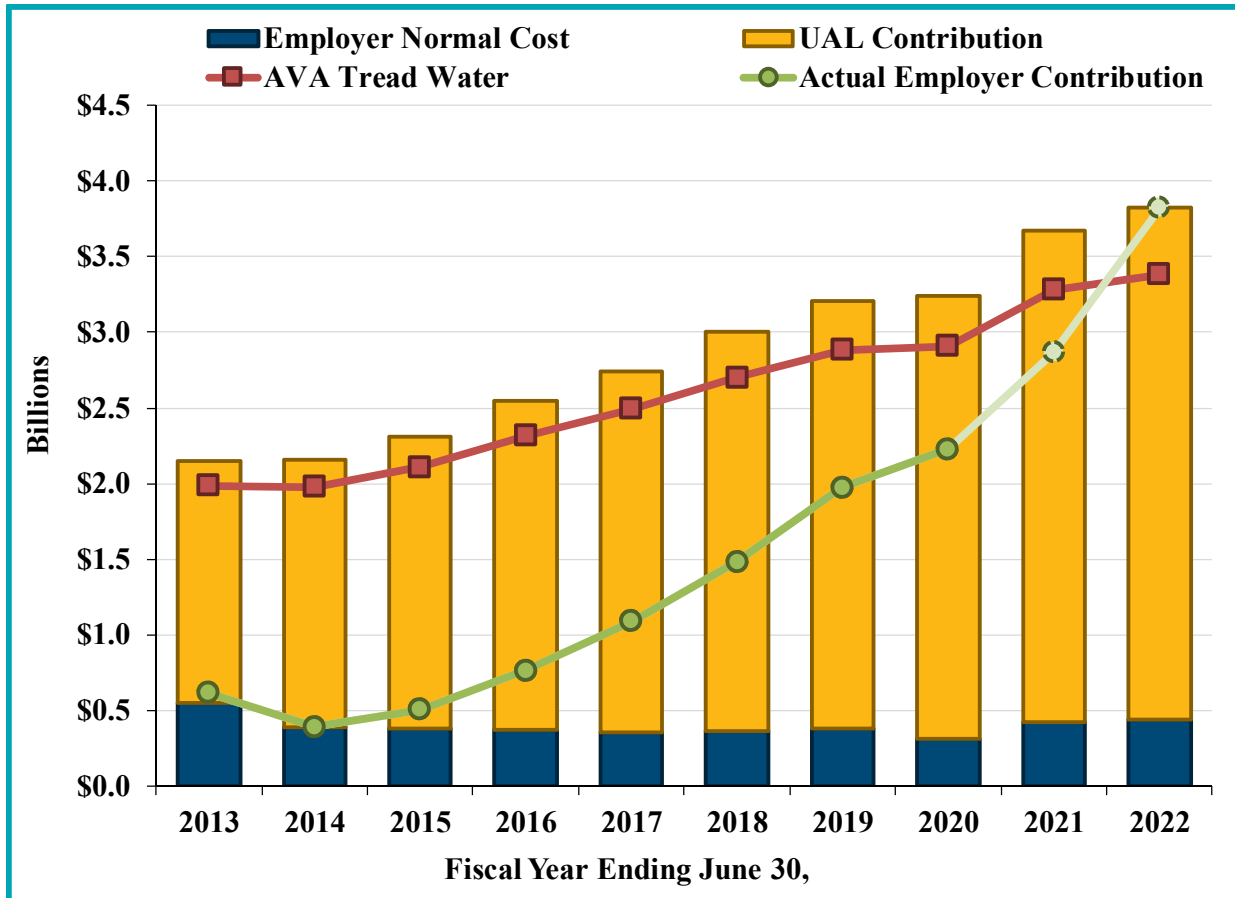
SECTION I – BOARD SUMMARY

Contributions

This graph shows the historical trends for the State contributions. The Statutory contributions are comprised of the State normal cost (blue bars) and the amortization of the UAL (gold bars). The green line shows the actual State contributions over the period. For FYE 2021 and FYE 2022, the green line has a lighter shade to indicate that these are expected, rather than actual, contributions based on the State appropriating 78% and 100% of the Statutory contribution, respectively. The expected contributions are shown in Table I-1.

The red line is the **tread water** line, which is the State normal cost plus the interest on the UAL. The tread water line shows the minimum contributions that are needed to avoid an increase in the UAL.

The graph shows that not only has the State been making contributions less than required by Statute, but that the State contributions have historically been significantly below the tread water line. When contributions are lower than the normal cost plus interest on the UAL, the unfunded actuarial liability is expected to grow from one year to the next. For FYE 2022, actual State contributions are expected to be greater than the tread water amount for the first time during the entire period shown.



TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION I – BOARD SUMMARY

Projected Future Outlook

The analysis of projected financial trends is perhaps the most important component of the valuation. This has been recognized by the State Legislature in their adoption of Chapter 277, P.L. 2017 requiring the System to have stress testing performed annually. The charts presented in this section show the expected progress of the TPAF's funded status over the next 30 years, measured in terms of the expected funded ratios and State contributions assuming that the Fund is ongoing.

While experience will not conform exactly to the assumptions every year, the trends reflect reasonable expectations. As a result, in addition to the baseline projection, we provided additional **stress testing** in Section II based on varying investment returns in the future. It is our opinion that the stress testing analyses shown in Section II meet the requirements of Chapter 277, P. L. 2017.

The projections assume a constant active population. As members retire, terminate and die based on the current valuation assumptions, it is assumed that new members will replace them based on characteristics (age/gender/salary) similar to recent new members.

Additional assumptions used for these projections, including the investment rate of return for each subsequent valuation as recommended by the State Treasurer, as well as the anticipated appropriation percentages, are shown in Appendix B.

Baseline Scenario

The baseline projection shows the outcome if all actuarial assumptions, including the long-term rate of return assumption of 7.00%, as recommended by the State Treasurer are exactly met. For each scenario we show two graphs.

The top graph compares the Market Value of Assets (green line), the Actuarial or smoothed Value of Assets (gold line), and the Actuarial Value of Assets plus Special Asset Value (blue line) to the Fund's Actuarial Liabilities (gray bars). In addition, at the top of the graph, we show the Fund's funded ratio on an Actuarial Value of Assets basis (ratio of Actuarial Value of Assets to Actuarial Liabilities). The years shown in the graph signify the valuation date as of July 1 of the labeled year.

The Fund's funded ratio on an Actuarial Value of Assets basis is projected to drop slightly next year as the valuation investment rate of return assumption decreases from 7.30% to 7.00%, before beginning a slow but steady increase to 100% by 2049.

The bottom graph shows the contributions by fiscal year. The member contributions are in purple and the State contributions are in gold.

The projected lottery revenue is provided by the DPB and is outlined in blue. Lottery revenue amounts shaded in gold are offsets to Statutory contributions. Lottery revenue amounts shaded

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SECTION I – BOARD SUMMARY

white are additional contributions in excess of the Statutory contributions that pay down the UAL. The lottery revenue through FYE 2022 largely offsets the Statutory contribution while lottery amounts after that include additional payments toward the UAL. The lottery offsets during the projection period are calculated based on the methodology as defined in Chapter 98, P.L. 2017.

The projection assumes the State appropriates 100% of the Statutory contribution in FYE 2022 and each year thereafter. Both the appropriated State contributions and the member contributions are also shown in dollar amounts.

The dashed black line in the bottom graph shows the gross normal cost. The difference between the dashed black line and the purple bar is the State portion of the normal cost.

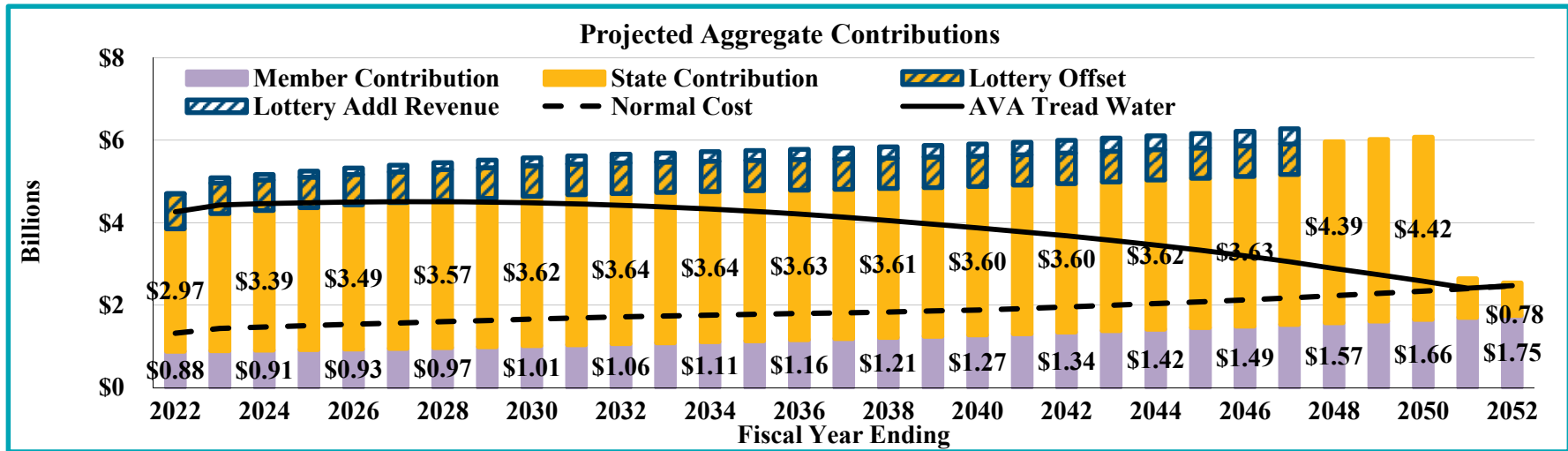
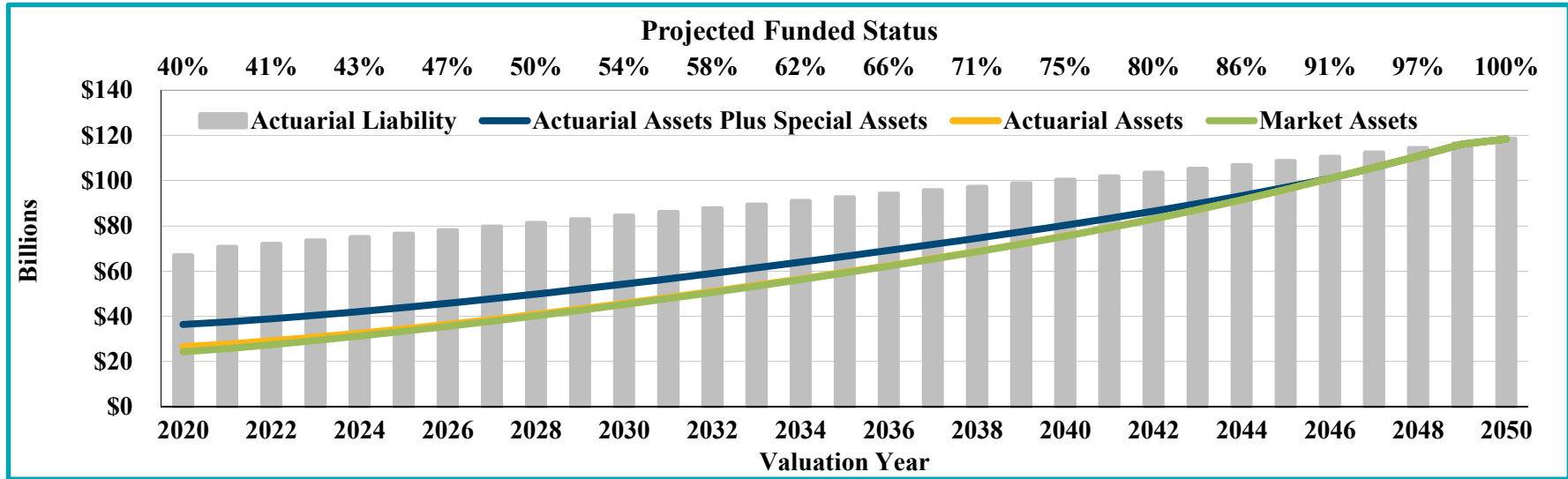
The solid black line is the tread water line based on the Actuarial Value of Assets. Because the tread water metric equals the normal cost plus interest on the UAL, the difference between the solid black line and the dashed black line is the interest on the UAL. When contributions fall below the solid black line, the UAL grows and the funded ratio falls. When the contributions exceed the solid line, as is the case throughout the projection period, the UAL is expected to decrease and the funded ratio is expected to increase.

The Statutory contributions increase for FYE 2023 as the valuation investment rate of return assumption decreases from 7.30% to 7.00%. Thereafter, the Statutory contributions remain relatively steady until lottery revenue stops. Once the appropriated amount equals the Statutory contribution, beginning in FYE 2022, the contributions reach the level necessary to pay down the UAL and the tread water line begins to decrease relative to the Statutory contribution. Additionally, expected lottery revenue that is contributed each year in excess of the Statutory contributions also helps pay down the UAL sooner.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION I – BOARD SUMMARY

Baseline: 7.0% return for all years



SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

Actuarial valuations are based on a set of assumptions about future economic and demographic experience. These assumptions represent a reasonable estimate of future experience, but actual future experience will undoubtedly be different and may be significantly different. This section of the report is intended to identify the primary risks to the plan, provide some background information about those risks, and provide an assessment of those risks.

Identification of Risks

The fundamental risk to the Fund is that the contributions needed to pay the benefits become unaffordable. While there are a number of factors that could lead to contribution amounts becoming unaffordable, we believe the primary risks are:

- Investment risk,
- Assumption change risk, and
- Contribution risk.

Other risks that we have not identified may also turn out to be important.

Investment risk is the potential for investment returns to be different than expected. Lower investment returns than anticipated will increase the unfunded actuarial liability necessitating higher contributions in the future unless there are other gains that offset these investment losses. The potential volatility of future investment returns is determined by the Fund's asset allocation and the affordability of the investment risk is determined by the amount of assets invested relative to the size of the plan sponsor or other contribution base.

Assumption change risk is the potential for the environment to change such that future valuation assumptions are different than the current assumptions. For example, declines in interest rates over the last three decades resulted in higher investment returns for fixed income investments, but lower expected future returns necessitating either a change in investment policy, a reduction in discount rate, or some combination of the two. Assumption change risk is an extension of the other risks identified, but rather than capturing the risk as it is experienced, it captures the cost of recognizing a change in environment when the current assumption is no longer reasonable.

Contribution risk is the potential for actual future contributions to deviate from expected future contributions. There are different sources of contribution risk ranging from the sponsor choosing to not make contributions in accordance with the funding policy to material changes in the contribution base (e.g., covered employees, covered payroll, sponsor revenue) that affect the amount of contributions the Fund can collect.

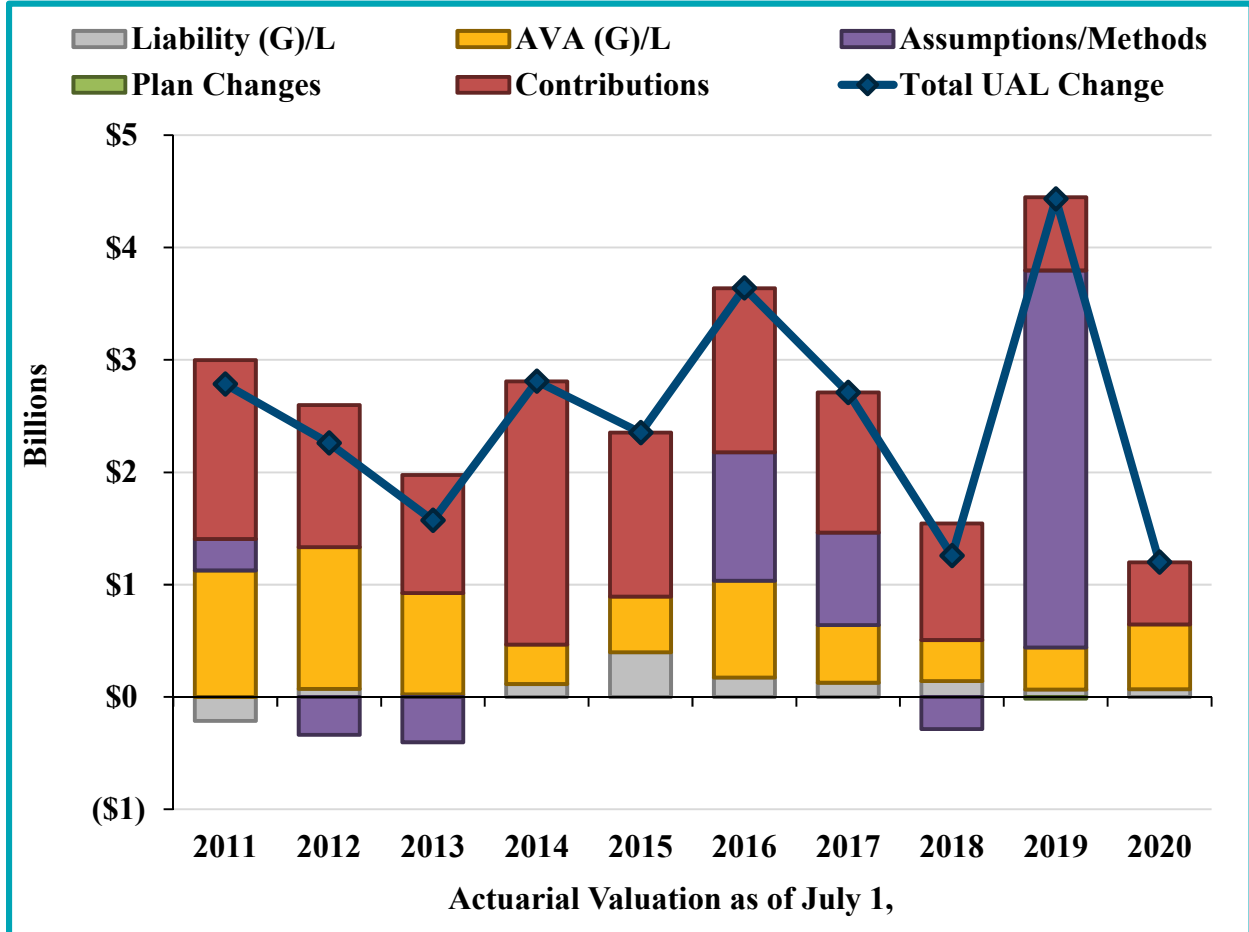
The following chart shows the components of changes in the Unfunded Actuarial Liability (UAL) for the Fund over the last 10 years, including investment gains and losses on the Actuarial Value of Assets, liability gains and losses, assumption and plan/policy changes, and contributions compared to the tread water level of contributions (normal cost plus interest on the UAL). The net UAL change is shown by the dark blue line. Table II-1 below the chart summarizes the changes in the UAL over the last 10 years.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

These total changes in UAL support our identification of investment returns, assumption changes, and contributions as the primary risks to the System.

Historical Changes in UAL 2011-2020



Actuarial Valuation as of July 1,

**TABLE II-1
Changes in Unfunded Actuarial Liability
(Dollar amounts in millions)**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Discount Rate	7.95%	7.90%	7.90%	7.90%	7.90%	7.65%	7.50%	7.50%	7.30%	7.30%	
Source											
AVA (G)/L	\$ 1,125.6	\$ 1,260.3	\$ 902.6	\$ 350.4	\$ 495.2	\$ 859.3	\$ 513.5	\$ 367.6	\$ 374.4	\$ 575.9	\$ 6,824.7
Liability (G)/L	(212.5)	72.5	22.1	114.9	398.7	173.7	126.6	140.4	67.1	70.0	973.5
Assumptions/Methods	281.1	(337.7)	(404.3)	0.0	0.0	1,144.2	822.6	(286.8)	3,353.5	0.0	4,572.7
Plan/Policy Changes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(15.6)	0.0	(15.6)
Contributions ¹	1,590.8	1,263.8	1,051.0	2,343.1	1,458.9	1,461.1	1,246.2	1,036.8	652.8	553.1	12,657.7
Net UAL Change	\$ 2,785.0	\$ 2,259.0	\$ 1,571.4	\$ 2,808.4	\$ 2,352.8	\$ 3,638.2	\$ 2,708.9	\$ 1,258.0	\$ 4,432.3	\$ 1,199.0	\$ 25,013.0

¹ UAL change due to contributions (greater)/less than normal cost plus interest on the UAL.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

On a smoothed asset basis, the investment gains and losses (gold bars) from 2011 to 2020 reflect material investment losses driven by the market decline of 2008 and 2009, which were spread over the five successive years. In aggregate, over the 10-year period, investment losses have added approximately \$6,824.7 million to the UAL.

On the liability side (gray bars), the Fund has experienced a combination of gains and losses, however much smaller in magnitude compared to the assets, increasing the UAL by approximately \$973.5 million over the 10-year period.

Assumption and method changes (purple bars) over the last 10 years have increased the UAL by approximately \$4,572.7 million. The significant assumption changes have included reductions in the discount rate from 8.25% to 7.30%, as well as decreases in mortality rates and projected mortality improvement. It is important to note that the discount rate changes simply reflect a downward revision to the estimate of future investment earnings and ultimately costs will be determined by actual investment earnings.

Plan and policy changes (green bars) over the last 10 years have decreased the UAL by approximately \$15.6 million.

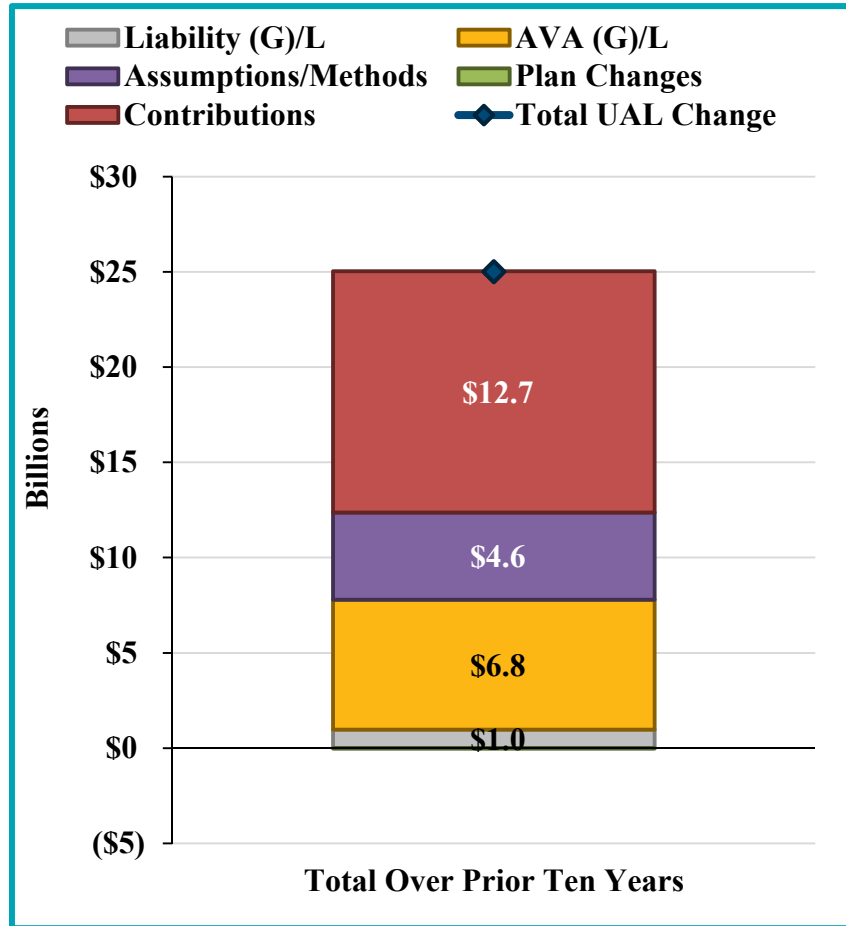
Each year the UAL is expected to increase for benefit accruals attributable to the current year (the normal cost) and interest on the UAL. This expected increase is referred to as the tread water level. If contributions are greater than the tread water level, the UAL is expected to decrease. Conversely, if contributions are less than the tread water level, the UAL is expected to increase. Changes due to contributions greater or less than the tread water level (red bars) have increased the UAL by approximately \$12,657.7 million over the last 10 years.

In general, the amortization methods used to determine the Statutory contributions are designed to collect more than the tread water level. However, contributions may be less than this threshold due to the State appropriating less than the Statutory contributions.

The following chart shows the total changes to the UAL over the 10-year period by source.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK



Plan Maturity Measures

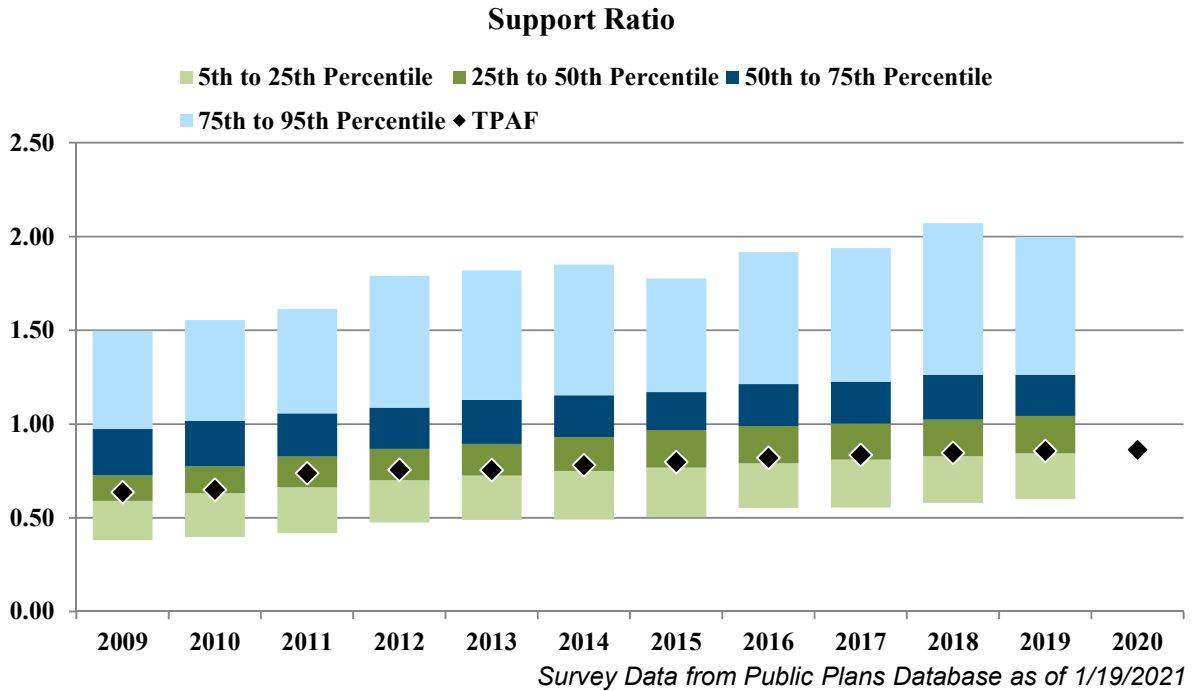
The future financial condition of a mature pension plan is more sensitive to each of the risks identified above than a less mature plan. Before assessing each of these risks, it is important to understand the maturity of the plan compared to other plans and how the maturity has changed over time.

Plan maturity can be measured in a variety of ways, but they all get at one basic dynamic - the larger the plan is compared to the contribution or revenue base that supports it, the more sensitive the plan will be to risk. The measures below have been selected as the most important in understanding the primary risks identified for the Fund.

SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

Inactives per Active (Support Ratio)

One simple measure of plan maturity is the ratio of the number of inactive members (those receiving benefits or entitled to a deferred benefit) to the number of active members. We refer to this ratio as the *support ratio*. The revenue base supporting the plan is usually proportional to the number of active members, so a relatively high number of inactives compared to actives indicate a larger plan relative to its revenue base as well. We also discussed this risk metric in Section I.



The chart above shows the distribution from the 5th to 95th percentile of support ratios for the plans in the Public Plans Database. The black diamond shows how TPAF compares dating back to 2009. TPAF has been less mature than the median plan. Though the support ratio increased following the Great Recession, it has remained stable at about the 25th percentile.

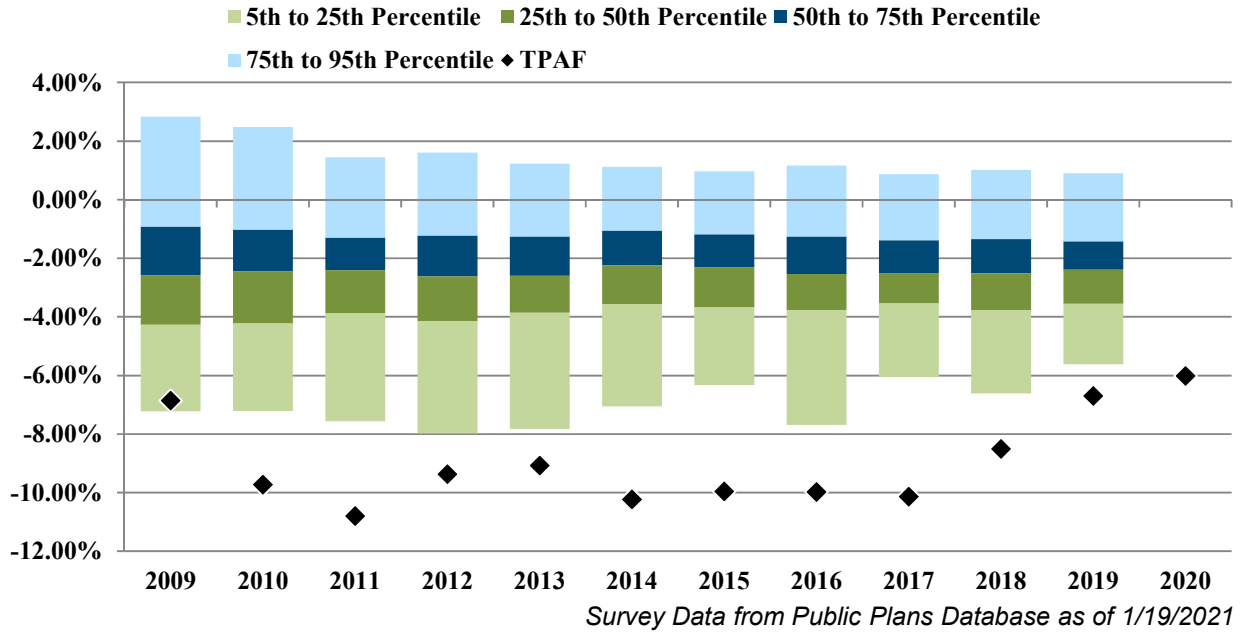
Net Cash Flow

The net cash flow of the plan as a percentage of the beginning of year assets indicates the sensitivity of the plan to short-term investment returns. Net cash flow is equal to contributions less benefit payments and administrative expenses. Mature plans can have large amounts of benefit payments compared to contributions, particularly if they are well funded. Investment losses in the short-term are compounded by the net withdrawal from the plan leaving a smaller asset base to try to recover from the investment losses. Large negative cash flows can also create liquidity issues. We also discussed this risk metric in Section I.

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Net Cash Flow



The chart above shows the distribution from the 5th to 95th percentile of net cash flow for the plans in the Public Plans Database. The black diamond shows how TPAF compares to other public plans. Since the Great Recession, TPAF has been at or below the 5th percentile compared to the database of other public plans in terms of having significantly more negative cash flow as a percentage of assets causing a serious defunding risk for the Fund.

Assessing Costs and Risks

The fundamental risk to the Fund is that the contributions needed to fund the benefits become unaffordable. Assessing this risk, however, is complex because there is no bright line of what is unaffordable and the contribution amounts themselves are affected not just by the experience of the Fund, but also by the interaction of that experience and decisions by the State and the Board related to the amount of contributions appropriated, assumptions, asset smoothing methods, and amortization periods.

Investment Risk - Stress Testing

This section illustrates stress testing of the investment return assumption and is an extension of the baseline projections provided in the Summary section. Under the baseline results, we assumed the ultimate 7.00% investment return assumption each and every year beginning July 1, 2020.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

For stress testing purposes, we developed six hypothetical scenarios to illustrate the impact investment returns may have on future funded status and contribution amounts. The scenarios are balanced between positive and negative scenarios and are based on a lognormal distribution of one and five year expected returns as shown in the following table using the capital market assumptions from the New Jersey Division of Investments (geometric return of 6.94%, standard deviation of 11.05%).

Distribution of Expected Average Annual Returns		
Percentile	1 Year	5 Year
5%	-9.7%	-0.8%
25%	-0.2%	3.7%
50%	6.9%	6.9%
75%	14.6%	10.3%
95%	26.6%	15.3%

The scenarios include: a one-year shock using the 5th and 95th percentile returns for one year; a 5-year moderate scenario using the 25th and 75th percentile returns for five years; and a 5-year significant scenario using the 5th and 95th percentile returns for five years. The table below summarizes the theoretical scenarios.

FYE	Theoretical Scenarios					
	1-Yr Shock		5-Yr Moderate		5-Yr Significant	
	Neg	Pos	Neg	Pos	Neg	Pos
2021	-9.7%	26.6%	3.7%	10.3%	-0.8%	15.3%
2022	7.0%	7.0%	3.7%	10.3%	-0.8%	15.3%
2023	7.0%	7.0%	3.7%	10.3%	-0.8%	15.3%
2024	7.0%	7.0%	3.7%	10.3%	-0.8%	15.3%
2025	7.0%	7.0%	3.7%	10.3%	-0.8%	15.3%
2026+	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%

In reviewing each of these projections, it is the future trends, not necessarily the actual values, that are important to observe in consideration of the risks of the Fund and the potential volatility of future funded ratios and Statutory contribution levels.

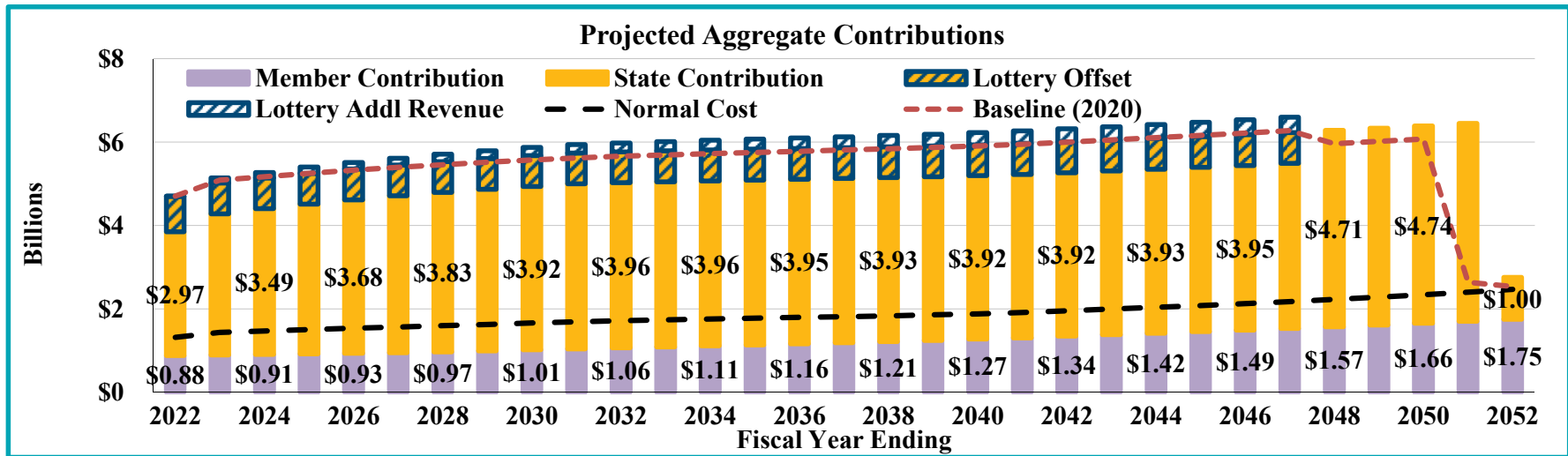
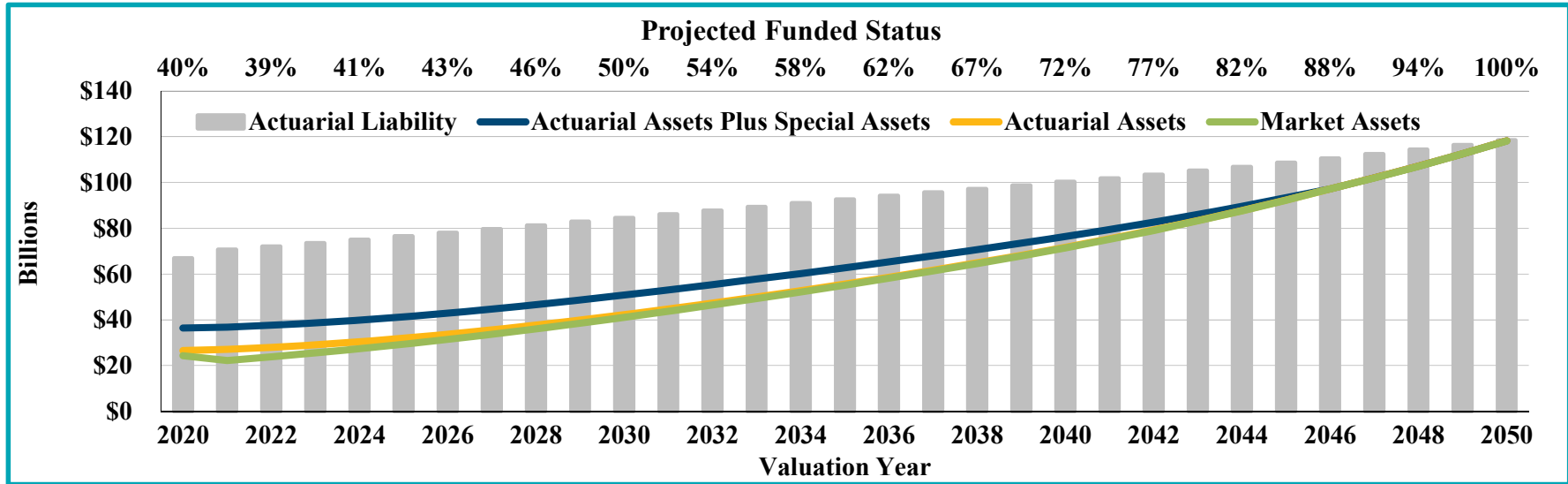
We note that when asset returns are high, excess assets may be used to offset employer costs. We have not shown the implications of a surplus and assume that the State will always contribute at least the normal cost.

The graphs on the following pages show the projections under each of these theoretical scenarios. Instead of the tread water line shown for the baseline projection, the contribution graphs include a dashed red line representing the expected contributions under the baseline projections shown in the Summary section to facilitate the comparison between the particular scenario and the baseline projections assuming all assumptions are met.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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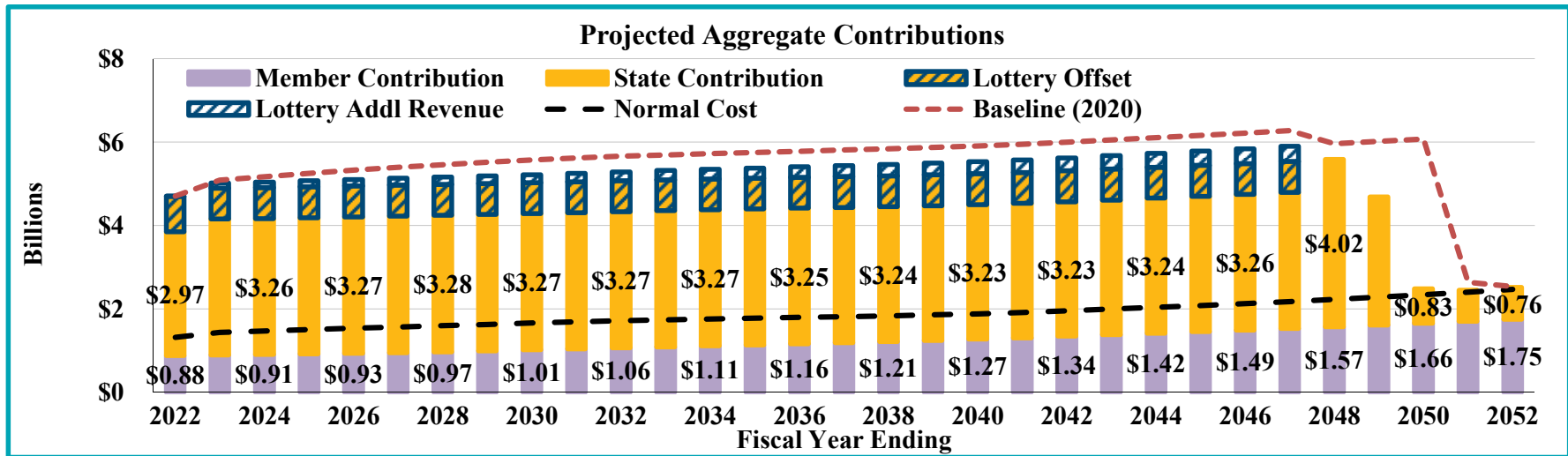
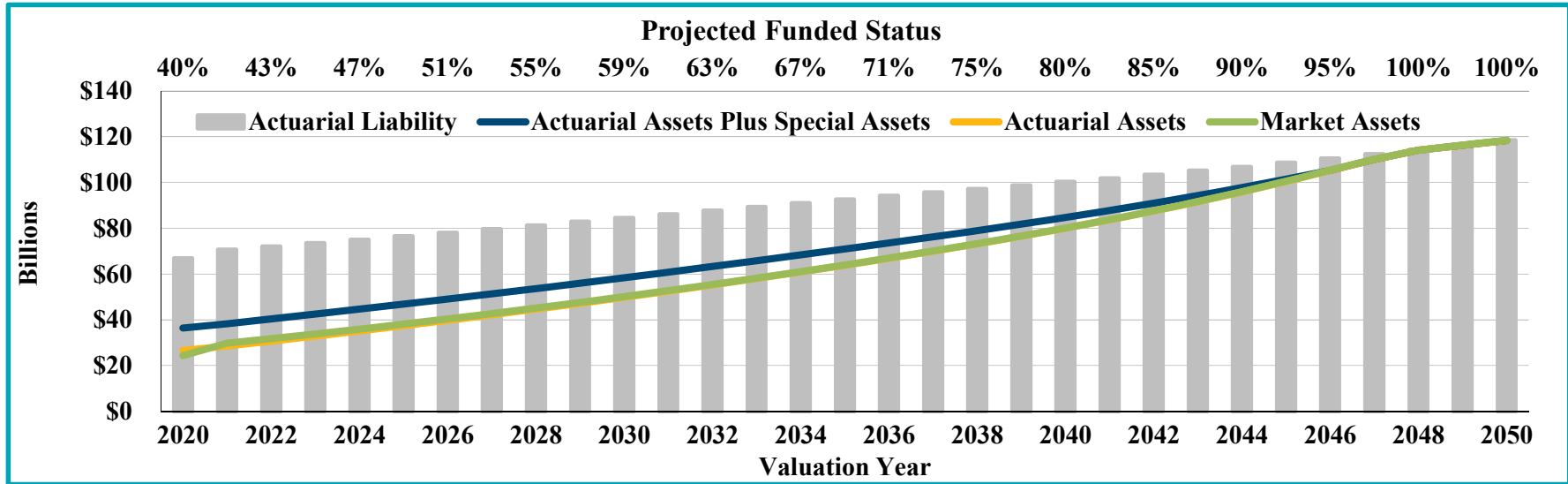
One-Year Negative Shock Scenario: -9.7% return FYE 2021, 7.0% after



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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

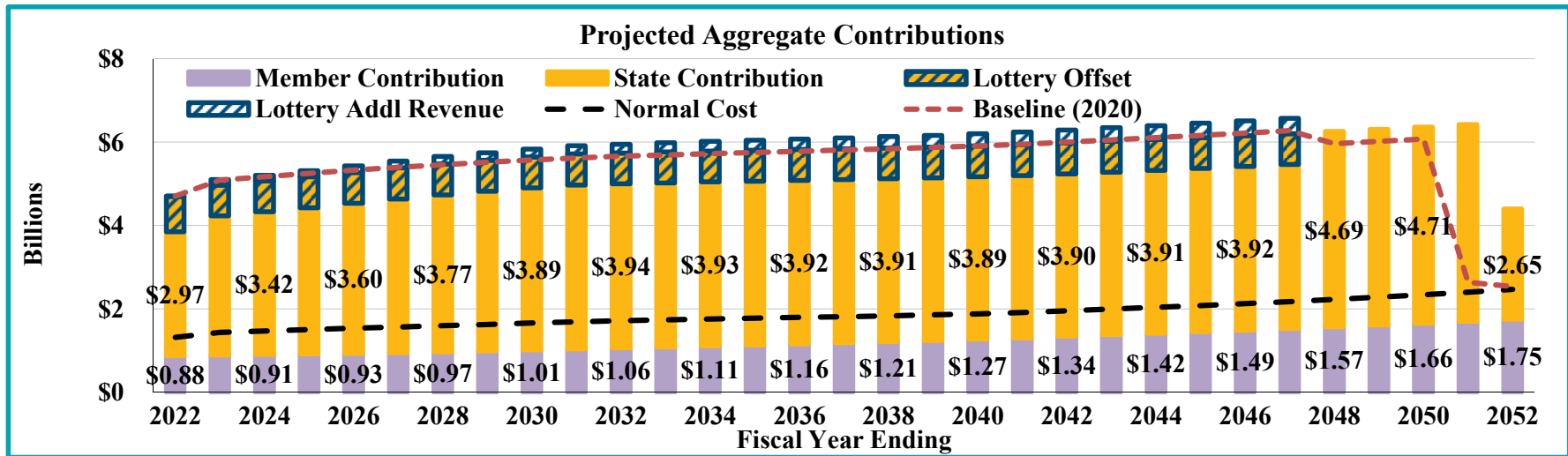
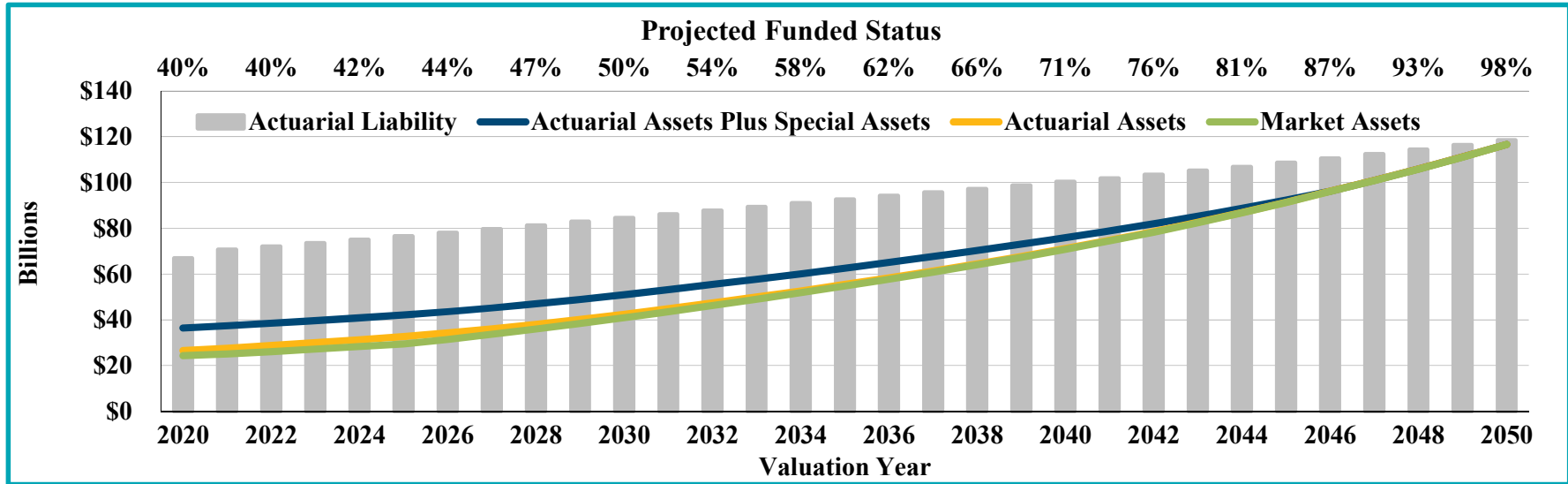
One-Year Positive Shock Scenario: 26.6% return FYE 2021, 7.0% after



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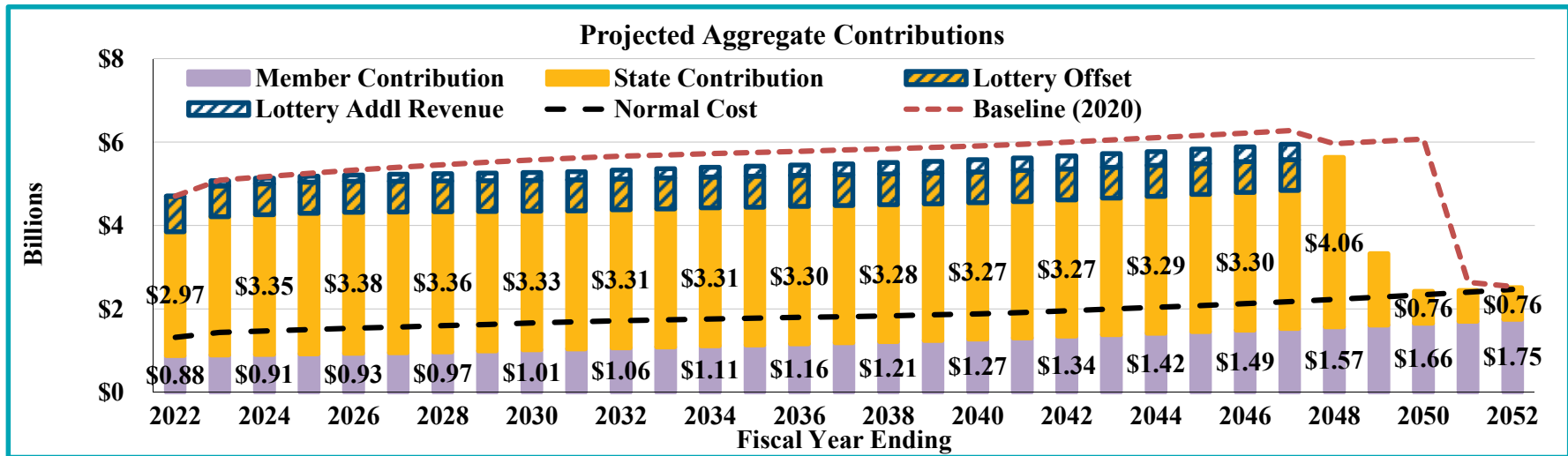
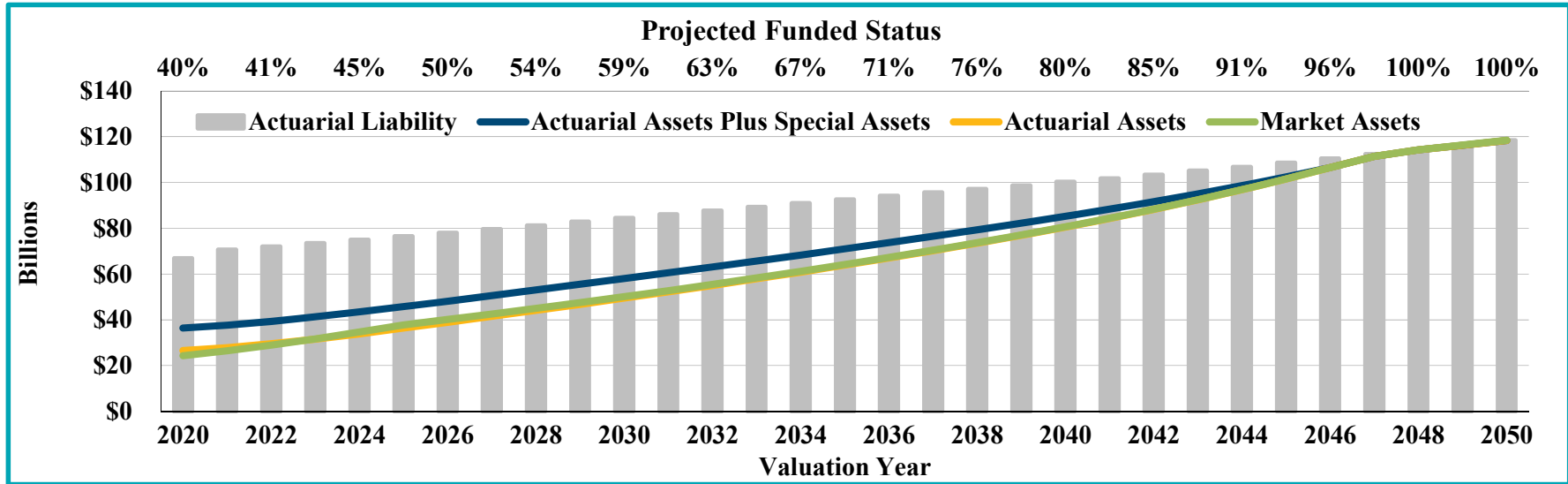
Five-Year Moderate Negative Scenario: 3.7% return FYE 2021-2025, 7.0% after



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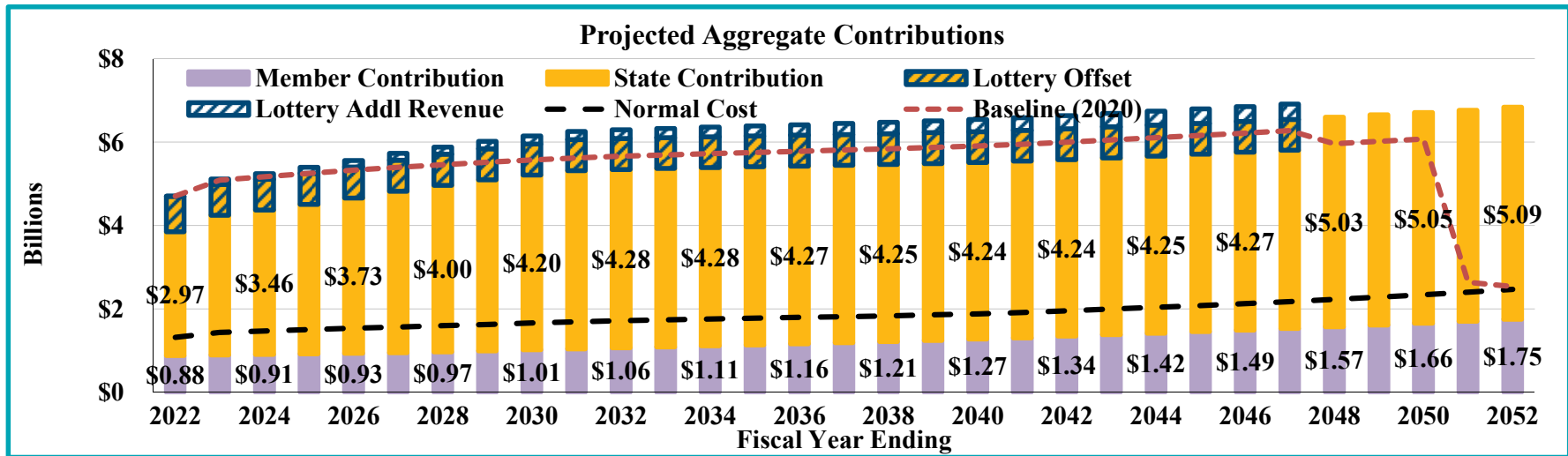
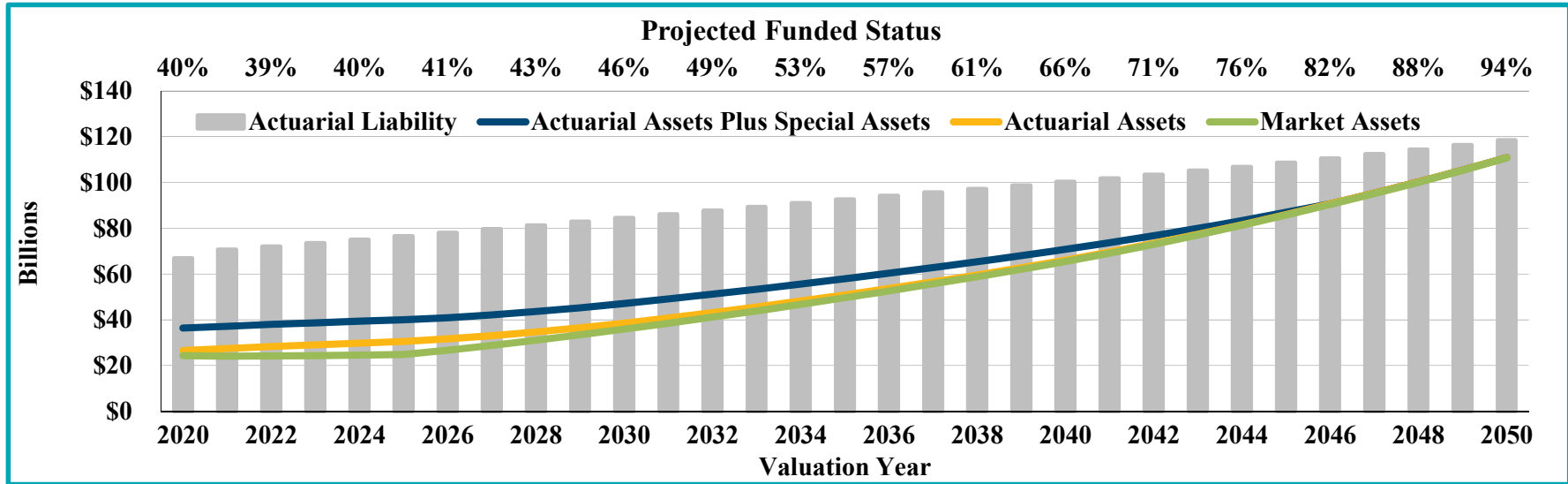
Five-Year Moderate Positive Scenario: 10.3% return FYE 2021-2025, 7.0% after



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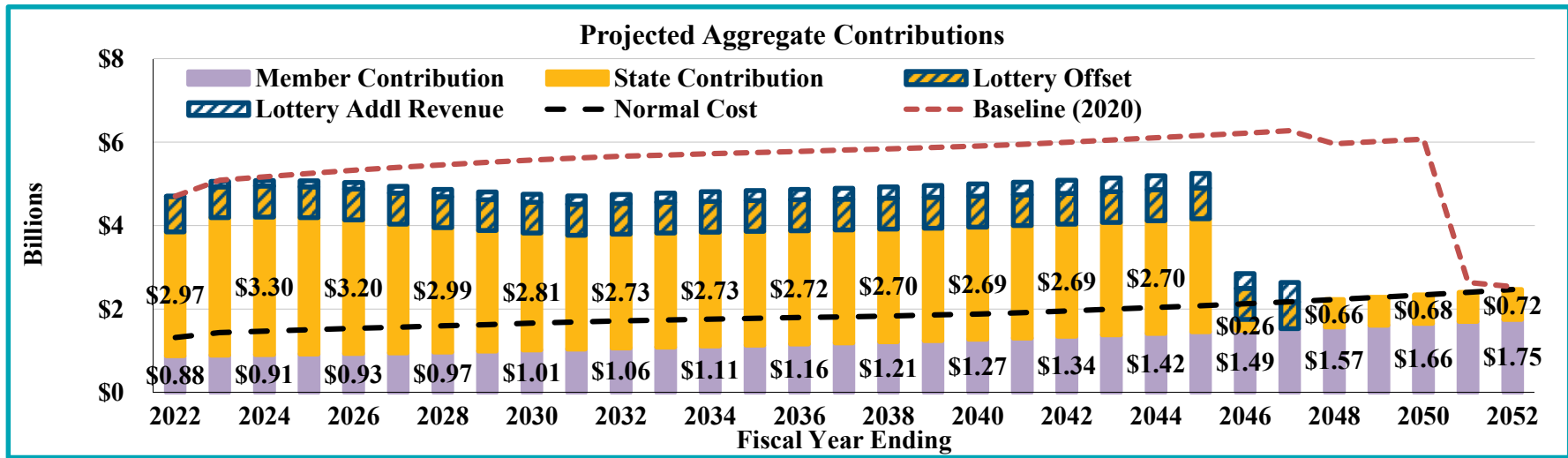
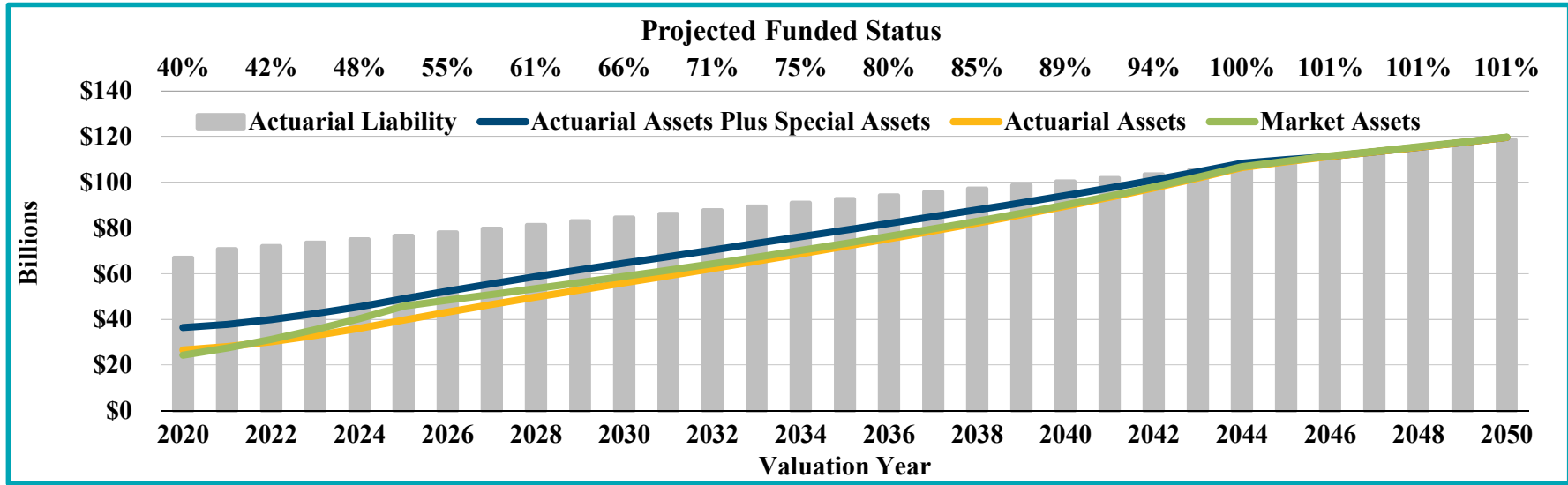
Five-Year Significant Negative Scenario: -0.8% return FYE 2021-2025, 7.0% after



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Five-Year Significant Positive Scenario: 15.3% return FYE 2021-2025, 7.0% after



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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

These scenarios show that actual future investment returns have a significant impact on future State contribution amounts. In each of the scenarios, the State contribution amount increases in FYE 2023 as the valuation investment rate of return assumption decreases from 7.30% to 7.00%. The following table summarizes the impact on the State contributions in FYE 2034 for each of the investment return scenarios.

Table II-2						
Impact on Contributions for FYE 2034						
(dollar amounts in billions)						
	1-Yr Shock		5-Yr Moderate		5-Yr Significant	
	Neg	Pos	Neg	Pos	Neg	Pos
Amount	\$0.32	(\$0.37)	\$0.29	(\$0.33)	\$0.64	(\$0.91)
Percent	9%	-10%	8%	-9%	18%	-25%

The positive scenarios sometimes show the system achieving a 100% funded status during the 30-year projection period, which results in the State contribution decreasing to equal the employer normal cost.

The investment returns used in the projections above were selected solely to illustrate the impact of investment volatility on the pattern of future funded status and contribution amounts. They are not intended to be predictive of actual future contributions or funded status or even to represent a realistic pattern of investment returns.

Assumption Change Risk – Sensitivity Testing

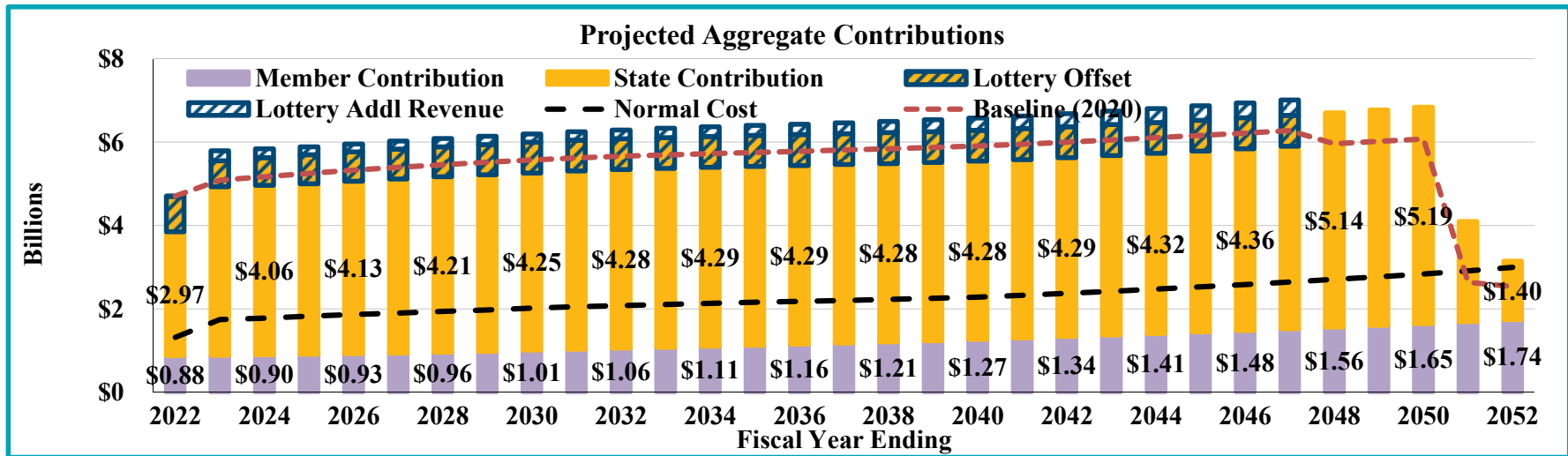
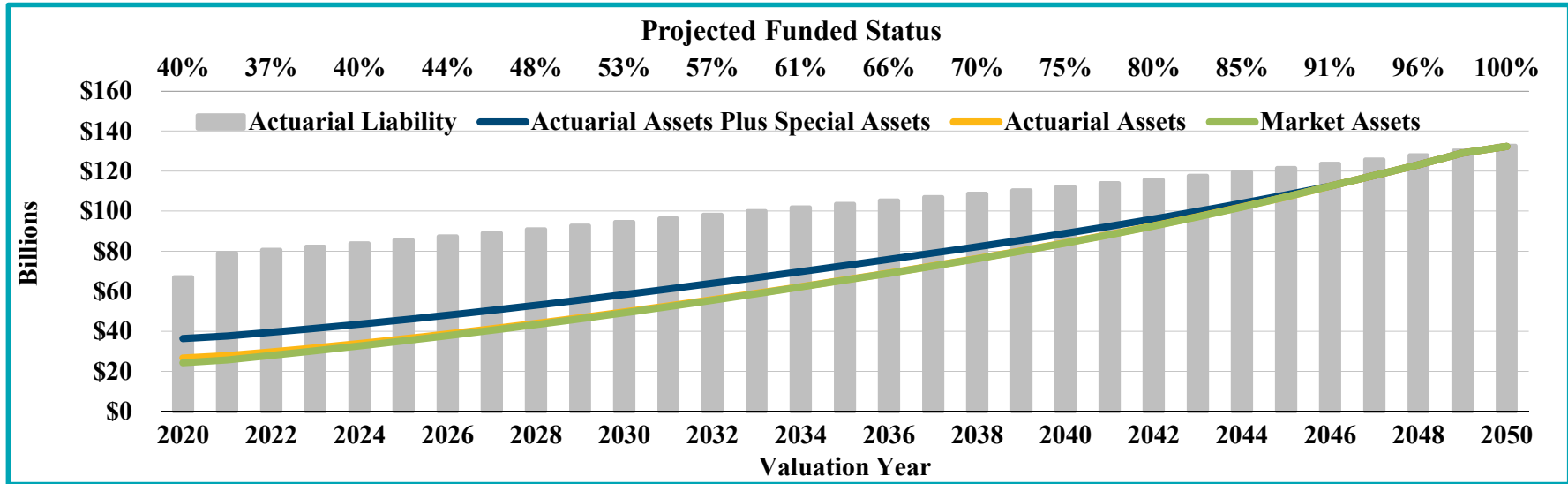
As shown in Table II-1, assumption changes over the last decade have increased the UAL by approximately \$4,572.7 million. The most significant changes were reductions in the discount rate, decreases in mortality rates and projected mortality improvement. The reductions in discount rates have been largely driven by declines in interest rates that affect expectations of future investment returns. If there are further declines in interest rates or if there is a desire or need to reduce investment risk that reduces expected returns, the discount rate and expected returns may need to be reduced further. The charts on the following page show the impact on projected future funded status and contribution amounts if the discount rate and expected returns were reduced by 100 basis points to 6.00% beginning with the July 1, 2021 valuation.

This scenario results in Statutory contributions in FYE 2034 that are approximately 18% higher than the baseline.

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6.00% Discount Rate and Investment Return Assumption Effective July 1, 2021



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Contribution Risk – Sensitivity Testing

The amortization method used to determine the Statutory contributions is designed to collect more than the tread water level and, therefore, gradually pay down the UAL. However, appropriated contributions have consistently been less than the Statutory contributions and the tread water level, causing an increase in the UAL of approximately \$12,657.7 million over the last 10 years. The baseline projections assume the State appropriates 100% of the Statutory contribution beginning in FYE 2022, at which time contributions are projected to be greater than the tread water level.

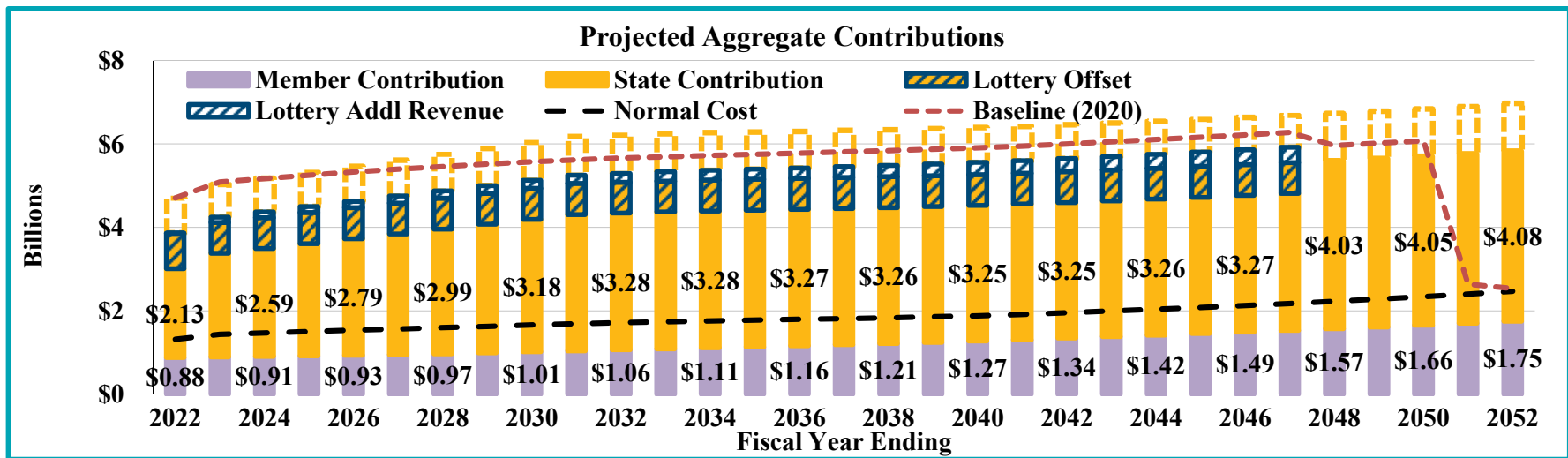
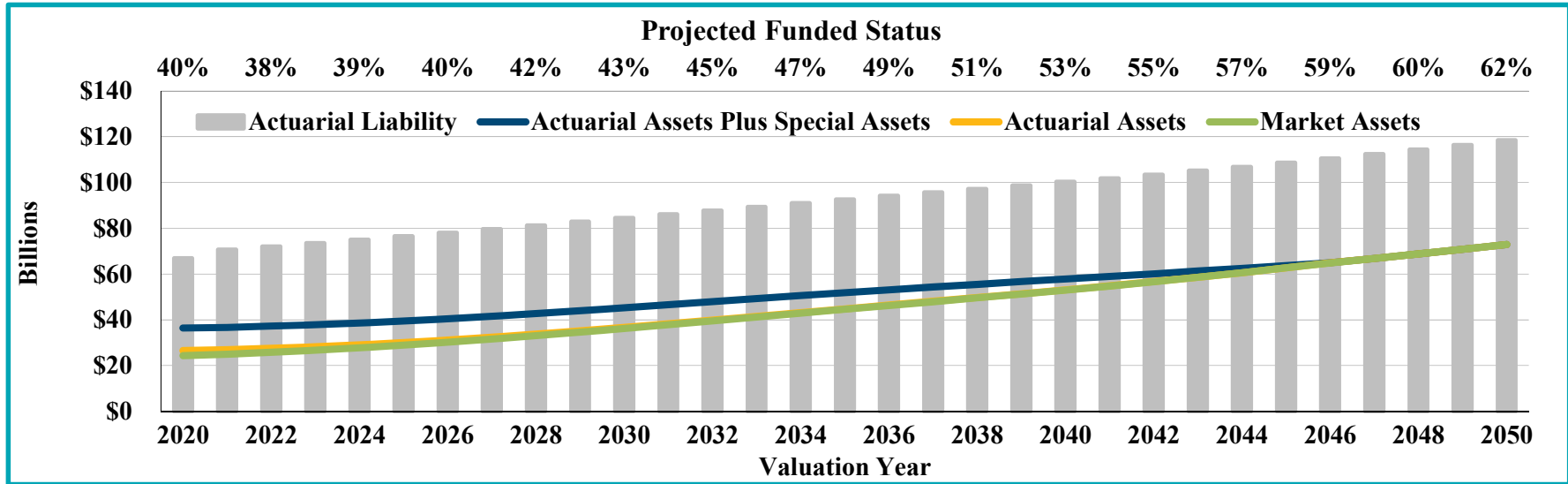
Contribution risk is the potential for actual future contributions to deviate from expected future contributions. The charts on the following page illustrate the impact on projected future funded status and contribution amounts if the State appropriation remains at 78% of the Statutory contribution for each year in the future, rather than increasing to 100% of the Statutory contribution. In illustrating the contribution risk sensitivity, we assume the State's appropriation percent remains at the current level of 78%. The gold outline in the bottom graph shows the State's full Statutory contributions with the shaded portion showing the anticipated appropriated amount.

This scenario shows the Statutory and appropriated State contributions gradually increasing over time. The Statutory contributions quickly exceed the baseline. The appropriated contributions are below the baseline initially but eventually grow to reach a similar level, with a lower funded ratio. The funded ratio at the end of the projection period is 62% compared to 100% under the baseline projection.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

State Appropriates 78% of Statutory Contribution for Fiscal Year Ending June 30, 2022 and Thereafter



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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

More Detailed Assessment

While a more detailed assessment is always valuable to enhance the understanding of the risks identified above, we believe the scenarios illustrated above cover the primary risks facing the Fund at this time. We would be happy to provide the Board with a more in-depth analysis at their request.

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SECTION III – ASSETS

The Fund uses and discloses two different asset measurements for funding, which are presented in this section of the report: market value and actuarial value of assets. The market value represents the value of the assets if they were liquidated on the valuation date. The actuarial value of assets is a value that smooths annual investment returns to reduce annual investment volatility and is used in determining contribution levels. In compliance with New Jersey Statute, the method used to calculate the actuarial value of assets recognizes 20% of the difference between the market value of assets and the expected actuarial value of assets each year.

Actuarial Standards of Practice (ASOP) No. 44 states that the asset valuation method should produce an actuarial value of assets that falls within a reasonable range of market value, recognizes the difference between the market value and actuarial value of assets within a reasonably short period of time, and is likely to produce actuarial value of assets that are sometimes greater than and sometimes less than the corresponding market values. The asset method required under N. J. Statute does not meet the requirements of ASOP No. 44 because this method has produced actuarial value of assets which have consistently been greater than the market value of assets and recognizes investment losses slowly over time. Additionally, the method may produce an actuarial value of assets that falls outside of what is generally considered to be a reasonable range of the market value.

On the following pages, we present detailed information on the Fund's assets:

- Disclosure of assets at July 1, 2019 and July 1, 2020,
- Statement of cash flows during the year,
- Development of the actuarial value of assets,
- Disclosure of investment performance for the year,
- Development of the Special Asset Value (SAV), and
- Development of the Actuarial Balance Sheet.

Disclosure

The market value of assets represents a “snap-shot” value as of the last day of the fiscal year that provides the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the value of the investments. Because these fluctuations would cause volatility in employer contributions, an actuarial value of assets is developed. Table III-1 on the following page presents the market value as of June 30, 2019 and June 30, 2020. Table III-2 presents the Fund's net cash flows from June 30, 2019 to June 30, 2020. Table III-3 presents the development of the Actuarial Value of Assets as of July 1, 2020. Tables III-4 and III-5 show the market and actuarial value of assets historical investment returns compared to the assumed return for each year, as well as the cumulative returns over various periods and durations of time.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION III – ASSETS

Table III-1 Statement of Assets at Market Value		
	June 30, 2020	June 30, 2019
Assets		
Cash	\$ 10,637,877	\$ 6,180,296
Investment Holdings	21,151,800,750	22,690,207,686
Employers' Contributions Receivable - State	359,756,750	0
Employers' Contributions Receivable - NCGI	5,389,614	5,671,665
Employers' Contributions Receivable - Common L	127,559,200	101,891,800
Employers' Contributions Receivable - Local Employers	2,953	720,684
Employers' Contributions Receivable - Local Employers ERI	6,423,758	9,798,143
Employers' Contributions Receivable - Delayed Enrollments	504,941	551,705
Employers' Contributions Receivable - Delayed Appropriations	0	5,079,408
Members' Contributions Receivable	90,067,355	84,097,036
Accrued Interest on Investments	229,808	82,302
Accounts Receivable	33,118,131	3,653,862
Loans Receivable	263,806,406	270,804,824
Securities Lending Collateral	396,739,193	289,647,691
Total Assets	\$ 22,446,036,736	\$ 23,468,387,102
Liabilities		
Pension Payroll Payable	\$ (316,973,143)	\$ (308,723,013)
Pension Adjustment Payroll Payable	(23,219,647)	(24,442,624)
Withholdings Payable	(44,858,819)	(44,027,809)
Administrative Expenses Payable	(16,886,394)	(490,857)
Death Benefits Payable	(5,389,614)	(3,135,963)
Securities Lending Collateral & Rebates Payable	(396,607,967)	(289,297,550)
Other Accounts Payable	(112,921,154)	(101,535,010)
Total Liabilities	\$ (916,856,738)	\$ (771,652,826)
Preliminary Market Value of Assets	\$ 21,529,179,998	\$ 22,696,734,276
Discounted Receivables		
State Appropriations	\$ 1,934,534,318	\$ 1,376,520,108
Expected Lottery Revenue	815,754,857	804,620,111
Market Value of Assets	\$ 24,279,469,173	\$ 24,877,874,495

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION III – ASSETS

Fund Cash Flows as of June 30, 2020

Table III-2	
Changes in Market Value for FYE June 30, 2020	
Additions	
Contributions	
Member Contributions	\$ 867,037,595
Member Transfer Contributions	13,801,432
State Appropriations	1,439,027,000
State Lottery	789,467,000
NCGI Contributions	42,513,729
Employer Transfer Contributions from Other Systems	1,786,947
Other Contributions - Delayed Enrollments	329,571
Other Contributions - Delayed Appropriations	(5,079,408)
Total Contributions	<u>\$ 3,148,883,866</u>
Net Investment Income	318,393,101
Total Additions	\$ 3,467,276,967
Deductions	
Withdrawal of Member Contributions	\$ 66,013,880
Withdrawal of Member Transfer Contributions	5,381,121
Withdrawal of Employer Transfer Contributions	789,925
Adjustment for Member Loans	(261,592)
Retirement Allowances	4,230,853,848
Pension Adjustment Benefits	276,029,186
NGCI Premiums	42,513,729
Administrative Expenses	13,511,148
Total Deductions	\$ 4,634,831,245
Net Increase/(Decrease)	\$ (1,167,554,278)
Preliminary Market Value of Assets Beginning of Year	\$ 22,696,734,276
Preliminary Market Value of Assets End of Year	\$ 21,529,179,998
Discounted Receivables	
State Appropriations	\$ 1,934,534,318
Expected Lottery Revenue	<u>815,754,857</u>
Market Value of Assets End of Year	\$ 24,279,469,173
Approximate Return	1.46%

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SECTION III – ASSETS

Actuarial Value of Assets (AVA)

To determine on-going funding requirements, most pension systems utilize an actuarial value of assets that differs from the market value of assets. The actuarial value of assets represents an asset value based on averaging or smoothing year-to-year market value returns for purposes of reducing contribution volatility. Each year, 20% of the difference between the adjusted market value of assets and the expected actuarial value of assets is added to the expected actuarial value of assets.

Table III-3 Development of Actuarial Value of Assets as of July 1, 2020		
1.	Preliminary Actuarial Value of Assets as of July 1, 2019 ¹	\$ 24,194,289,717
2.	Net Cash Flow excluding Investment Income	(1,485,947,379)
3.	Expected Investment Income ²	<u>1,700,117,119</u>
4.	Expected Actuarial Value of Assets as of July 1, 2020: [1 + 2 + 3]	\$ 24,408,459,457
5.	Preliminary Market Value as of June 30, 2020	\$ 21,529,179,998
6.	20% of Difference from MVA = [(5-4) x 0.2]	\$ (575,855,892)
7.	Preliminary Actuarial Value of Assets as of July 1, 2020 ¹ : [4 + 6]	\$ 23,832,603,565
8.	Discounted Receivables	
	State Appropriations	\$ 1,934,534,318
	Expected Lottery Revenue	<u>815,754,857</u>
	Total	\$ 2,750,289,175
9.	Actuarial Value of Assets as of July 1, 2020: [7 + 8]	\$ 26,582,892,740
10.	Rate of Return on Actuarial Value of Assets	4.83%
11.	Ratio of Actuarial Value of Assets to Market Value of Assets	109.5%

¹ Excludes discounted State appropriations receivable

² Refer to Appendix B, Actuarial Methods, for details on the assumed timing of contributions

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SECTION III – ASSETS

Investment Performance

The market value of assets rate of return was 1.46% for the year ending June 30, 2020. This is compared to an assumed return of 7.30% for the same period. On an actuarial value of assets basis, the return for FYE 2020 was 4.83%. In the table below, we show historical asset returns compared to the investment return assumption, beginning with the year ending on June 30, 2000. As of July 1, 1999, the actuarial value of assets was reset to equal the market value of assets.

Table III-4 Annual Rates of Return			
Year Ended June 30	Investment Return Assumption	Market Value	Actuarial Value¹
2000	8.75%	11.57%	9.33%
2001	8.75%	-9.70%	5.47%
2002	8.75%	-8.25%	2.98%
2003	8.75%	2.97%	2.79%
2004	8.75%	14.22%	4.32%
2005	8.25%	8.84%	4.50%
2006	8.25%	10.30%	5.35%
2007	8.25%	15.95%	7.15%
2008	8.25%	-2.27%	5.31%
2009	8.25%	-16.29%	1.36%
2010	8.25%	13.83%	2.74%
2011	8.25%	17.91%	4.71%
2012	7.95%	2.46%	3.85%
2013	7.90%	11.69%	4.86%
2014	7.90%	16.58%	6.67%
2015	7.90%	4.15%	6.10%
2016	7.90%	-1.12%	4.68%
2017	7.65%	13.05%	5.64%
2018	7.50%	9.19%	5.97%
2019	7.50%	6.18%	5.91%
2020	7.30%	1.46%	4.83%

¹The prior actuary reported an actuarial value return for 2000 based on the prior actuarial value of assets method. The return shown for that year was recalculated based on available information.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION III – ASSETS

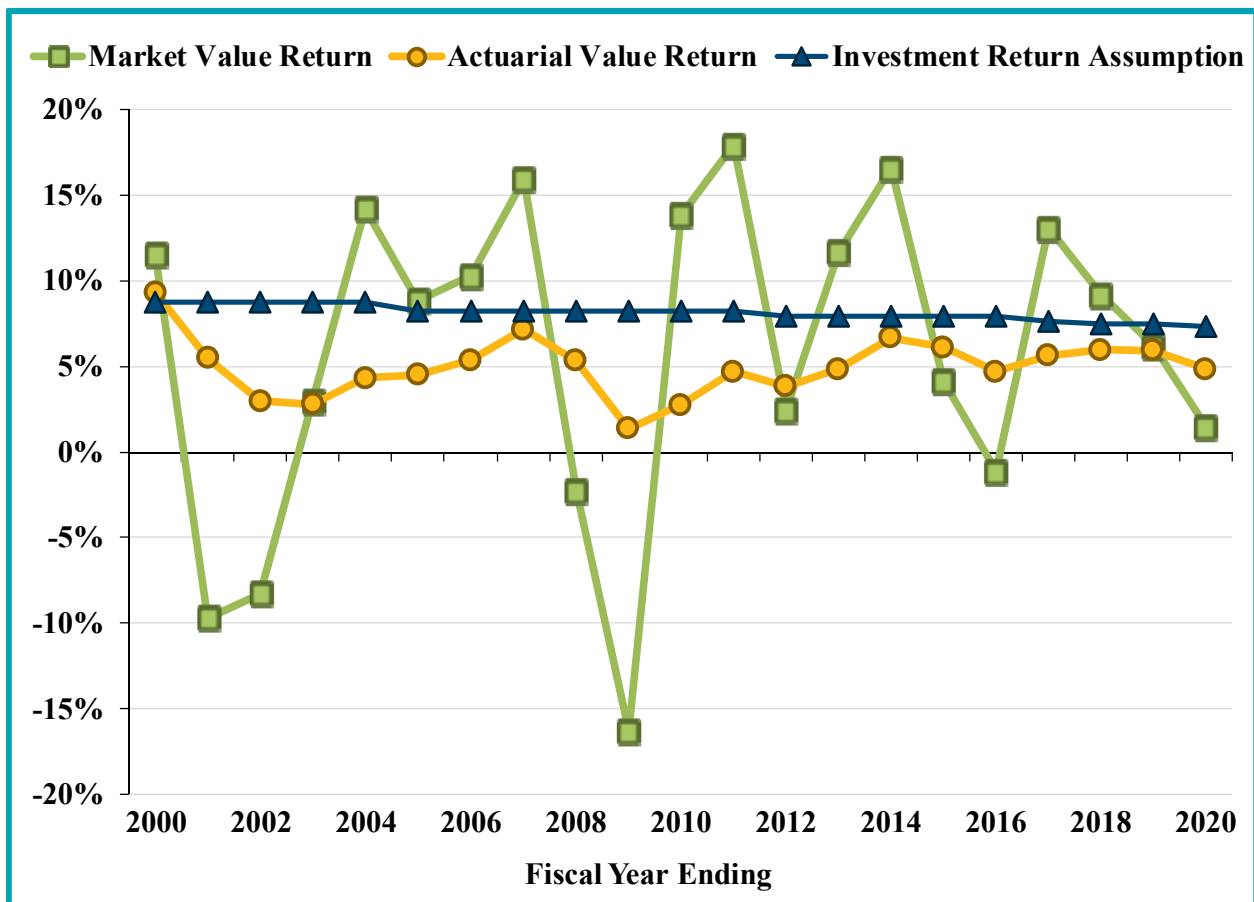
Additionally, we show the compound annualized rates of return for various periods since the July 1, 1999 AVA reset in the following table. On a cumulative basis, there are periods where the market value return significantly exceeds the actuarial value return. This is due to the recognition of market value losses from earlier years in the actuarial value. We present compound annualized rates of return over consecutive five-year periods to help illustrate this point.

Table III-5 Compound Annualized Rates of Returns			
Period	Investment Return		
	Assumption	Market Value	Actuarial Value
Since July 1, 1999	8.14%	5.43%	4.96%
20-Year	8.11%	5.13%	4.75%
15-Year	7.93%	6.48%	5.00%
10-Year	7.77%	7.98%	5.32%
5-Year	7.57%	5.63%	5.40%
Consecutive Five-Year Periods			
2000 to 2004	8.75%	1.69%	4.95%
2005 to 2009	8.25%	2.63%	4.72%
2010 to 2014	8.05%	12.36%	4.56%
2015 to 2019	7.69%	6.18%	5.66%
2020 (One-Year)	7.30%	1.46%	4.83%

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION III – ASSETS

We present the annual rates of return from Table III-4 in the following graph. The market value returns (green) show significant volatility with years above and below the investment return assumption (blue). The largest deviations from expectations are losses in 2001 and 2002 and again in 2008 and 2009. The actuarial value returns (yellow) follow the direction of market value returns, but much more gradually as gains and losses are recognized over time. For nearly the entire period, the actuarial value returns fall short of the investment return assumption and result in AVA losses and UAL increases. When the actuarial return approaches the assumption, the MVA is closing in on the AVA with the possibility of AVA gains in the near future. However, both such instances (2007 and 2014) are followed by market value losses (large, sharp losses in 2008-2009 and small cumulative losses in 2015-2020).



**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION III – ASSETS

Development of Special Asset Value (SAV)

Under Chapter 98, P.L. 2017, the Lottery Enterprise Contribution Act, TPAF receives 77.78% of the proceeds of the Lottery Enterprise for a term of 30 years. The value of the Lottery Enterprise is classified as a special asset, and is included in the actuarial value of assets used for the purpose of calculating the target funding ratio under Chapter 78, P.L. 2010. The special asset value is the present value of remaining lottery contributions to the retirement systems.

Table III-6 shows the development of the special asset value as of July 1, 2020. The depreciated value is a roll forward of the Lottery Enterprise value from the appraisal date.

Table III-6 Development of Special Asset Value for July 1, 2020		
1.	Lottery Enterprise Value as of Appraisal Date of June 30, 2017 ¹	\$ 13,535,103,380
2.	Depreciated Value at end of Valuation Year at June 30, 2021 ¹	13,486,010,814
3.	Discounted Value as of July 1, 2020 at 7.30%	12,568,509,612
4.	Allocation to TPAF	77.78%
5.	Special Asset Value as of July 1, 2020	\$ 9,775,786,776

¹ Provided by the Division of Pensions and Benefits

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION III – ASSETS

Actuarial Balance Sheet

Table III-7	
Actuarial Balance Sheet as of June 30, 2020	
Assets	
<u>Retirement Fund Reserve (RFR)</u>	
Credited to Fund with Distribution of Income	\$ 42,672,941,880
Add/(Deduct) reserve transferable from/(to) ECR ¹	223,139,199
Adjusted RFR ²	<u>\$ 42,896,081,079</u> ³
Members' Contributions Reserve (MCR) ²	\$ 8,157,119,528
Accumulative Interest Reserve (AIR) with Distribution of Income ²	\$ 6,904,643,265
<u>Employers' Contributions Reserve (ECR)</u>	
Credited to Fund with Distribution of Income	\$ (31,151,811,933)
Add/(Deduct) reserve transferable from/(to) RFR	(223,139,199)
Adjusted CRF ²	<u>\$ (31,374,951,132)</u>
Benefit Enhancement Fund (BEF) ²	\$ 0
Special Asset Value as of July 1, 2020	\$ 9,775,786,776
Present Value of Prospective Contributions to ECR and BEF	<u>\$ 30,518,639,459</u>
Total Assets	\$ 66,877,318,975
Liabilities	
<u>Payable from RFR</u>	
Retirees, Disableds, and Beneficiaries currently receiving benefits	\$ 42,896,081,079 ³
<u>Payable from Annuity Savings Fund and ECR</u>	
Active and Deferred Vested Members due a future benefit	\$ 23,981,237,896
Total Liabilities	\$ 66,877,318,975

¹ It is recommended that the RFR be put into balance each year by transferring assets from the ECR to the RFR so that the RFR will contain sufficient assets to cover the retiree and beneficiary liability.

² Actuarial Value of Assets equals RFR + MCR + AIR + ECR + BEF.

³ Includes the present value of Local ERI payments of \$2,620,537.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION IV – LIABILITIES

In this section, we present detailed information on liabilities of the Fund, including:

- Disclosure of liabilities at July 1, 2019 and July 1, 2020,
- Active liabilities broken down by Tier, and
- The development of the actuarial gain and loss.

Disclosure

The Actuarial Liability is used for determining employer contributions. For TPAF, the funding method employed is the Projected Unit Credit (PUC) Actuarial Cost Method. Under this funding method, the actuarial liability is calculated as the actuarial present value of the projected benefits allocated to periods prior to the valuation year.

This liability is determined for funding purposes and is not appropriate for measuring the cost of settling plan liabilities by purchasing annuities or paying lump sums.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION IV – LIABILITIES

Table IV-1 shows the actuarial liability, unfunded actuarial liability and funded ratios as of July 1, 2020, and July 1, 2019 for the Fund. The unfunded actuarial liability (UAL) and funded ratio based on the actuarial value of assets plus the special asset value (AVA + SAV) are used to compare against the “target funded ratio” and is different from the UAL used in determining the Statutory contributions which is based on just the actuarial value of assets (AVA).

Table IV-1 Disclosure of Liabilities		
	July 1, 2020	July 1, 2019
Actuarial Liability		
Contributing Actives	\$ 22,991,793,432	\$ 22,129,473,344
Non-Contributing Actives	926,663,233	873,596,654
Deferred Vested	62,781,231	68,143,384
Retirees	40,358,704,480	39,927,659,770
Disabled	1,011,977,791	1,011,052,979
Beneficiaries	1,525,398,808	1,460,921,754
Total Actuarial Liability	<u>\$ 66,877,318,975</u>	<u>\$ 65,470,847,885</u>
Actuarial Value of Assets	<u>\$ 26,582,892,740</u>	<u>\$ 26,375,429,936</u>
Unfunded Actuarial Liability/(Surplus)	\$ 40,294,426,235	\$ 39,095,417,949
Funded Ratio (AVA)	39.7%	40.3%
Actuarial Value of Assets + Special Asset Value	<u>\$ 36,358,679,516</u>	<u>\$ 36,188,020,515</u>
Unfunded Actuarial Liability/(Surplus)	\$ 30,518,639,459	\$ 29,282,827,370
Funded Ratio (AVA + SAV)	54.4%	55.3%

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION IV – LIABILITIES

Tables IV-2 and IV-3 show the number of members, total appropriation salary, actuarial liability, and gross normal cost for contributing and non-contributing active members by Tier as of July 1, 2020.

Table IV-2 Contributing Active Liabilities by Tier				
	Number of Members	Appropriation Payroll¹	Actuarial Liability	Gross Normal Cost
Tier 1	73,482	\$ 6,858,680,764	\$ 20,245,176,248	\$ 883,678,206
Tier 2	10,034	748,778,558	1,050,192,133	81,400,949
Tier 3	5,031	360,902,412	424,018,859	37,530,913
Tier 4	2,933	205,412,186	177,379,731	17,689,346
Tier 5	50,803	3,165,154,618	1,095,026,461	211,070,224
Total	142,283	\$ 11,338,928,538	\$ 22,991,793,432	\$ 1,231,369,638

¹ Tier 1 members limited to the 401(a)(17) pay limit. Other tiers limited to the Social Security Wage Base.

Table IV-3 Non-Contributing Member Liabilities by Tier				
	Number of Members	Last Reported Payroll	Actuarial Liability	Gross Normal Cost
Tier 1	7,464	\$ 457,836,421	\$ 796,678,698	\$ 0
Tier 2	880	53,673,684	39,270,184	0
Tier 3	439	26,314,454	16,057,675	0
Tier 4	246	15,460,291	7,858,032	0
Tier 5	5,090	268,681,721	66,798,644	0
Total	14,119	\$ 821,966,571	\$ 926,663,233	\$ 0

Table IV-4 presents the change in the actuarial liabilities, actuarial assets, and unfunded actuarial liability during the plan year. In general, the unfunded actuarial liability (UAL) of any retirement system is expected to change at each subsequent valuation for a variety of reasons. In each valuation, we report on those elements of change in the UAL which are of particular significance, potentially affecting the long-term financial outlook of the Fund. For this purpose, we focus on the UAL without considering the SAV because this UAL is used to determine the Statutory contribution.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION IV – LIABILITIES

Table IV-4 Development of 2020 Experience (Gain)/Loss			
	Actuarial Liability	Actuarial Value of Assets	Unfunded Actuarial Liability
1. Value as of July 1, 2019	\$ 65,470,847,885	\$ (26,375,429,936)	\$ 39,095,417,949
2. Additions			
Normal Cost	\$ 1,196,564,998	\$ 0	\$ 1,196,564,998
Statutory State Contributions	0	(3,672,624,754)	(3,672,624,754)
Expected Member Contributions	0	(827,645,931)	(827,645,931)
Total Additions	<u>\$ 1,196,564,998</u>	<u>\$ (4,500,270,685)</u>	<u>\$ (3,303,705,687)</u>
3. Decreases			
Benefit Payments	\$ (4,572,635,322)	\$ 4,572,635,322	\$ 0
Expected Administrative Expenses	0	0	0
Total Deductions	<u>\$ (4,572,635,322)</u>	<u>\$ 4,572,635,322</u>	<u>\$ 0</u>
4. Net Transfers from Other Systems			
Employer Contributions	\$ 997,022	\$ (997,022)	\$ 0
Member Contributions	8,420,311	(8,420,311)	0
Total Net Transfers	<u>\$ 9,417,333</u>	<u>\$ (9,417,333)</u>	<u>\$ 0</u>
5. Expected Interest	\$ 4,703,097,226	\$ (1,791,459,481)	\$ 2,911,637,745
6. Expected Value as of July 1, 2020: [1 + 2 + 3 + 4 + 5]	\$ 66,807,292,120	\$ (28,103,942,113)	\$ 38,703,350,007
7. Other Changes			
Appropriation Adjustment	\$ 0	\$ 807,141,356	\$ 807,141,356
Contribution Timing	0	115,952,425	115,952,425
Actual Lottery Revenue	0	43,988,064	43,988,064
Other Employer Contributions	0	4,920,153	4,920,153
Actual Member Contributions	0	(40,804,136)	(40,804,136)
Change in Methods/Assumptions	0	0	0
Change in Benefits/Policy	0	0	0
Total Other Changes	<u>\$ 0</u>	<u>\$ 931,197,862</u>	<u>\$ 931,197,862</u>
8. Expected Value after Changes: [6 + 7]	\$ 66,807,292,120	\$ (27,172,744,251)	\$ 39,634,547,869
9. Actual Value as of July 1, 2020	\$ 66,877,318,975	\$ (26,582,892,740)	\$ 40,294,426,235
10. Actuarial (Gain)/Loss: [9 - 8]	\$ 70,026,855	\$ 589,851,511	\$ 659,878,366

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION IV – LIABILITIES

Table IV-5 shows the components of the Actuarial (gain)/loss.

Table IV-5 Actuarial (Gain)/Loss Analysis		
Components	July 1, 2020	July 1, 2019
Actuarial Value of Assets		
Investment Return	\$ 575,855,892	\$ 374,388,860
Administrative Expenses	13,995,619	14,435,034
Total	<u>\$ 589,851,511</u>	<u>\$ 388,823,894</u>
Actuarial Liability		
Salary Increases	\$ 99,429,970	\$ 58,214,503
New Entrants	46,616,152	40,970,983
Demographic Experience and Census Data Updates		
Contributing Actives	59,470,321	(2,079,804)
Non-Contributing Actives	(33,777,131)	(9,051,607)
Inactives	<u>(91,957,445)</u>	<u>(14,076,303)</u>
Sub-Total	<u>\$ 79,781,867</u>	<u>\$ 73,977,772</u>
Impact of Net Transfers from Other Systems	<u>(9,755,012)</u>	<u>(6,900,753)</u>
Total	<u>\$ 70,026,855</u>	<u>\$ 67,077,019</u>
Actuarial (Gain)/Loss	\$ 659,878,366	\$ 455,900,913

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION V – CONTRIBUTIONS

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine what level (if any) of contributions is needed to properly maintain the funding status of the Plan. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that are both stable and predictable.

Under the current funding policy, the State funding requirement contains two components: the employer normal cost and an amortization of the unfunded actuarial liability (UAL). The UAL for this purpose does not include the special asset value. The funding methodology prescribed by NJ State Statute does not include a cost component for administrative expenses, and therefore administrative expenses are implicitly covered by the investment rate of return assumption. Because the investment rate of return assumption is recommended by the State Treasurer, we provide no opinion on the reasonableness of the assumption.

For TPAF, the funding method employed is the Projected Unit Credit (PUC) Actuarial Cost Method. Under this funding method, the actuarial liability is calculated as the actuarial present value of the projected benefits linearly allocated to periods prior to the valuation year. Refunds are valued as the Accumulated Deductions with interest as of the valuation date as provided by the Division of Pensions and Benefits. The unfunded actuarial liability is the actuarial liability on the valuation date less the actuarial value of assets.

In accordance with Chapter 78, P. L. 2011, beginning with the July 1, 2019 valuation, the unfunded actuarial liability was amortized over a closed 30-year period as a level dollar amount. For the July 1, 2020 valuation, the amortization period has decreased to 29 years.

Under Chapter 98, P.L. 2017, the Lottery Enterprise Contribution Act, TPAF receives 77.78% of the proceeds of the Lottery Enterprise for a term of 30 years. As of the July 1, 2020 valuation, 26 years remain. The State's pension contribution shall be reduced by the product of the allocable percentage for such retirement system, the adjustment percentage for such retirement system and the special asset adjustment.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

SECTION V – CONTRIBUTIONS

Table V-1 shows the development of the Lottery Enterprise contribution offset. According to N.J. Statute, the methodology for determining the percentage varies depending on the applicable fiscal year. The following table shows both calculations to illustrate how the adjustment percentage may change over time.

Table V-1	
Development of Lottery Enterprise Contribution Offset for Fiscal Year Ending 2022	
<u>For Fiscal Years Through 2022</u>	
1. Special Asset Adjustment for FYE 2022	\$ 1,095,871,137
2. Allocable Percentage to TPAF for Fiscal Years through 2022	77.78%
3. Adjustment Percentage	100.00%
4. Lottery Enterprise Contribution Offset as of June 30, 2021 [1 x 2 x 3]	\$ 852,368,570
<u>For Fiscal Years Beginning 2023</u>	
5. Special Asset Value Allocated to TPAF as of July 1, 2020	\$ 9,775,786,776
6. 26-Year Level Dollar Amortization payable June 30, 2021	\$ 849,669,501
7. Initial Special Asset Value Allocated to TPAF as of July 1, 2016	\$ 9,779,398,978
8. Maximum Special Asset Adjustment: 30-Year Level Dollar Amortization at 7.65%	\$ 840,156,036
9. Special Asset Adjustment as of June 30, 2021 [lesser of 6 and 8]	\$ 840,156,036
10. Adjustment Percentage	88.27%
11. Funded Ratio based on Actuarial Value + Special Asset Value	54.37%
12. Applicable Adjustment Percentage [If 11. < 50%, 10. - 3 x (50% - 11.), otherwise 10.]	88.27%

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION V – CONTRIBUTIONS

Table V-2 shows the development of the Statutory pension contributions for the FYE 2022 and 2021 in dollar amounts. Table V-3 shows the components of the Statutory pension contribution as a percent of appropriation payroll.

Table V-2 Development of Statutory Pension Contributions		
Valuation Date Fiscal Year Ending	July 1, 2020 2022	July 1, 2019 2021
1. Unfunded Actuarial Liability Contribution¹		
a. Actuarial Liability	\$ 66,877,318,975	\$ 65,470,847,885
b. Actuarial Value of Assets	26,582,892,740	26,375,429,936
c. Unfunded Actuarial Liability (UAL): [a - b]	<u>\$ 40,294,426,235</u>	<u>\$ 39,095,417,949</u>
d. Amortization Period (years)	29	30
e. Amortization of UAL Payable at Valuation Date (Level Dollar)	\$ 3,149,558,561	\$ 3,025,194,270
f. UAL Contribution Payable Beginning of Fiscal Year [1e with one year of interest]	\$ 3,379,476,336	\$ 3,246,033,452
2. Normal Cost Contribution		
a. Gross Basic Normal Cost	\$ 1,152,297,167	\$ 1,118,124,369
b. Expected Member Contributions	(819,515,867)	(798,996,217)
c. State Basic Normal Cost	<u>\$ 332,781,300</u>	<u>\$ 319,128,152</u>
d. Chapter 133, P.L. 2001	79,072,471	78,440,629
e. State Normal Cost at Valuation Date	<u>\$ 411,853,771</u>	<u>\$ 397,568,781</u>
f. State Normal Cost Payable Beginning of Fiscal Year [2e with one year of interest]	\$ 441,919,096	\$ 426,591,302
3. Total Statutory Pension Contribution as of Beginning of Fiscal Year [1 + 2]	\$ 3,821,395,432	\$ 3,672,624,754
4. Lottery Enterprise Contribution Offset	\$ (852,368,570)	\$ (843,411,195)
5. Net Pension Contribution as of Beginning of Fiscal Year [3 + 4]	\$ 2,969,026,862	\$ 2,829,213,559

¹ Includes UAL contributions due to State ERI programs.

Table V-3 Statutory Pension Contributions as a Percent of Appropriation Payroll		
Valuation Date Fiscal Year Ending	July 1, 2020 2022	July 1, 2019 2021
State Basic Normal Cost Rate	3.15%	3.10%
Chapter 133, P.L. 2001 Rate	0.75%	0.76%
UAL Contribution Rate ¹	<u>29.80%</u>	<u>29.35%</u>
Total Statutory Pension Contribution	33.70%	33.21%

¹ Includes UAL contributions due to State ERI programs.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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SECTION V – CONTRIBUTIONS

Table V-4 shows the breakdown of the Statutory contributions payable by various State departments and certain State colleges.

Table V-4 Fiscal Year Ending 2022 Statutory Contributions Payable by the State and Certain State Colleges								
Group	Appropriation Payroll	Basic Normal Cost Contribution	Ch. 133, P.L. 2009 Normal Cost Contribution	UAL Contribution		Lottery Enterprise Contribution Offset	Net Pension Contribution	
				Basic	State ERI			
Certain State Colleges								
NJ Institute for Technology	\$ 0	\$ 0	\$ 0	\$ 0	\$ 78,987	\$ 0	\$ 78,987	
Rowan University	0	0	0	0	66,624	0	66,624	
New Jersey City University	0	0	0	0	392,779	0	392,779	
Kean University	107,350	3,381	803	31,958	205,445	(8,070)	233,517	
William Patterson University	151,030	4,756	1,130	44,961	75,858	(11,353)	115,352	
Monclair State University	0	0	0	0	162,529	0	162,529	
The College of New Jersey	0	0	0	0	41,774	0	41,774	
Stockton State College	0	0	0	0	0	0	0	
Total Certain State Colleges	\$ 258,380	\$ 8,137	\$ 1,933	\$ 76,919	\$ 1,023,996	\$ (19,423)	\$ 1,091,562	
State								
Department of Higher Education	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	
Department of Education	10,166,347	320,149	76,071	3,026,470	2,910,492	(764,223)	5,568,959	
County Colleges	449,000	14,139	3,360	133,665	0	(33,752)	117,412	
Charter Schools	284,041,255	8,944,747	2,125,369	84,557,649	0	(21,351,915)	74,275,850	
Other	11,044,013,556	347,787,163	82,638,028	3,287,747,145	0	(830,199,257)	2,887,973,079	
Total State	\$ 11,338,670,158	\$ 357,066,198	\$ 84,842,828	\$ 3,375,464,929	\$ 2,910,492	\$ (852,349,147)	\$ 2,967,935,300	
Total System	\$ 11,338,928,538	\$ 357,074,335	\$ 84,844,761	\$ 3,375,541,848	\$ 3,934,488	\$ (852,368,570)	\$ 2,969,026,862	

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX A – MEMBERSHIP INFORMATION

The data for this valuation was provided by the Division of Pensions and Benefits as of July 1, 2020. Cheiron did not audit any of the data. However, we did perform an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standards of Practice No. 23. The following is a list of data charts contained in this section:

- A-1: Contributing Active Member Data by Tier
- A-2: Non-Contributing Active Member by Tier
- A-3: Inactive Member Data by Status
- A-4: Reconciliation of Membership
- A-5 to A-6: Contributing Active Member Data by Age and Service
- A-7 to A-8: Inactive Member Data by Age and Status

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX A – MEMBERSHIP INFORMATION

**Table A-1
Contributing Active Member Data by Tier**

	July 1, 2020	July 1, 2019	% Change		July 1, 2020	July 1, 2019	% Change
<u>Tier 1</u>				<u>Tier 2</u>			
Count	73,482	77,347	-5.0%	Count	10,034	10,179	-1.4%
Average Age	50.4	49.9	0.9%	Average Age	42.8	41.9	2.0%
Average Service	20.7	20.0	3.3%	Average Service	12.5	11.5	8.6%
Average Appropriation Pay	\$ 93,338	\$ 90,473	3.2%	Average Appropriation Pay	\$ 74,624	\$ 71,196	4.8%
Total Appropriation Payroll	\$ 6,858,680,764	\$ 6,997,830,934	-2.0%	Total Appropriation Payroll	\$ 748,778,558	\$ 724,707,014	3.3%
<u>Tier 3</u>				<u>Tier 4</u>			
Count	5,031	5,129	-1.9%	Count	2,933	2,977	-1.5%
Average Age	41.7	40.9	2.0%	Average Age	40.0	39.0	2.5%
Average Service	11.0	10.0	9.8%	Average Service	9.8	8.8	11.0%
Average Appropriation Pay	\$ 71,736	\$ 68,531	4.7%	Average Appropriation Pay	\$ 70,035	\$ 66,933	4.6%
Total Appropriation Payroll	\$ 360,902,412	\$ 351,494,126	2.7%	Total Appropriation Payroll	\$ 205,412,186	\$ 199,260,242	3.1%
<u>Tier 5</u>				<u>Total</u>			
Count	50,803	46,163	10.1%	Count	142,283	141,795	0.3%
Average Age	35.8	35.2	1.7%	Average Age	44.1	44.0	0.3%
Average Service	4.7	4.2	11.7%	Average Service	13.9	13.7	1.2%
Average Appropriation Pay	\$ 62,303	\$ 60,401	3.1%	Average Appropriation Pay	\$ 79,693	\$ 78,011	2.2%
Total Appropriation Payroll	\$ 3,165,154,618	\$ 2,788,310,822	13.5%	Total Appropriation Payroll	\$ 11,338,928,538	\$ 11,061,603,138	2.5%

Reflects all records for multiple members, which are active members employed by more than one TPAF-participating employer at the same time.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX A – MEMBERSHIP INFORMATION

**Table A-2
Non-Contributing Member Data by Tier**

	July 1, 2020	July 1, 2019	% Change		July 1, 2020	July 1, 2019	% Change
<u>Tier 1</u>				<u>Tier 2</u>			
Count	7,464	7,620	-2.0%	Count	880	1,019	-13.6%
Average Age	51.1	50.6	1.0%	Average Age	42.9	41.7	2.9%
Average Service	13.1	12.7	3.1%	Average Service	9.1	7.8	16.1%
Average Last Reported Pay	\$ 66,075	\$ 64,576	2.3%	Average Last Reported Pay	\$ 63,071	\$ 59,191	6.6%
Total Last Reported Pay	\$ 457,836,421	\$ 453,968,436	0.9%	Total Last Reported Pay	\$ 53,673,684	\$ 58,066,268	-7.6%
<u>Tier 3</u>				<u>Tier 4</u>			
Count	439	514	-14.6%	Count	246	288	-14.6%
Average Age	42.5	41.1	3.6%	Average Age	38.8	38.2	1.4%
Average Service	7.8	6.5	18.9%	Average Service	7.3	6.5	12.5%
Average Last Reported Pay	\$ 61,054	\$ 57,567	6.1%	Average Last Reported Pay	\$ 63,103	\$ 61,530	2.6%
Total Last Reported Pay	\$ 26,314,454	\$ 29,128,659	-9.7%	Total Last Reported Pay	\$ 15,460,291	\$ 17,597,514	-12.1%
<u>Tier 5</u>				<u>Total</u>			
Count	5,090	4,830	5.4%	Count	14,119	14,271	-1.1%
Average Age	37.0	36.5	1.5%	Average Age	45.0	44.6	1.0%
Average Service	3.2	2.8	10.6%	Average Service	9.0	8.7	3.7%
Average Last Reported Pay	\$ 59,168	\$ 57,794	2.4%	Average Last Reported Pay	\$ 63,243	\$ 61,662	2.6%
Total Last Reported Pay	\$ 268,681,721	\$ 238,340,815	12.7%	Total Last Reported Pay	\$ 821,966,571	\$ 797,101,692	3.1%

Average pay calculations exclude 1,122 and 1,344 members with no reported pay information as of July 1, 2020 and July 1, 2019, respectively.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX A – MEMBERSHIP INFORMATION

Table A-3 Inactive Member Data by Status			
	July 1, 2020	July 1, 2019	% Change
Retirees			
Count	97,068	95,841	1.3%
Annual Retirement Allowances	\$ 4,171,830,957	\$ 4,095,575,746	1.9%
Average Retirement Allowance	\$ 42,978	\$ 42,733	0.6%
Beneficiaries			
Count	7,129	6,838	4.3%
Annual Retirement Allowances	\$ 194,556,681	\$ 184,321,296	5.6%
Average Retirement Allowance	\$ 27,291	\$ 26,955	1.2%
Ordinary Disability			
Count	3,419	3,436	-0.5%
Annual Retirement Allowances	\$ 99,384,170	\$ 98,871,921	0.5%
Average Retirement Allowance	\$ 29,068	\$ 28,775	1.0%
Accidental Disability			
Count	274	273	0.4%
Annual Retirement Allowances	\$ 12,676,069	\$ 12,491,832	1.5%
Average Retirement Allowance	\$ 46,263	\$ 45,758	1.1%
In-Pay Total			
Count	107,890	106,388	1.4%
Annual Retirement Allowances	\$ 4,478,447,877	\$ 4,391,260,795	2.0%
Average Retirement Allowance	\$ 41,509	\$ 41,276	0.6%
Deferred Vested Members			
Count	407	432	-5.8%
Annual Retirement Allowances	\$ 7,543,452	\$ 8,067,684	-6.5%
Average Retirement Allowance	\$ 18,534	\$ 18,675	-0.8%

QDRO benefits included with member records for valuation purposes.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX A – MEMBERSHIP INFORMATION

Table A-4 Reconciliation of Plan Membership from July 1, 2019 to July 1, 2020							
	Contributing Actives	Non-Contrib. Actives	Deferred Vested	Retired	Disabled	Beneficiaries	Total
1. July 1, 2019	141,795	14,271	432	95,841	3,709	6,838	262,886
2. Additions							
a. New Entrants	6,972	294					7,266
b. New Beneficiaries						115	115
c. Data Corrections				4	1		5
d. Total	<u>6,972</u>	<u>294</u>	<u>0</u>	<u>4</u>	<u>1</u>	<u>115</u>	<u>7,386</u>
3. Reductions							
a. Withdrawal/Certain Period End	(589)	(2,447)	(3)			(2)	(3,041)
b. Died without Beneficiary	(46)	(26)	(1)	(1,970)	(119)	(363)	(2,525)
c. Data Corrections	(2)	(5)					(7)
d. Total	<u>(637)</u>	<u>(2,478)</u>	<u>(4)</u>	<u>(1,970)</u>	<u>(119)</u>	<u>(365)</u>	<u>(5,573)</u>
4. Changes in Status							
a. Contributing Actives	1,788	(1,788)					0
b. Non-Contributing Actives	(4,118)	4,118					0
c. Deferred Vested	(28)	(39)	67				0
d. Retired	(3,398)	(208)	(88)	3,694			0
e. Disabled	(84)	(46)			130		0
f. Died with Beneficiary	(7)	(5)		(501)	(28)	541	0
g. Total	<u>(5,847)</u>	<u>2,032</u>	<u>(21)</u>	<u>3,193</u>	<u>102</u>	<u>541</u>	<u>0</u>
5. July 1, 2020	142,283	14,119	407	97,068	3,693	7,129	264,699

Reflects all records for multiple members, which are active members employed by more than one TPAF-participating employer at the same time. QDRO benefits included with member records for valuation purposes.

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APPENDIX A – MEMBERSHIP INFORMATION

**Table A-5
Counts by Age and Service Distribution of Contributing Active Members**

Attained Age	Years of Service								Total
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & up	
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Under 30	712	11,328	3,279	0	0	0	0	0	15,319
30 to 34	297	4,949	11,083	2,559	10	0	0	0	18,898
35 to 39	179	2,705	4,707	10,341	3,448	10	0	0	21,390
40 to 44	158	1,984	2,388	4,359	11,333	2,515	6	0	22,743
45 to 49	127	1,638	1,969	2,507	5,338	7,717	1,184	3	20,483
50 to 54	87	1,071	1,536	2,062	3,255	4,168	4,088	845	17,112
55 & up	79	983	1,465	2,877	6,028	6,283	3,519	5,104	26,338
Total	1,639	24,658	26,427	24,705	29,412	20,693	8,797	5,952	142,283

**Table A-6
Average Appropriation Pay by Age and Service Distribution of Contributing Active Members**

Attained Age	Years of Service								Total
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & up	
	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.
Under 30	\$ 55,901	\$ 56,778	\$ 60,561	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 57,547
30 to 34	58,220	59,340	63,364	71,124	62,407	0	0	0	63,280
35 to 39	60,622	61,399	66,083	74,209	85,416	103,818	0	0	72,508
40 to 44	65,542	63,648	68,680	77,021	89,553	98,489	93,627	0	83,522
45 to 49	65,242	64,295	69,197	78,023	90,149	99,246	106,537	117,507	88,807
50 to 54	64,974	65,759	68,954	76,803	88,721	98,692	104,423	105,186	90,945
55 & up	66,199	67,128	70,338	77,613	88,155	95,342	101,411	107,930	92,479
Total	\$ 59,468	\$ 59,654	\$ 65,127	\$ 75,386	\$ 88,788	\$ 97,859	\$ 103,495	\$ 107,545	\$ 79,693

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX A – MEMBERSHIP INFORMATION

Table A-7 Counts by Age and Status of Inactive Members					
Attained Age	Status				Total
	Retiree	Beneficiary	Ordinary Disability	Accidental Disability	
Under 45	0	94	89	4	187
45 to 49	16	56	136	3	211
50 to 54	335	93	224	9	661
55 to 59	2,832	147	300	22	3,301
60 to 64	9,257	304	516	40	10,117
65 to 69	21,322	680	734	68	22,804
70 to 74	27,842	1,321	649	59	29,871
75 to 79	17,406	1,466	435	36	19,343
80 to 84	9,008	1,232	210	23	10,473
85 & up	9,050	1,736	126	10	10,922
Total	97,068	7,129	3,419	274	107,890

Table A-8 Average Retirement Allowances by Age and Status of Inactive Members					
Attained Age	Status				Total
	Retiree	Beneficiary	Ordinary Disability	Accidental Disability	
Under 45	\$ 0	\$ 13,363	\$ 27,381	\$ 44,804	\$ 20,707
45 to 49	35,577	21,108	29,893	49,265	28,268
50 to 54	42,211	19,543	31,467	57,756	35,592
55 to 59	50,393	24,157	31,542	51,352	47,518
60 to 64	44,846	25,479	30,564	47,177	43,544
65 to 69	44,937	27,767	30,013	47,763	43,954
70 to 74	44,506	29,012	29,103	44,342	43,485
75 to 79	42,254	29,016	26,775	46,182	40,910
80 to 84	39,904	28,466	25,469	43,684	38,277
85 & up	33,930	25,455	21,319	28,114	32,432
Total	\$ 42,978	\$ 27,291	\$ 29,068	\$ 46,263	\$ 41,509

QDRO benefits included with member records for valuation purposes.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

A. Actuarial Assumptions

- | | |
|---|---|
| 1. Investment Rate of Return | 7.30% per annum, compounded annually. |
| 2. Administrative Expenses | No explicit assumption is made for administrative expenses for funding purposes per the funding methodology prescribed by NJ State Statute. |
| 3. Interest Crediting Rate on Accumulated Deductions | 7.30% per annum, compounded annually. Interest credits are assumed to end upon termination. |
| 4. Cost-of-Living Adjustments (COLAs) | No future COLAs are assumed. Previously granted COLAs are included in the data. |

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- 5. Salary Increases** Salary increases vary by years of service and time period. Annual salary increases are shown below.

Years of Service	Period Ending June 30, 2026	Ultimate Period
0-2	3.05%	4.25%
3	3.20	4.40
4	3.35	4.55
5	3.50	4.70
6	3.65	4.85
7	3.80	5.00
8	3.95	5.15
9	4.10	5.30
10	4.20	5.40
11	4.30	5.50
12-16	4.45	5.65
17	3.70	4.90
18	3.30	4.50
19	3.05	4.25
20	2.85	4.05
21	2.65	3.85
22	2.45	3.65
23	2.25	3.45
24	2.05	3.25
25	1.85	3.05
26	1.75	2.95
27-28	1.65	2.85
29+	1.55	2.75

Salary increases are assumed to occur on October 1.

- 6. 401(a)(17) Pay Limit** \$285,000 in 2020 increasing 2.75% per annum, compounded annually.
- 7. Social Security Wage Base** \$137,700 in 2020 increasing 3.25% per annum, compounded annually.

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8. Termination

Termination rates are as follows:

Service	Rates
0	7.00%
1	7.00
2	6.25
3	5.50
4	4.25
5	3.75
6	3.25
7	3.00
8	2.50
9	2.50
10	2.25
11	2.20
12	1.95
13	1.70
14	1.40
15	1.20
16	1.00
17	0.90
18	0.90
19	0.70
20	0.55
21	0.55
22	0.55
23	0.40
24-29	0.30

No termination is assumed after attainment of retirement eligibility.

67% of members with 10 or more years of service at termination are assumed to elect a deferred retirement benefit.

All other members are assumed to receive a refund of Accumulated Deductions with credited interest.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

9. Disability

Representative disability rates are as follows:

Age	Ordinary	Accidental
25	0.005%	0.006%
30	0.005	0.006
35	0.040	0.006
40	0.090	0.006
45	0.140	0.006
50	0.200	0.006
55	0.350	0.006

Accidental disability rates apply at all ages.

Ordinary disability rates apply upon attainment of 10 years of service until the attainment of unreduced retirement eligibility with at least 25 years of service.

Members are assumed to receive the greater of the applicable disability benefit or the early or service retirement benefit, depending on eligibility.

Tier 4 and Tier 5 members are not eligible for the Ordinary or Accidental Disability benefits but the disability rates still apply. Such members terminating under the disability decrement are assumed to separate from service and elect a deferred retirement benefit.

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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

10. Mortality

Pre-Retirement Mortality: The Pub-2010 Teachers Above-Median Income Employee mortality table [*PubT-2010(A) Employee*] as published by the Society of Actuaries with a 93.9% adjustment for males and 85.3% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018. All pre-retirement deaths are assumed to be ordinary deaths.

Healthy Retirees and Beneficiaries (Healthy Annuitants): The Pub-2010 Teachers Above-Median Income Healthy Retiree mortality table [*PubT-2010(A) Healthy Retiree*] as published by the Society of Actuaries with a 114.7% adjustment for males and 99.6% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Disabled Retirees (Disabled Annuitants): The Pub-2010 Non-Safety Disabled Retiree mortality table [*PubNS-2010 Disabled Retiree*] as published by the Society of Actuaries with a 106.3% adjustment for males and 100.3% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

11. Retirement

Retirement rates for Tier 1-4 members are as follows:

Age	Less Than 25 Years of Service	25 Years of Service	26 or More Years of Service
< 50	N/A	1.5%	1.5%
50	N/A	1.5	1.5
51	N/A	2.0	2.0
52	N/A	3.0	2.5
53	N/A	4.0	3.0
54	N/A	6.0	3.5
55	N/A	10.0	13.0
56	N/A	18.0	17.0
57	N/A	18.0	17.0
58	N/A	20.0	17.0
59	N/A	25.0	17.0
60	4.0	25.0	20.0
61	6.0	25.0	22.0
62	6.0	33.0	27.0
63	8.0	42.0	30.0
64	8.0	42.0	30.0
65	12.0	42.0	30.0
66	18.0	55.0	35.0
67	18.0	55.0	40.0
68	18.0	55.0	30.0
69	18.0	55.0	30.0
70	18.0	55.0	30.0
71	18.0	55.0	30.0
72	18.0	55.0	30.0
73	18.0	55.0	30.0
74	18.0	55.0	30.0
75	100.0	100.0	100.0

Rates apply upon retirement eligibility by tier.

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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

Retirement rates for Tier 5 members are as follows:

Age	Less Than 25 Years of Service	25 Years of Service	26 to 29 Years of Service	30 Years of Service	31 or More Years of Service
< 50	N/A	N/A	N/A	1.5%	1.5%
50	N/A	N/A	N/A	1.5	1.5
51	N/A	N/A	N/A	2.0	2.0
52	N/A	N/A	N/A	3.0	2.5
53	N/A	N/A	N/A	4.0	3.0
54	N/A	N/A	N/A	6.0	3.5
55	N/A	N/A	N/A	10.0	13.0
56	N/A	N/A	N/A	18.0	17.0
57	N/A	N/A	N/A	18.0	17.0
58	N/A	N/A	N/A	20.0	17.0
59	N/A	N/A	N/A	25.0	17.0
60	N/A	N/A	N/A	25.0	20.0
61	N/A	N/A	N/A	25.0	22.0
62	N/A	N/A	N/A	33.0	27.0
63	N/A	N/A	N/A	42.0	30.0
64	N/A	N/A	N/A	42.0	30.0
65	12.0	42.0	42.0	42.0	30.0
66	18.0	55.0	35.0	35.0	35.0
67	18.0	55.0	40.0	40.0	40.0
68	18.0	55.0	30.0	30.0	30.0
69	18.0	55.0	30.0	30.0	30.0
70	18.0	55.0	30.0	30.0	30.0
71	18.0	55.0	30.0	30.0	30.0
72	18.0	55.0	30.0	30.0	30.0
73	18.0	55.0	30.0	30.0	30.0
74	18.0	55.0	30.0	30.0	30.0
75	100.0	100.0	100.0	100.0	100.0

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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

- 12. Family Composition Assumptions** For members not currently in receipt, 100% of members are assumed married to spouses of the opposite sex. Males are assumed to be three years older than females.
- For purposes of the optional form of payment death benefit for members currently in receipt, beneficiary status is based on the beneficiary allowance reported. If no beneficiary date of birth is provided, the beneficiary is assumed to be the member's spouse of the opposite sex with males assumed to be three years older than females.
- No additional dependent children or parents are assumed.
- 13. Form of Payment** Current actives are assumed to elect the Maximum Option.
- 14. Data** Information provided by the prior actuary was relied upon for the purposes of setting the status of and valuing non-contributing records. For non-contributing terminated members, a deferred retirement benefit is estimated, when applicable, based on the last known salary. For non-contributing members with incomplete information, the benefit is based on the Annuity Savings Fund.
- For current beneficiaries with incomplete information, reasonable assumptions were made based on information available in prior years.
- Inactive participants receiving benefits according to the 2019 data but omitted from the 2020 data are assumed to have died without a beneficiary.
- Tier 4 and 5 members on long-term disability appeared on the active data for the first time in 2019. The number of members on long-term disability is immaterial for valuation purposes. Therefore, we valued these members as regular contributing and non-contributing members while we gain clarity on what happens with these members.
- 15. Rationale for Assumptions** The demographic and economic assumptions used in this report, except for the investment return assumption, reflect the results of the July 1, 2015 – June 30, 2018 Experience Study, which was approved by the Board of Trustees on February 6, 2020. The investment return assumption was recommended by the State Treasurer.
- 16. Changes in Assumptions since Last Valuation** None.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

B. Projection Assumptions

- 1. Investment Rate of Return** July 1, 2021 and later valuations: 7.00% per annum, compounded annually.
- 2. Appropriation Percentages** The State is assumed to appropriate 100% of the Statutory contribution in FYE 2022 and each year thereafter.
- 3. Administrative Expenses** The actual administrative expenses paid in FYE 2020 are assumed to increase by 2.75% per annum, compounded annually.
- 4. New Entrants**
 - Contributing active population assumed to remain at 2020 levels.
 - Assumed to join mid-year.
 - Age/sex distributions based on the last three years of new hires.
 - Salary based on salary for most recent hires reported on 2020 data.
 - New entrant salary assumed to increase with the 29+ years of service salary increase rates.
- 5. Demographic Assumptions** Same as those used for valuation purposes.
- 6. Projection Basis** This report includes projections of future assets, liabilities, funded status and contributions for the purpose of assisting the Board of Trustees with the management of the System.

The projections are based on the same census data and financial information as of July 1, 2020 which has been used for the actuarial valuation. The projections assume continuation of the plan provisions and actuarial assumptions in effect as of July 1, 2020 and do not reflect the impact of any changes in benefits or actuarial assumptions that may be adopted after July 1, 2020 unless otherwise indicated. While the assumptions individually are reasonable for the underlying valuation that supports the projections, specifically for projection purposes, they are also considered reasonable in the aggregate.

The projections assume that all future assumptions are met except where indicated with respect to future investment returns and demographic assumptions. The future outcomes become increasingly uncertain over time, and therefore the general trends and not the absolute values should be considered in the review of these projections.

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

C. Actuarial Methods

The actuarial methods used for determining State contributions are described below.

1. Actuarial Cost Method

The actuarial cost method for funding calculations is the Projected Unit Credit Cost Method. Non-contributory active members only use the Unit Credit Cost Method.

The actuarial liability is calculated as the actuarial present value of the projected benefits linearly allocated to periods prior to the valuation year based on service. Refunds are valued as the Accumulated Deductions with interest as of the valuation date as provided by the Division of Pensions and Benefits. The unfunded actuarial liability is the actuarial liability on the valuation date less the actuarial value of assets.

In accordance with Chapter 78, P.L. 2011:

- Beginning with the July 1, 2010 actuarial valuation, the accrued liability contribution shall be computed so that if the contribution is paid annually in level dollars, it will amortize the unfunded accrued liability over an open 30 year period.
- Beginning with the July 1, 2019 actuarial valuation, the accrued liability contribution shall be computed so that if the contribution is paid annually in level dollars, it will amortize the unfunded accrued liability over a closed 30 year period (i.e., for each subsequent actuarial valuation the amortization period shall decrease by one year).
- Beginning with the July 1, 2029 actuarial valuation, when the remaining amortization period reaches 20 years, any increase or decrease in the unfunded accrued liability as a result of actuarial losses or gains for subsequent valuation years shall serve to increase or decrease, respectively, the amortization period for the unfunded accrued liability, unless an increase in the amortization period will cause it to exceed 20 years. If an increase in the amortization period as a result of actuarial losses for a valuation year would exceed 20 years, the accrued liability contribution shall be computed for the valuation year using a 20 year amortization period.

To the extent that the amortization period remains an open period in future years and depending upon the specific circumstances, it should be noted that in the absence of emerging actuarial gains or contributions made in excess of the actuarially determined contribution, any existing unfunded accrued liability may not be fully amortized in the future.

The non-contributory group life insurance benefit is funded separately through a term cost.

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

2. Asset Valuation Method

For the purposes of determining contribution rates, an actuarial value of assets is used that dampens the volatility in the market value of assets, resulting in a smoother pattern of contributions.

The actuarial value of assets is adjusted to reflect actual contributions, benefit payments and administrative expenses, and an assumed rate of return on the previous year's assets and current year's cash flow at the prior year's actuarial valuation interest rate, with a further adjustment to reflect 20% of the difference between the resulting value and the actual market value of Fund assets.

3. Contributions

Chapter 83, P.L. 2016 requires the State to make the required pension contributions on a quarterly basis in each fiscal year according to the following schedule: at least 25% by September 30, at least 50% by December 31, at least 75% by March 31, and at least 100% by June 30. As such, contributions are assumed to be made on a quarterly basis with the first contribution 15 months after the associated valuation date.

Chapter 98, P.L. 2017, the Lottery Enterprise Contribution Act, allows the TPAF to receive 77.78% of the proceeds of the Lottery Enterprise, based upon their members' past or present employment in schools and institutions in the State for a term of 30 years. Revenues from Chapter 98, P.L. 2017, the Lottery Enterprise Contribution Act, are assumed to be contributed to the trust on a monthly basis. The State's pension contribution is reduced by the product of the allocable percentage for the TPAF, the adjustment percentage, and the special asset value.

Contributions payable in the fiscal year starting on the valuation date are included in the actuarial value of assets as receivable contributions, discounted by the applicable valuation interest rate.

Legislation has provided for additional benefits and/or funding requirements which are included in this valuation and are described as follows.

Early Retirement Incentive Programs

State and Local employers which elected to participate in various early retirement incentive programs authorized by NJ Statute make contributions to cover the cost of these programs over amortization periods elected by the employer to the extent permitted by NJ Statute.

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APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

Chapter 133, P.L. 2001

Chapter 133, P.L. 2001 increased the accrual rate from 1/60 to 1/55. In addition, it lowered the age required for a veteran benefit equal to 1/55 of highest 12-month Compensation for each Year of Service from 60 to 55.

Chapter 133, P.L. 2001 established the Benefit Enhancement Fund (BEF) to fund the additional annual employer normal contribution due to the Statute's increased benefits. (Chapter 353, P.L. 2001 extended this coverage to this Statute's additional annual employer normal contribution). If the assets in the BEF are insufficient to cover the normal contribution for the increased benefits for a valuation period, the State will pay such amount. As of July 1, 2020, there are no assets in the BEF.

4. Valuation Software

Cheiron utilizes ProVal, an actuarial valuation software leased from Winklevoss Technologies (WinTech) to calculate liabilities and project benefit payments. We have relied on WinTech as the developer of ProVal. We have reviewed ProVal and have a basic understanding of it and have used ProVal in accordance with its original intended purpose. We have not identified any material inconsistencies in assumptions or output of ProVal that would affect this actuarial valuation.

5. Changes in Methods since Last Valuation

None.

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APPENDIX C – SUMMARY OF PLAN PROVISIONS

This summary of Plan provisions provides an overview of the major provisions of the TPAF used in the actuarial valuation. It is not intended to replace the more precise language of the NJ State Statutes, Title 18A, Chapter 66, and if there is any difference between the description of the plan herein and the actual language in the NJ State Statutes, the NJ State Statutes will govern. This valuation is prepared based on plan provisions in effect as of July 1, 2020 and does not reflect the impact of any changes in benefits that may have been approved after the valuation date.

1. Eligibility for Membership

Employees appointed to positions requiring certification by the New Jersey Department of Education as members of a regular teaching or professional staff of a public school system in New Jersey are required to enroll as a condition of employment. Employees of the Department of Education holding unclassified, professional and certificated titles are eligible for membership. Temporary or substitute employees are not eligible. The eligible employee must be scheduled to work at least 32 hours per week effective May 22, 2010, per Chapter 1, P.L. 2010.

- a) Class B (or Tier 1) Member: Any member hired prior to July 1, 2007.
- b) Class D (or Tier 2) Member: Any member hired on or after July 1, 2007 and before November 2, 2008.
- c) Class E (or Tier 3) Member: Any member hired after November 1, 2008 and before May 22, 2010.
- d) Class F (or Tier 4) Member: Any member hired after May 21, 2010 and before June 28, 2011.
- e) Class G (or Tier 5) Member: Any member hired on or after June 28, 2011.

2. Plan Year

The 12-month period beginning on July 1 and ending on June 30.

3. Years of Service

A year of service for each year an employee is a Member of the Retirement System plus service, if any, covered by a prior service liability. Tier 4 members must be scheduled to work at least 32 hours per week, Tier 3 members must have an annual salary of \$7,500 (indexed for inflation) and other members must have an annual salary of \$500.

4. Compensation

Base salary upon which contributions by a Member to the Annuity Savings Fund were based. Chapter 113, P.L. 1997 provides that Compensation cannot exceed the compensation limitation of Section 401(a)(17) of the Internal Revenue Code. Chapter 103, P.L. 2007 provides that for a Tier 2, 3, 4 or 5 Member, Compensation cannot exceed the annual maximum wage contribution base for Social Security, pursuant to the Federal Insurance Contribution Act.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX C – SUMMARY OF PLAN PROVISIONS

5. Final Compensation

The average annual compensation upon which contributions by a Member are made for the three consecutive years of service immediately preceding retirement, or the highest three fiscal years of service, if greater. Chapter 1, P. L. 2010 provides that for a Tier 4 or Tier 5 Member, Final Compensation is the average annual compensation upon which contributions by a Member are made for the five consecutive years of service immediately preceding retirement, or the highest five fiscal years of service, if greater.

6. Final Year Compensation

The compensation upon which contributions by a Member to the Annuity Savings Fund are based in the last year of service.

7. Accumulated Deductions

The sum of all amounts deducted from the compensation of a Member or contributed by the Member or on the Member's behalf without interest.

8. Interest Credits on Accumulated Deductions

Members receive interest credits while contributing and for the first two years of inactivity. The rate depends on the type of benefit. Prior to July 1, 2018, members received interest credits for the entire period of inactivity until retirement or death.

9. Member Contributions

Each Member contributes a percentage of Compensation. Effective October 1, 2011, Chapter 78, P.L. 2011 set the member contribution rate at 6.5% and increased it by 1/7 of 1% each July thereafter until it attained an ultimate rate of 7.5% on July 1, 2018.

10. Benefits

- a) **Service Retirement:** For a Tier 1 or Tier 2 Member, age 60. For a Tier 3 or Tier 4 Member, age 62. For a Tier 5 Member, age 65.

Benefit is an annual retirement allowance comprised of a member annuity plus an employer pension which together will provide a total allowance of:

- (1) For a Tier 1, 2 or 3 Member, 1/55 of Final Compensation for each Year of Service.
- (2) For a Tier 4 or 5 Member, 1/60 of Final Compensation for each Year of Service.

- b) **Early Retirement:** Prior to eligibility for Service Retirement. For a Tier 1, 2, 3 or 4 Member, 25 Years of Service. For a Tier 5 Member, 30 Years of Service.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX C – SUMMARY OF PLAN PROVISIONS

Benefit is an annual retirement allowance comprised of a member annuity plus an employer pension which together will provide a total allowance of:

- (1) For a Tier 1 Member, the Service Retirement benefit reduced by 1/4 of one percent for each month the retirement date precedes age 55.
- (2) For a Tier 2 Member, the Service Retirement benefit reduced by 1/12 of one percent for each month the retirement date precedes age 60 through age 55 and by 1/4 of one percent for each month the retirement date precedes age 55.
- (3) For a Tier 3 or 4 Member, the Service Retirement benefit reduced by 1/12 of one percent for each month the retirement date precedes age 62 through age 55 and by 1/4 of one percent for each month the retirement date precedes age 55.
- (4) For a Tier 5 Member, the Service Retirement benefit reduced by 1/4 of one percent for each month the retirement date precedes age 65.

- c) **Veteran Retirement:** Age 55 with 25 Years of Service or Age 60 with 20 Years of Service for a qualified military veteran who retires directly from active service.

Benefit is an annual retirement allowance comprised of a member annuity plus an employer pension which together will provide a total allowance of the greater of:

- (1) 54.5% of highest 12-month Compensation, or
- (2) For a member who is at least age 55 with 35 Years of Service, 1/55 of highest 12-month Compensation for each Year of Service.

Veterans may receive a Service Retirement benefit if greater.

- d) **Deferred Retirement:** Termination of service prior to eligibility for Service Retirement with 10 Years of Service.

Benefit is either:

- (1) A refund of Accumulated Deductions plus, if the member has completed three years of service, interest accumulated at 2.0% per annum; or
- (2) A deferred life annuity, commencing at age 60 for a Tier 1 or Tier 2 Member, age 62 for a Tier 3 or Tier 4 Member or age 65 for a Tier 5 Member, comprised of a member annuity plus an employer pension which together will provide a total allowance of the Service Retirement benefit based on Final Compensation and Years of Service at date of termination.

For Members who die during the deferral period, the benefit is a return of Accumulated Deductions with credited interest.

TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX C – SUMMARY OF PLAN PROVISIONS

- e) **Non-Vested Termination:** Termination of service prior to eligibility for Service Retirement and less than 10 Years of Service.

Benefit is a refund of Accumulated Deductions plus, if the member has completed three Years of Service, interest accumulated at 2.0% per annum.

- f) **Death Benefits**

- (1) **Ordinary Death Before Retirement:** Death of an active contributing Member. Benefit is equal to:

- a. Lump sum payment equal to 150% of Final Year Compensation, also known as the non-contributory group life insurance benefit, plus
- b. Accumulated Deductions with credited interest.

- (2) **Accidental Death Before Retirement:** Death of an active Member resulting from injuries received from an accident during performance of duty and not a result of willful negligence. Benefit is equal to:

- a. Lump sum payment equal to 150% of Final Year Compensation, also known as the non-contributory group life insurance benefit, plus
- b. Spouse life annuity of 50% of Final Year Compensation payable until spouse's death or remarriage. If there is no surviving spouse or upon death or remarriage, a total of 20% (35%, 50%) of Final Year Compensation payable to one (two, three or more) dependent child(ren). If there is no surviving spouse or dependent child(ren), 25% (40%) of Final Year Compensation to one (two) dependent parent(s). If there is no surviving spouse, dependent child(ren) or parent(s), the benefit is a refund of Accumulated Deductions with credited interest.

- (3) **Death After Retirement:** Death of a retired Member. Benefit is equal to:

- a. Lump sum payment equal to 3/16 of Final Year Compensation for a Member retired under service, early, veteran or deferred retirement with 10 Years of Service. For a Member receiving a disability benefit, lump sum payment of 150% of Final Year Compensation if death occurs prior to age 60 and 3/16 of Final Compensation if death occurs after age 60. This benefit is also known as the non-contributory group life insurance benefit, plus
- b. Any survivor benefit due under the Member's optional form of payment election. Previously granted COLAs also apply to life annuities.

Members are also eligible for a voluntary, employee-paid life insurance policy, known as the contributory group life insurance policy. This benefit is not paid through the Fund and is not considered for valuation purposes.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX C – SUMMARY OF PLAN PROVISIONS

g) Disability Retirement

- (1) Ordinary Disability Retirement: 10 years of service and totally and permanently incapacitated from the performance of normal or assigned duties. Only available to Tier 1, 2 and 3 Members.

Benefit is an annual retirement allowance comprised of a member annuity plus an employer pension which together will provide a total allowance of:

- a. 1.64% of Final Compensation for each Year of Service; or
- b. 43.6% of Final Compensation.

- (2) Accidental Disability Retirement: Total and permanent incapacitation as a direct result of a traumatic event occurring during and as a result of the performance of regular or assigned duties. Only available to Tier 1, 2 and 3 Members.

Benefit is an annual retirement allowance comprised of a member annuity plus an employer pension which together will provide a total allowance of 72.7% of the Compensation at the date of injury.

The pension portion of the benefit will be offset for any periodic Workers' Compensation benefits.

Tier 4 and Tier 5 Members are eligible for long-term disability coverage. This benefit is not paid through the Fund and is not considered for valuation purposes. Both Member and employer contributions to the Fund continue while on long-term disability, with the policy covering the Member portion. The long-term disability benefit equals 60% of Final Year Compensation and may be offset for other periodic benefits, such as Workers' Compensation, short-term disability or Social Security. The long-term disability benefit may continue through the earlier of age 70 or commencement of a retirement benefit under the Fund.

11. Optional Forms of Payment

The member may elect the following forms of payment.

- a) Maximum Option: Single life annuity with a return of the balance of the Accumulated Deductions with credited interest.
- b) Option 1: Single life annuity with a return of the balance of the initial reserve.
- c) Option 2: 100% joint and survivor annuity.
- d) Option 3: 50% joint and survivor annuity.
- e) Option 4: Other percentage joint and survivor annuity.
- f) Option A: 100% pop-up joint and survivor annuity.
- g) Option B: 75% pop-up joint and survivor annuity.
- h) Option C: 50% pop-up joint and survivor annuity.
- i) Option D: 25% pop-up joint and survivor annuity.

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APPENDIX C – SUMMARY OF PLAN PROVISIONS

12. Cost-of-Living Adjustments

Also known as Pension Adjustments. Provided annually to retirees and survivors after 24 months of retirement prior to July 1, 2011. Chapter 78, P.L. 2011 eliminated future adjustments effective July 1, 2011. Adjustments may be reinstated in the future subject to certain conditions outlined in Chapter 78, P.L. 2011.

13. Changes in Plan Provisions since Last Valuation

None.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX D – HISTORICAL DATA AND REQUIRED EXHIBITS

**Table D-1
Historical Summary of Assets and Liabilities**

Valuation Date July 1,	Market Value of Assets	Actuarial + Special Asset Value ¹	Actuarial Liability	Funded Ratio	
				Market Value	Actuarial + Special Asset Value ¹
2020	\$ 24,279,469,173	\$ 36,358,679,516	\$ 66,877,318,975	36.30%	54.37%
2019	24,877,874,495	36,188,020,515	65,470,847,885	38.00%	55.27%
2018	24,838,481,325	36,127,247,378	60,971,919,315	40.74%	59.25%
2017	24,495,303,183	36,367,511,298	59,954,548,700	40.86%	60.66%
2016	23,732,571,086	36,949,157,326	57,865,971,163	41.01%	63.85%
2015	26,320,738,690	28,301,404,184	55,359,377,071	47.55%	51.12%
2014	27,643,078,116	29,044,777,902	53,749,976,641	51.43%	54.04%
2013	26,859,612,370	30,469,857,304	52,366,655,055	51.29%	58.19%
2012	26,037,983,392	31,079,212,983	51,194,110,587	50.86%	60.71%
2011	27,654,006,602	32,156,229,300	50,222,688,750	55.06%	64.03%

¹ Includes Special Asset Value beginning with July 1, 2016 valuation

**Table D-2
Historical Summary of State Appropriation for Pension ¹**

Fiscal Year Ending June 30,	Gross Statutory Contribution	Actual State Appropriation	Actual Lottery Revenue	Contribution Deficiency (Excess)	Percentage of Contribution Covered
2021 ²	\$ 3,672,624,754	\$ 2,021,236,113	\$ 845,005,487	\$ 806,383,154	78.04%
2020	3,244,013,909	1,439,027,000	789,467,000	1,015,519,909	68.70%
2019	3,208,116,552	1,114,920,000	859,469,000	1,233,727,552	61.54%
2018	2,999,577,684	721,230,000	759,134,509	1,519,213,175	49.35%
2017	2,737,175,151	1,087,919,000	0	1,649,256,151	39.75%
2016	2,544,811,534	764,489,000	0	1,780,322,534	30.04%
2015	2,306,611,715	504,320,000	0	1,802,291,715	21.86%
2014	2,158,287,358	392,035,985	0	1,766,251,373	18.16%
2013	2,148,185,001	613,766,799	0	1,534,418,202	28.57%
2012	2,009,810,329	287,115,915	0	1,722,694,414	14.29%

¹Excludes contributions for NCGI

²Reflects the State's planned contribution of 78% of the Statutory contribution and expected lottery revenue

The information above is based on the final actuarial valuation reports for the given years. The amounts do not reflect differences between the discounted State appropriations receivable and the actual State contribution amounts that became known after the issuance of the reports.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX D – HISTORICAL DATA AND REQUIRED EXHIBITS

In accordance with the Government Finance Officers Association (GFOA) and their recommended checklist for Comprehensive Annual Financial Reports, we have prepared the following schedules for the Fund. The GFOA checklist uses the term Actuarial Accrued Liability, which is the same as the Actuarial Liability used elsewhere in this report.

**Table D-3
Schedule Retirees and Beneficiaries Added to and Removed From Rolls**

Valuation Date July 1,	Added to Rolls		Removed from Rolls		Rolls at End of Year		Average Annual Allowance ¹	% Increase in Average Annual Allowance ¹
	Number	Annual Allowance	Number ¹	Annual Allowance	Number ¹	Annual Allowance		
2020	4,485	\$ 190,920,500	2,983	\$ 104,839,770	107,890	\$ 4,478,447,877	\$ 41,509	0.57%
2019	4,500	190,652,924	2,815	95,949,554	106,388	4,391,260,795	41,276	0.61%
2018	4,634	192,293,599	2,511	82,862,457	104,703	4,295,446,681	41,025	1.50%
2017	4,792	N/A	2,510	N/A	103,528	4,184,662,175	40,421	0.61%
2016	5,460	N/A	2,444	N/A	101,246	4,067,574,984	40,175	0.75%
2015	5,789	N/A	2,381	N/A	98,230	3,916,956,144	39,875	0.81%
2014	5,284	N/A	2,191	N/A	94,822	3,750,680,254	39,555	1.04%
2013	4,614	N/A	2,193	N/A	91,729	3,591,007,462	39,148	0.96%
2012	5,496	N/A	2,100	N/A	89,308	3,462,975,740	38,776	1.40%
2011	7,744	N/A	2,069	N/A	85,912	3,285,419,699	38,242	3.75%

¹ Beginning with the 2018 valuation, QDRO records excluded from headcounts and QDRO benefits included with member records. This change resulted in 948 fewer records on the rolls as of July 1, 2018.

**Table D-4
Schedule of Active Member Valuation Data**

Valuation Date July 1,	Number of Contributing Active Members ¹	Annual Compensation ¹	Annual Average Compensation ¹	% Increase in Average Annual Compensation ¹	Number of Participating Employers ²
2020	142,283	\$ 11,338,928,538	\$ 79,693	2.16%	680
2019	141,795	11,061,603,138	78,011	1.72%	677
2018	141,128	10,823,504,797	76,693	1.84%	678
2017	143,092	10,775,872,458	75,307	1.59%	N/A
2016	142,845	10,588,493,706	74,126	1.02%	N/A
2015	142,454	10,453,176,648	73,379	0.82%	N/A
2014	141,874	10,325,972,743	72,783	2.83%	N/A
2013	151,318	10,710,424,746	70,781	1.36%	N/A
2012	150,200	10,488,890,840	69,833	1.31%	N/A
2011	151,115	10,416,454,800	68,931	1.54%	N/A

¹ Prior to July 1, 2018, includes non-contributing active members reported on active data with compensation.

Prior to July 1, 2014, includes all non-contributing active members.

² Number of locations reporting contributing active members. For GASB reporting purposes, the State may be considered the participating employer for multiple locations.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX D – HISTORICAL DATA AND REQUIRED EXHIBITS

**Table D-5
Schedule of Funding Progress**

Valuation Date July 1,	Actuarial Value of Assets ¹ (a)	Actuarial Accrued Liability (b)	(Surplus)/Unfunded		Covered Payroll (d)	(Surplus)/Unfunded
			Actuarial Accrued Liability (c) = (b) - (a)	Funded Ratio (a) / (b)		Actuarial Accrued Liability as % of Covered Payroll (c) / (d)
2020	\$ 26,582,892,740	\$ 66,877,318,975	\$ 40,294,426,235	39.75%	\$ 11,338,928,538	355.36%
2019	26,375,429,936	65,470,847,885	39,095,417,949	40.29%	11,061,603,138	353.43%
2018	26,308,754,955	60,971,919,315	34,663,164,360	43.15%	10,823,504,797	320.26%
2017	26,549,410,215	59,954,548,700	33,405,138,485	44.28%	10,775,872,458	310.00%
2016	27,169,758,348	57,865,971,163	30,696,212,815	46.95%	10,588,493,706	289.90%
2015	28,301,404,184	55,359,377,071	27,057,972,887	51.12%	10,453,176,648	258.85%
2014	29,044,777,902	53,749,976,641	24,705,198,739	54.04%	10,325,972,743	239.25%
2013	30,469,857,304	52,366,655,055	21,896,797,751	58.19%	10,710,424,746	204.44%
2012	31,079,212,983	51,194,110,587	20,114,897,604	60.71%	10,488,890,840	191.77%
2011	32,156,229,300	50,222,688,750	18,066,459,450	64.03%	10,416,454,800	173.44%

¹ Includes receivable amounts. Excludes Special Asset Value.

**Table D-6
Schedule of Funded Liabilities by Type (Solvency Test)**

Valuation Date July 1,	Actuarial Accrued Liability for			Actuarial Value of Assets ¹	Portion of Actuarial Accrued Liabilities Covered by Actuarial Value of Assets		
	Contributing & Non-Contributing Active Member Contributions (1)	Retirees, Beneficiaries & Deferred Vested (2)	Contributing & Non-Contributing Active Member Benefits Financed by Employer (3)		(1)	(2)	(3)
2020	\$ 14,960,290,939	\$ 42,958,862,310	\$ 8,958,165,726	\$ 26,582,892,740	100.00%	27.06%	0.00%
2019	14,079,166,893	42,467,777,887	8,923,903,105	26,375,429,936	100.00%	28.95%	0.00%
2018	13,283,767,530	40,171,903,581	7,516,248,204	26,308,754,955	100.00%	32.42%	0.00%
2017	12,466,587,057	39,224,970,512	8,262,991,131	26,549,410,215	100.00%	35.90%	0.00%
2016	11,709,150,079	38,027,977,392	8,128,843,692	27,169,758,348	100.00%	40.66%	0.00%
2015	11,129,745,608	36,128,130,029	8,101,501,434	28,301,404,184	100.00%	47.53%	0.00%
2014	10,624,778,098	34,587,834,921	8,537,363,622	29,044,777,902	100.00%	53.26%	0.00%
2013	10,079,938,128	33,312,970,535	8,973,746,392	30,469,857,304	100.00%	61.21%	0.00%
2012	9,432,073,781	32,411,855,950	9,350,180,856	31,079,212,983	100.00%	66.79%	0.00%
2011	8,987,300,905	30,765,265,431	10,470,122,414	32,156,229,300	100.00%	75.31%	0.00%

¹ Includes receivable amounts. Excludes Special Asset Value.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
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APPENDIX D – HISTORICAL DATA AND REQUIRED EXHIBITS

Table D-7 Analysis of Financial Experience Change in Unfunded Actuarial Accrued Liability						
Valuation Date July 1,	Actuarial Value Of Assets Investment (Gain)/Loss	Actuarial Liability (Gain)/Loss	Assumption & Method Changes	Plan/Policy Changes	Contributions ¹	Change in Unfunded Actuarial Accrued Liability
2020	\$ 575,855,892	\$ 70,026,855	\$ 0	\$ 0	\$ 553,125,539	\$ 1,199,008,286
2019	374,388,860	67,077,019	3,353,517,001	(15,561,490)	652,832,199	4,432,253,589
2018	367,568,407	140,440,865	(286,796,037)	0	1,036,812,640	1,258,025,875
2017	513,526,758	126,550,240	822,620,195	0	1,246,228,477	2,708,925,670
2016	859,296,816	173,672,067	1,144,195,634	0	1,461,075,411	3,638,239,928
2015	495,166,374	398,659,572	0	0	1,458,948,202	2,352,774,148
2014	350,424,947	114,878,752	0	0	2,343,097,289	2,808,400,988
2013	902,561,234	22,121,971	(404,297,149)	0	1,050,981,941	1,571,367,997
2012	1,260,307,398	72,510,427	(337,666,242)	0	1,263,818,721	2,258,970,304
2011	1,125,555,674	(212,466,070)	281,118,410	0	1,590,794,721	2,785,002,735

¹ Change due to contributions (greater)/less than normal cost plus interest on the Unfunded Actuarial Accrued Liability.

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APPENDIX E – EARLY RETIREMENT INCENTIVE CONTRIBUTION SCHEDULE

Table E-1 ERI Contribution Schedule - Local Employers				
Group	Location Number	Location Name	ERI 2 Information	
			Fiscal Year 2022 Payment	Present Value as of 7/1/2020
3	981	NJ Institute of Techonology	\$ 38,127	\$ 322,265
6	911	Allamuchy Board of Education	9,901	73,414
6	956	Hudson County Vocational Schools	66,509	493,155
6	8070	West New York Township Board of Education	233,545	1,731,703
Total			\$ 348,082	\$ 2,620,537

Consistent with established methodology, payment amounts are calculated using a payment date 21 months after the valuation date. Present values as of July 1, 2020 exclude expected payments for fiscal year ending 2021.

**TEACHERS' PENSION AND ANNUITY FUND OF NEW JERSEY
JULY 1, 2020 ACTUARIAL VALUATION**

APPENDIX E – EARLY RETIREMENT INCENTIVE CONTRIBUTION SCHEDULE

Table E-2 ERI Contribution Schedule - State Locations						
Group	Location Number	Location Name	ERI 3 Information		ERI 5 Information	
			Fiscal Year 2022 Payment	Present Value as of 7/1/2020	Fiscal Year 2022 Payment	Present Value as of 7/1/2020
2	90400	Education Department	\$ 1,891,802	\$ 21,021,874	\$ 466,041	\$ 5,178,692
2	90416	Marie Katzenback School for Deaf	336,658	3,740,973	136,336	1,514,977
2	90207	Office of Adm. Law	79,655	885,128	N/A	N/A
3	981	NJ Institute of Techonology	78,987	877,713	N/A	N/A
4	90411	New Jersey City University	392,779	4,364,596	N/A	N/A
4	90412	Kean University	205,445	2,282,925	N/A	N/A
4	90414	Montclair State University	162,529	1,806,037	N/A	N/A
4	90410	Rowan University	66,624	740,333	N/A	N/A
4	90415	The College of New Jersey	41,774	464,195	N/A	N/A
4	90413	William Paterson University	75,858	842,941	N/A	N/A
Total			\$ 3,332,111	\$ 37,026,715	\$ 602,377	\$ 6,693,669

Consistent with established methodology, payment amounts are calculated using a payment date 24 months after the valuation date.

Present values as of July 1, 2020 exclude expected payments for fiscal year ending 2021.

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APPENDIX F – GLOSSARY OF TERMS

1. Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disability, and retirement; changes in compensation; inflation; rates of investment earnings, and asset appreciation or depreciation; and other relevant items.

2. Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an allocation of such value to each year of service, usually in the form of a Normal Cost and an Actuarial Liability.

3. Actuarial Gain/(Loss)

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

4. Actuarial Liability

The portion of the Actuarial Present Value of Projected Benefits which will not be paid by future Normal Costs. It represents the value of the past Normal Costs with interest to the valuation date.

5. Actuarial Present Value (Present Value)

The value as of a given date of a future amount or series of payments. The Actuarial Present Value discounts the payments to the given date at the assumed investment return and includes the probability of the payment being made. As a simple example: assume you owe \$100 to a friend one year from now. Also, assume there is a 1% probability of your friend dying over the next year, in which case you won't be obligated to pay him. If the assumed investment return is 10%, the actuarial present value is:

$$\frac{\text{Amount}}{\text{Payment}} \times \frac{\text{Probability of}}{(1 - .01)} \times \frac{1/(1+\text{Investment Return})}{1/(1+.1)} = \$90$$

6. Actuarial Valuation

The determination, as of a specified date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

APPENDIX F – GLOSSARY OF TERMS

7. Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan as used by the actuary for the purpose of an Actuarial Valuation. The purpose of an Actuarial Value of Assets is to smooth out fluctuations in market values. This way long-term costs are not distorted by short-term fluctuations in the market.

8. Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

9. Amortization Payment

The portion of the pension plan contribution which is designed to pay interest and principal on the Unfunded Actuarial Liability in order to pay for that liability in a given number of years.

10. Funded Ratio

The ratio of the Actuarial Value of Assets to the Actuarial Liabilities.

11. Investment Return Assumption

The assumed interest rate used for projecting dollar related values in the future.

12. Mortality Table

A set of percentages which estimate the probability of death at a particular point in time. Typically, the rates are annual and based on age and sex.

13. Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses, which is allocated to a valuation year by the Actuarial Cost Method.

14. Projected Benefits

Those pension plan benefit amounts which are expected to be paid in the future under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and increases in future compensation and service credits.

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APPENDIX F – GLOSSARY OF TERMS

15. Projected Unit Credit Cost Method

A method under which the Actuarial Liability is calculated as the Actuarial Present Value of the Projected Benefits allocated to periods prior to the valuation year.

16. Unfunded Actuarial Liability

The excess of the Actuarial Liability over the Actuarial Value of Assets.