CHEIRON *Classic Values, Innovative Advice*

Teachers' Pension and Annuity Fund of New Jersey

Actuarial Valuation Report as of July 1, 2018

Produced by Cheiron

April 2019

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LETTER OF TRANSMITTAL

April 25, 2019

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, NJ 08625-0295

Dear Board Members:

We have performed the July 1, 2018 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 2020. 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.

We have accepted the assumptions and methodologies as adopted by the Board for the Teachers' Pension and Annuity Fund of New Jersey. The actuarial assumptions are the same as those used by the prior actuary. Cheiron has reviewed the assumptions. While we consider these assumptions to be generally reasonable, we have not yet performed our own actuarial experience study.

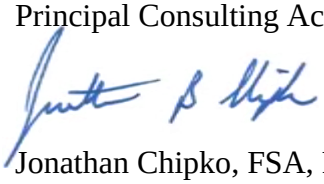
This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable 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, FCA, MAAA, EA
Consulting Actuary

cc: Kenneth Kent, FSA, FCA, MAAA, EA

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) 2020.

In this Section we present a summary of the principal valuation results. This includes the basis on which the July 1, 2018 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 followed by stress testing the Fund's projected financial outlook in accordance with the requirements set out in Chapter 277, P. L. 2017.

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.

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Valuation Basis

The July 1, 2018 valuation results are based on the same actuarial methods and assumptions as used in the July 1, 2017 valuation produced by the prior actuary, with one exception described below for the actuarial cost method. The demographic assumptions were based on the July 1, 2012 – June 30, 2015 Experience Study prepared by the prior actuary, which were subsequently approved by the Board of Trustees. The investment return assumption is based on the State Treasurer's recommendation. Cheiron has reviewed the demographic and economic assumptions. While we consider these assumptions to be generally reasonable, we have not yet performed our own actuarial experience study.

The actuarial cost method was updated based on clarification from the Division of Pensions and Benefits. After the update, the actuarial liability is based solely on the formula benefit without any comparison to the value of the estimated member annuity. See Appendix B for a full description of the actuarial cost method.

This report was prepared using census data and financial information as of July 1, 2018 provided by the Division of Pensions and Benefits and does not reflect any subsequent changes in the membership or the assets.

The Appropriations Act of Fiscal Year 2018 reduced the State pension contribution of $2,999,577,684 to $1,480,364,509. The $1,480,364,509 includes revenue of $759,134,509 from the Lottery Enterprise Contribution Act.

The potential impact of the Appropriations Act of 2019 reduces the State pension contribution for Fiscal Year 2019 from $3,208,116,552 to $1,925,224,705 (60% of the Statutory contribution less the Lottery Enterprise Contribution Offset plus expected revenue from the Lottery Enterprise Contribution Act {60% x $3,208,116,552 - $806,694,169 + $807,048,943}). This valuation reflects the potential impact of the Appropriations Act of 2019.

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, 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.

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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, 2018 valuation, 28 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 remaining 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 reflects Chapter 78, P.L. 2011, which increased the member contribution rate from 5.5% to 6.5% of compensation effective October 2011. Further, beginning July 2012, the member contribution rate was increased by 1/7th of 1% each July until a 7.5% member contribution rate is reached in July 2018.

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.

SECTION I – BOARD SUMMARY

Table I-1
Summary of Key Valuation Results

Valuation Date Fiscal Year End	July 1, 2018 2020	July 1, 2017 2019	% Change
Member Data			
Contributing Actives[1]	141,128	140,988	0.1%
Non-Contributing Members[1]	14,368	13,870	3.6%
Deferred Vested	219	206	6.3%
Retirees and Beneficiaries[2]	104,703	102,580	2.1%
Total Members	260,418	257,644	1.1%
Appropriation Payroll[3]	$ 10,823,504,797	$ 10,636,017,869	1.8%
Annual Allowances for Retirees and Beneficiaries	$ 4,295,446,681	$ 4,184,662,175	2.6%
Assets and Liabilities			
Actuarial Liability	$ 60,971,919,315	$ 59,954,548,700	1.7%
Actuarial Value of Assets (AVA)[4]	26,308,754,955	26,549,410,215	-0.9%
Unfunded Actuarial Liability/(Surplus)	$ 34,663,164,360	$ 33,405,138,485	3.8%
Funding Ratio (AVA)	43.1%	44.3%	-1.2%
Actuarial Value of Assets[4] + Special Asset Value	$ 36,127,247,378	$ 36,367,511,298	-0.7%
Unfunded Actuarial Liability/(Surplus)	$ 24,844,671,937	$ 23,587,037,402	5.3%
Funded Ratio (AVA + SAV)	59.3%	60.7%	-1.4%
Market Value of Assets (MVA)[3]	$ 24,838,481,325	$ 24,495,303,183	1.4%
Unfunded Actuarial Liability/(Surplus)	$ 36,133,437,990	$ 35,459,245,517	1.9%
Funded Ratio (MVA)	40.7%	40.9%	-0.2%
Contribution Amounts[5]			
State Normal Cost at End of Year	$ 309,040,948	$ 379,662,195	-18.6%
Amortization Payment of UAL	2,934,972,961	2,828,454,357	3.8%
Total Statutory Contribution for FYE	$ 3,244,013,909	$ 3,208,116,552	1.1%
Percent Appropriated	70%	60%	10.0%
State Appropriation for Pension	$ 2,270,809,736	$ 1,924,869,931	18.0%
Lottery Enterprise Contribution Offset	(832,596,867)	(806,694,169)	3.2%
Net State Contribution	$ 1,438,212,869	$ 1,118,175,762	28.6%

[1] Starting with the 2018 valuation, 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 II-2

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

SECTION I – BOARD SUMMARY

Below we highlight significant results of this valuation.

- The return on the market value of assets was 9.19% for the year ending June 30, 2018 which was higher than assumed rate of return of 7.50%. The return on the actuarial value of assets was 5.97%.
- The Actuarial Liability increased from $59,955 million as of July 1, 2017 to $60,972 million as of July 1, 2018.
- The funded ratio based on the Actuarial Value of Assets (without the Special Asset Value) decreased from 44.3% to 43.1%, and the unfunded actuarial liability increased from $33,405 million to $34,663 million. Based on the Actuarial Value of Assets + Special Asset Value, the funded ratio decreased from 60.7% to 59.3%. Based on the market value of assets, the funded ratio also decreased from 40.9% to 40.7%.
- During the year there was a total actuarial experience loss of $521 million, consisting of an asset loss of $381 million and a liability loss of $140 million.
- The gross Statutory contributions increased from $3,208 million for FYE 2019 to $3,244 million for FYE 2020.

Recent Trends

Although most of the attention given to the valuation reflects the most recently 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.

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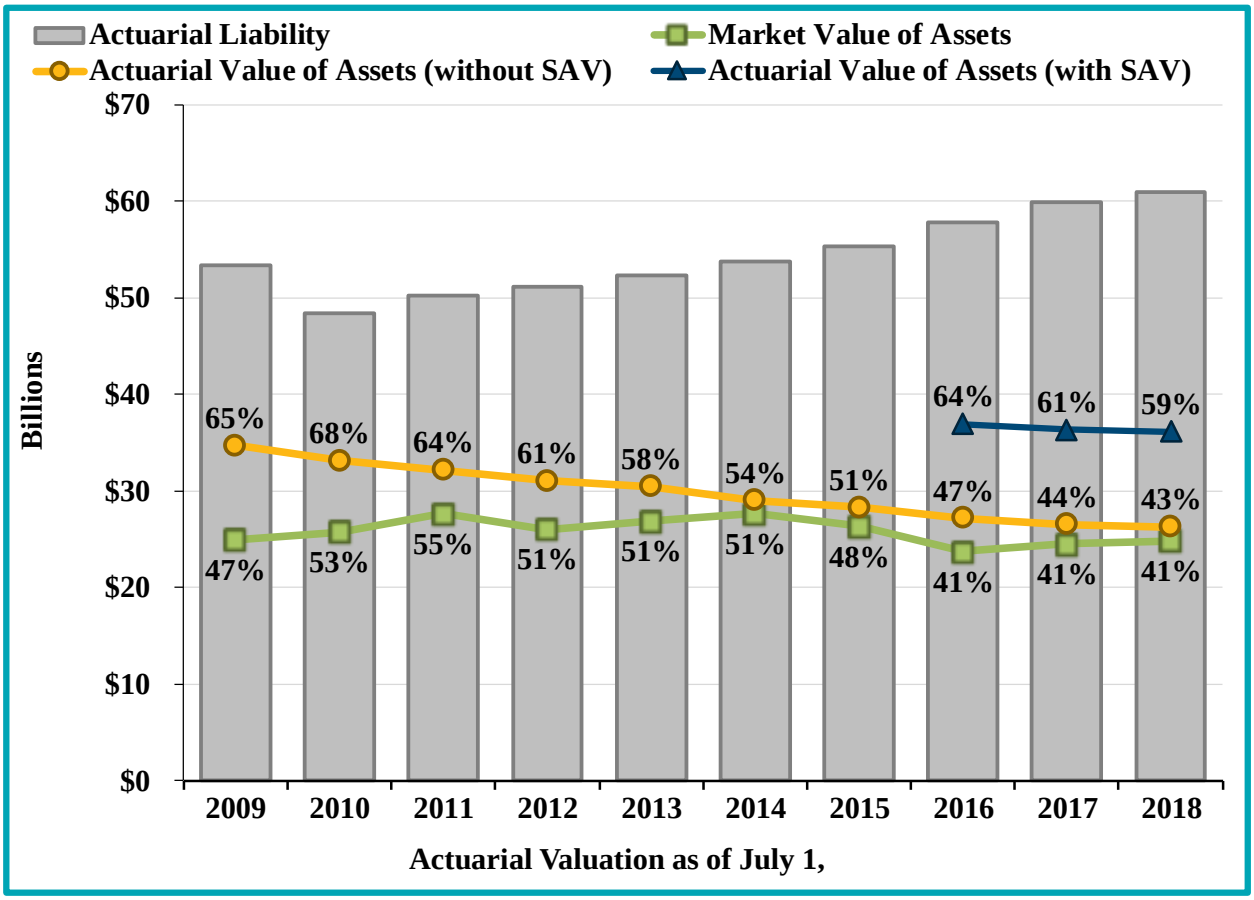
Assets and Liabilities

The grey 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 assets lines.

There was a decrease in the liability as of July 1, 2010 due to the benefit reforms of Chapter 1, P.L. 2010 and Chapter 78, P.L. 2011. Since July 1, 2010, the liability has been increasing over time in part due to additional benefit accruals but also due to decreases in the discount rate.

The funded ratio has been decreasing over time in part due to decreases in the discount rate, recognition of the 2008/2009 market losses reflected in the large gap between the MVA and AVA in 2009 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.

SECTION I – BOARD SUMMARY

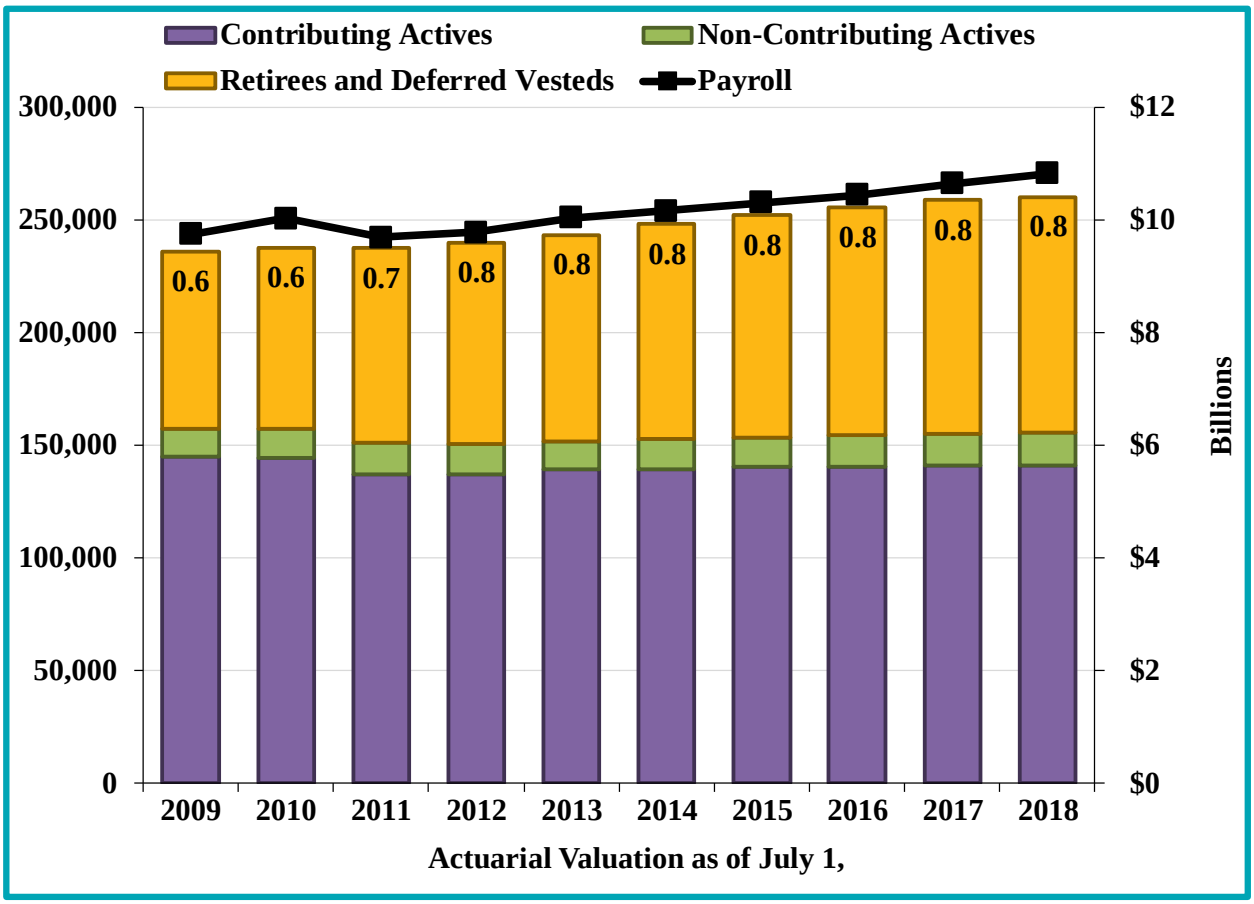
Membership Trends

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. The inactive-to-active ratio has increased over the period. As more of the liability moves from actives to inactives, the Fund will experience more volatility in contribution rates when actuarial gains and losses are recognized.

With the current inactive-to-active ratio of 0.8, 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, reflects all records for multiple members, which are active members employed by more than one participating employer at the same time.

The black line represents the appropriation payroll for active contributing members over the period, and it corresponds with the scale on the right.



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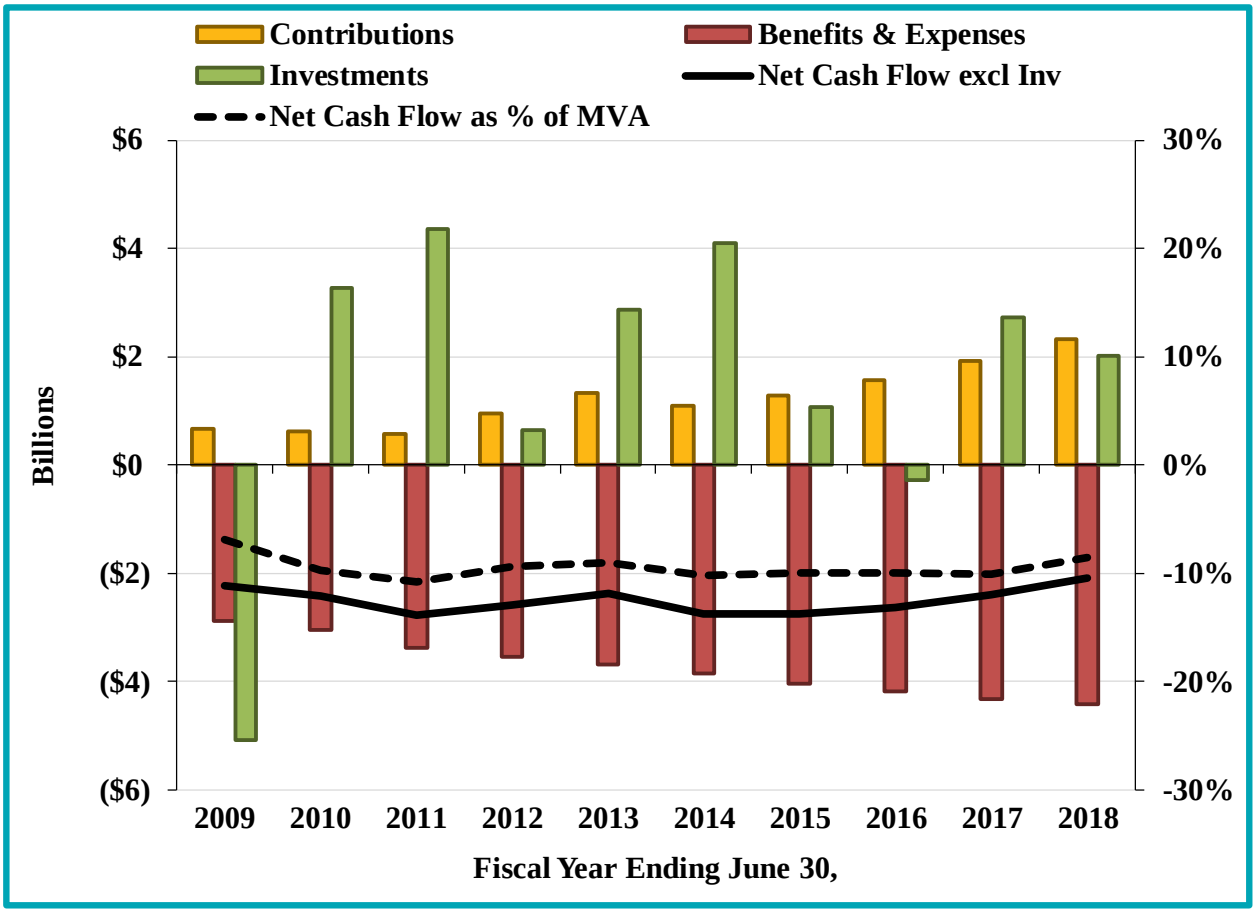
Cash Flows

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 excluding investments 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 -9.5%, 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.



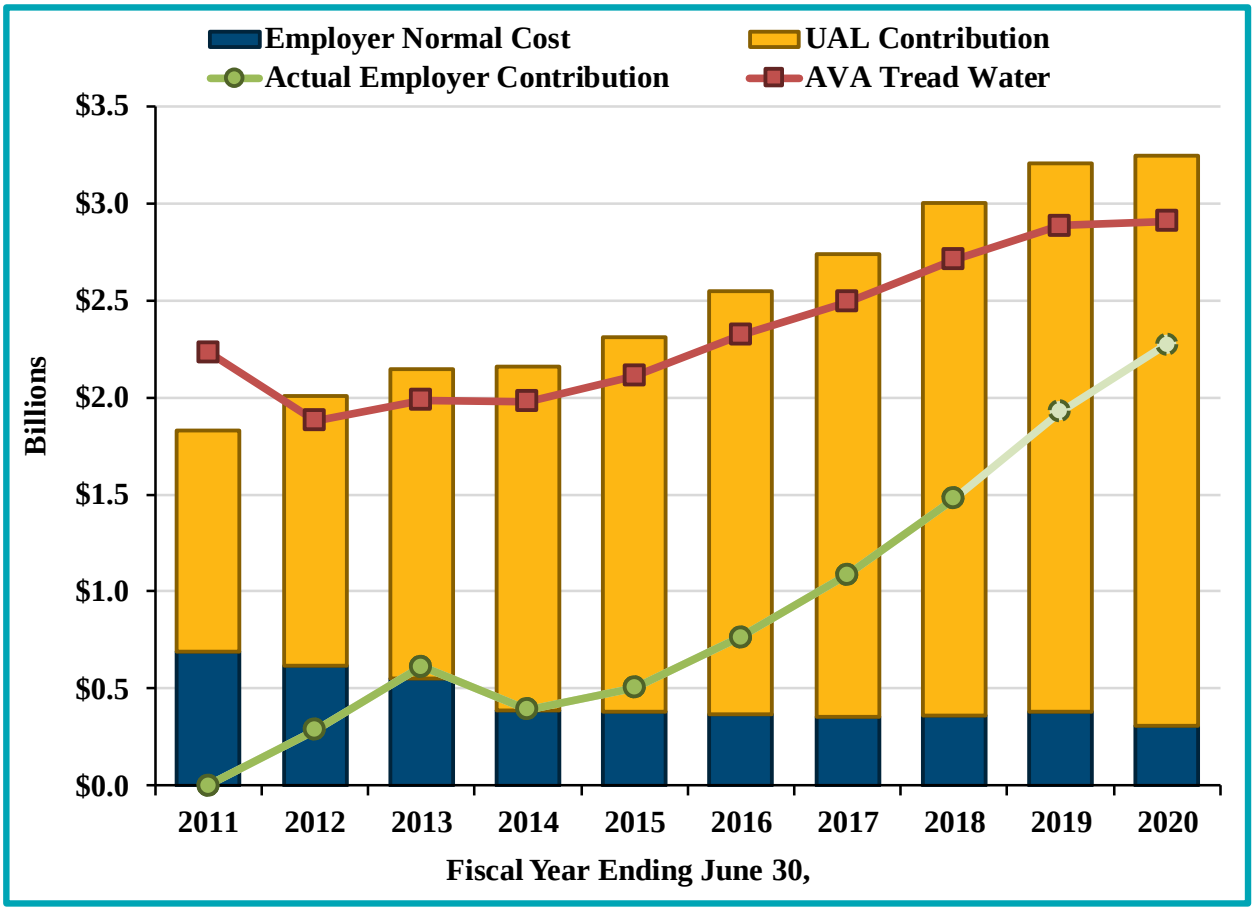
SECTION I – BOARD SUMMARY

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 2019 and 2020, the green line has a lighter shade to indicate that these are expected, rather than actual, contributions. The expected contributions are based on the anticipated appropriations 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 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 are 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.



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** based on varying investment returns in the future. It is our opinion that the stress testing analyses shown in this section 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 chart 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 over the next few years, as the State appropriates less than the Statutory amount and the valuation investment rate of return assumption gradually decreases from 7.50% to 7.00%, before beginning a slow but steady increase to 100% by 2048.

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The bottom graph shows the contributions by fiscal year. The member contributions are in purple and the State contributions are in gold. The gold outline shows the State's full Statutory contributions with the shaded portion showing the anticipated appropriated amount.

Lottery revenue is outlined in blue. Lottery revenue amounts shaded in gold are offsets to Statutory contributions. Lottery revenue amounts shaded 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 projection assumes the State appropriates 70% of the Statutory contribution in FYE 2020, and increases the percent by 10% a year, until reaching 100% of the Statutory contribution beginning with FYE 2023. Both the appropriated State contributions and the member contributions are also shown in dollar amounts.

The dashed black line in the bottom chart 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, as is the case through FYE 2021, the UAL grows and the funded ratio falls. When the contributions exceed the solid line, as is the case beginning in FYE 2023, the UAL decreases and the funded ratio increases.

The Statutory contributions increase steadily through FYE 2023 as the State appropriates less than the Statutory amount and the valuation investment rate of return assumption gradually decreases from 7.50% 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 2023, 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 pays down the UAL sooner.

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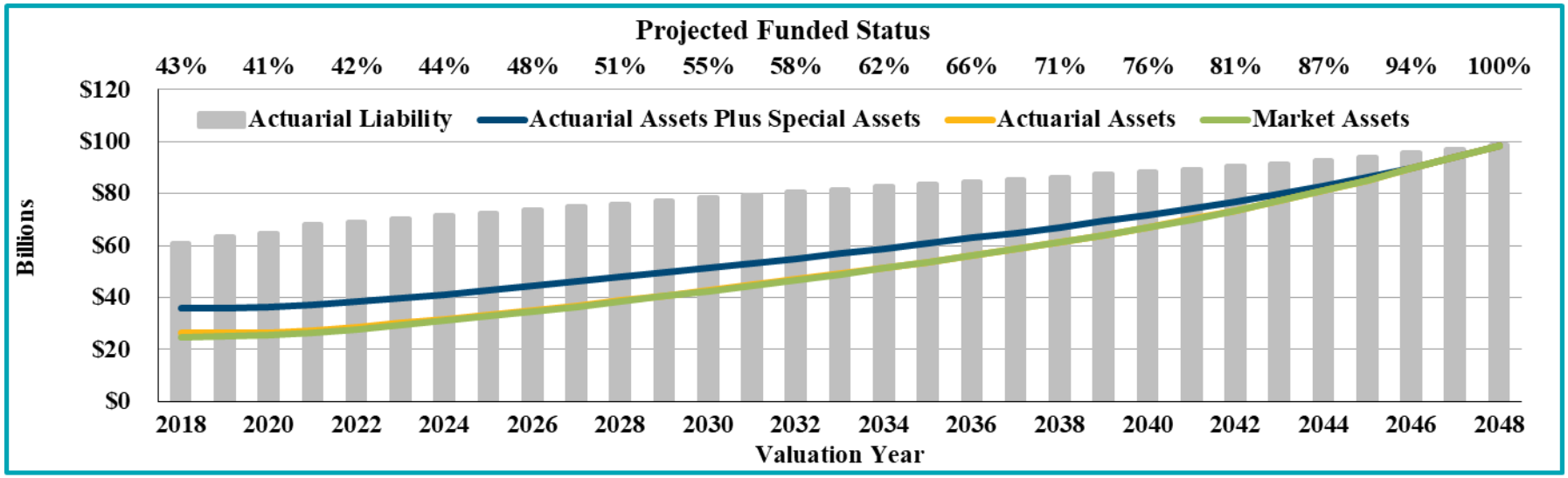
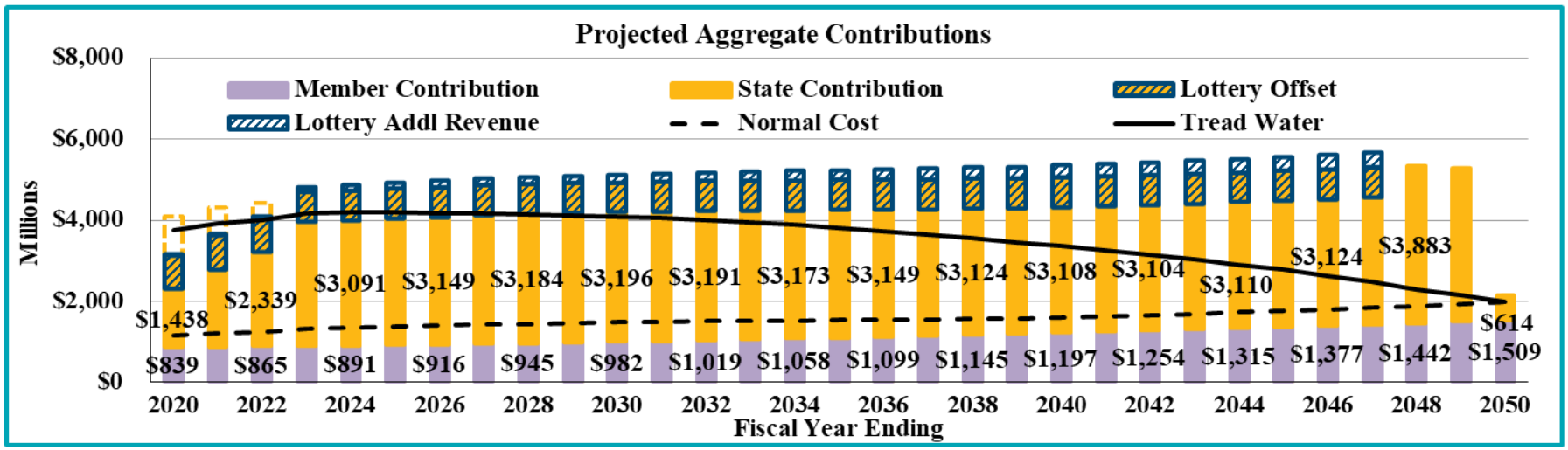
Baseline: 7.0% return for all years





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Stress Testing

The Baseline projections shown on the previous page assume all assumptions are met each and every year in the future. We know that will not be the case. We developed six hypothetical scenarios to illustrate the impact actual 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 table below using the capital market assumptions from the New Jersey Division of Investments (Geometric return of 7.14%, standard deviation of 12.27%).

Distribution of Expected Average Annual Returns		
Percentile	**1 Year**	**5 Year**
5%	-11.1%	-1.4%
25%	-0.8%	3.5%
50%	7.1%	7.1%
75%	15.7%	10.9%
95%	29.1%	16.5%

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.

Theoretical Scenarios						
	1-Yr Shock		5-Yr Moderate		5-Yr Significant	
FYE	**Neg**	**Pos**	**Neg**	**Pos**	**Neg**	**Pos**
2019	-11.1%	29.1%	3.5%	10.9%	-1.4%	16.5%
2020	7.0%	7.0%	3.5%	10.9%	-1.4%	16.5%
2021	7.0%	7.0%	3.5%	10.9%	-1.4%	16.5%
2022	7.0%	7.0%	3.5%	10.9%	-1.4%	16.5%
2023	7.0%	7.0%	3.5%	10.9%	-1.4%	16.5%
2024+	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%

In reviewing each of the 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.

SECTION I – BOARD SUMMARY

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 charts include a dashed red line representing the expected contributions under the baseline projections shown above to facilitate the comparison between the particular scenario and the baseline projections assuming all assumptions are met.

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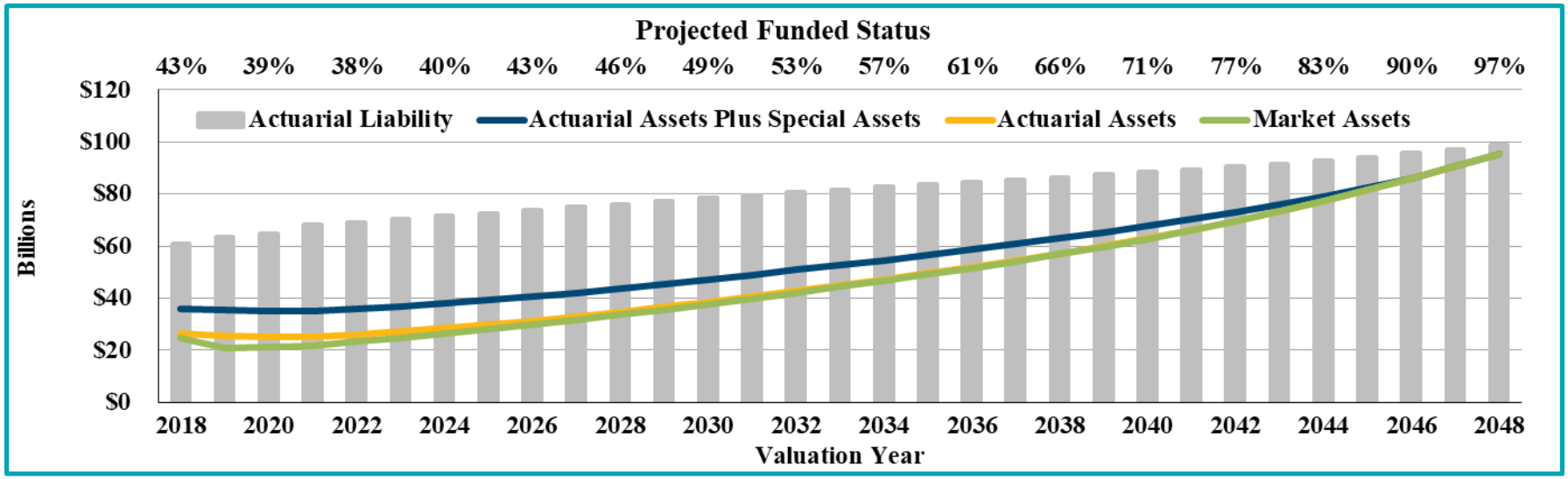
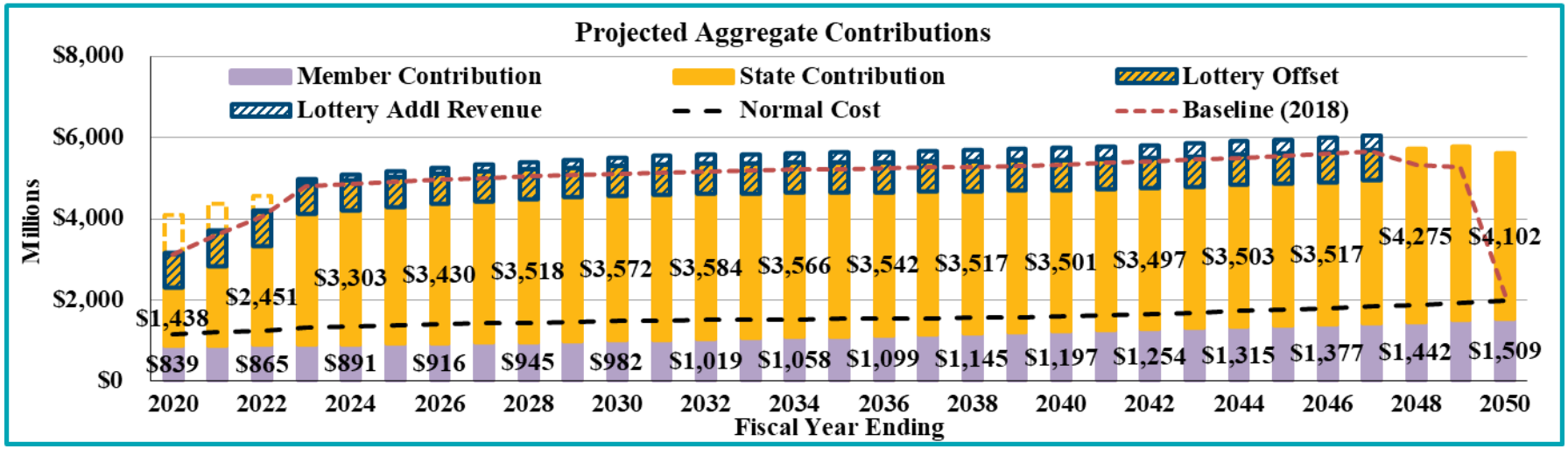
One-Year Negative Shock Scenario: -11.1% return FYE 2019, 7.0% after





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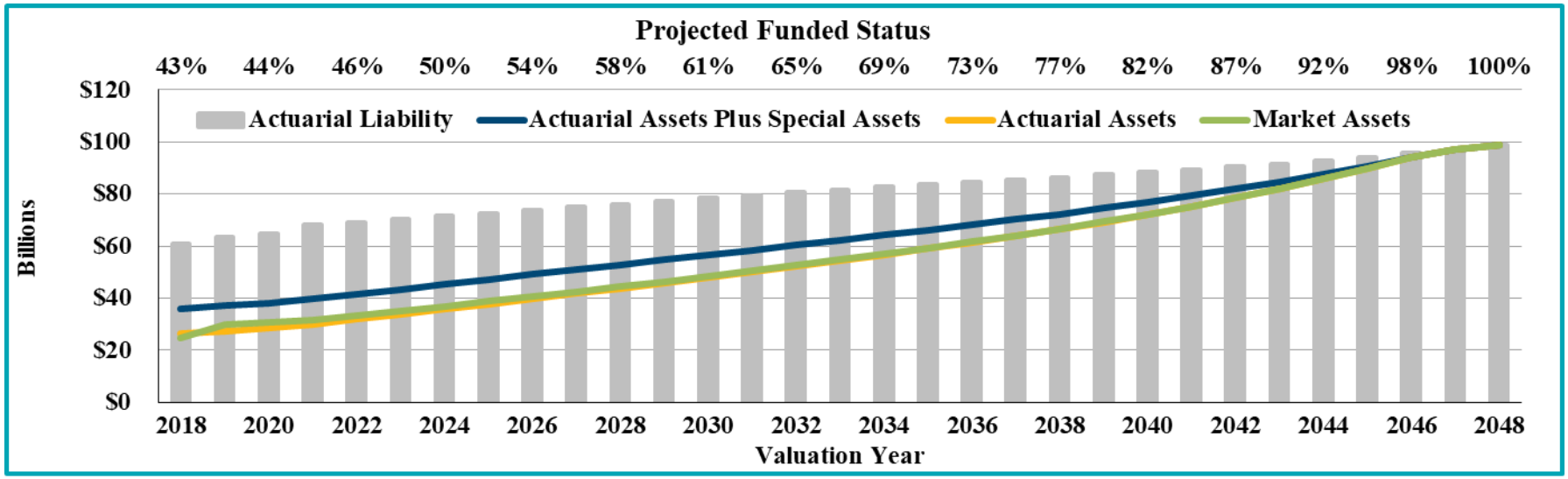
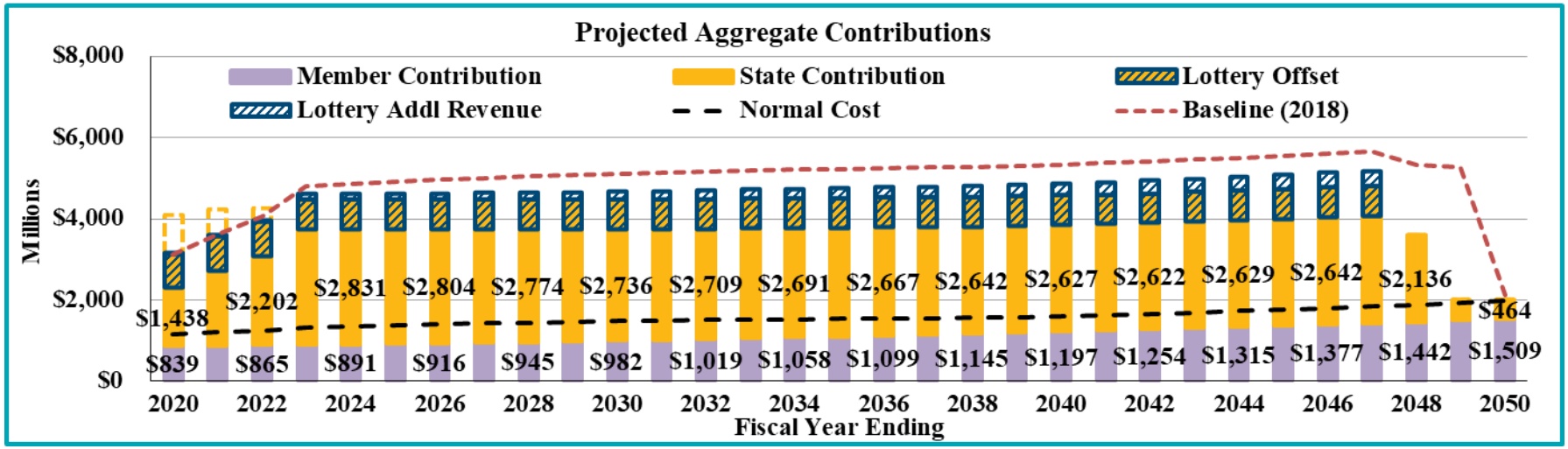
One-Year Positive Shock Scenario: 29.1% return FYE 2019, 7.0% after





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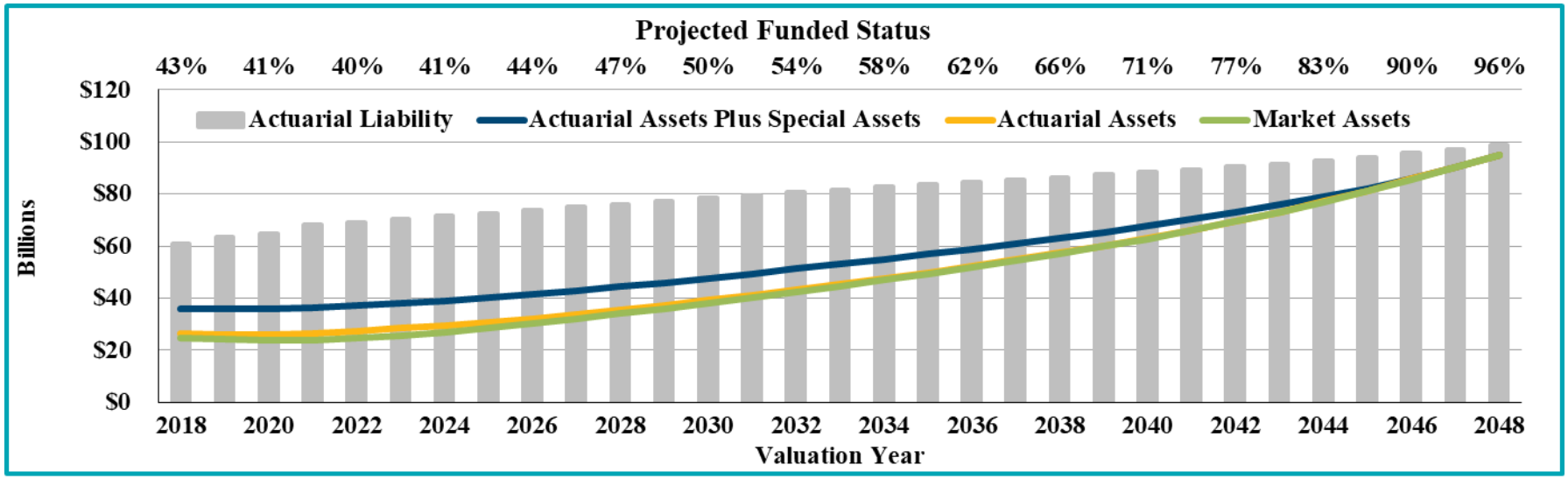
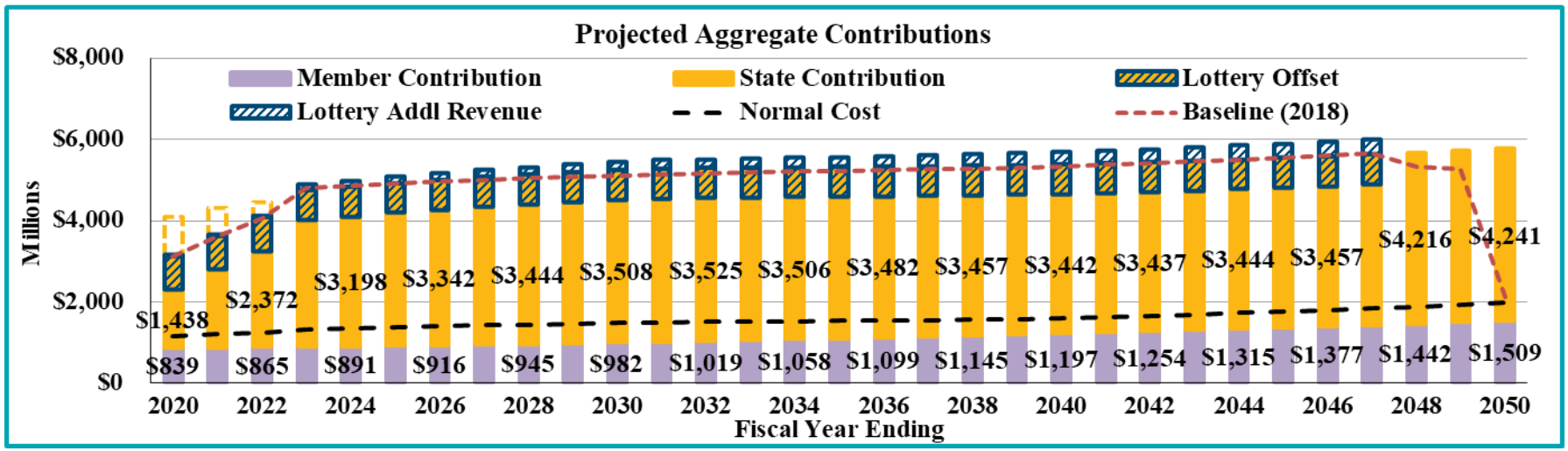
Five-Year Moderate Negative Scenario: 3.5% return FYE 2019-2023, 7.0% after





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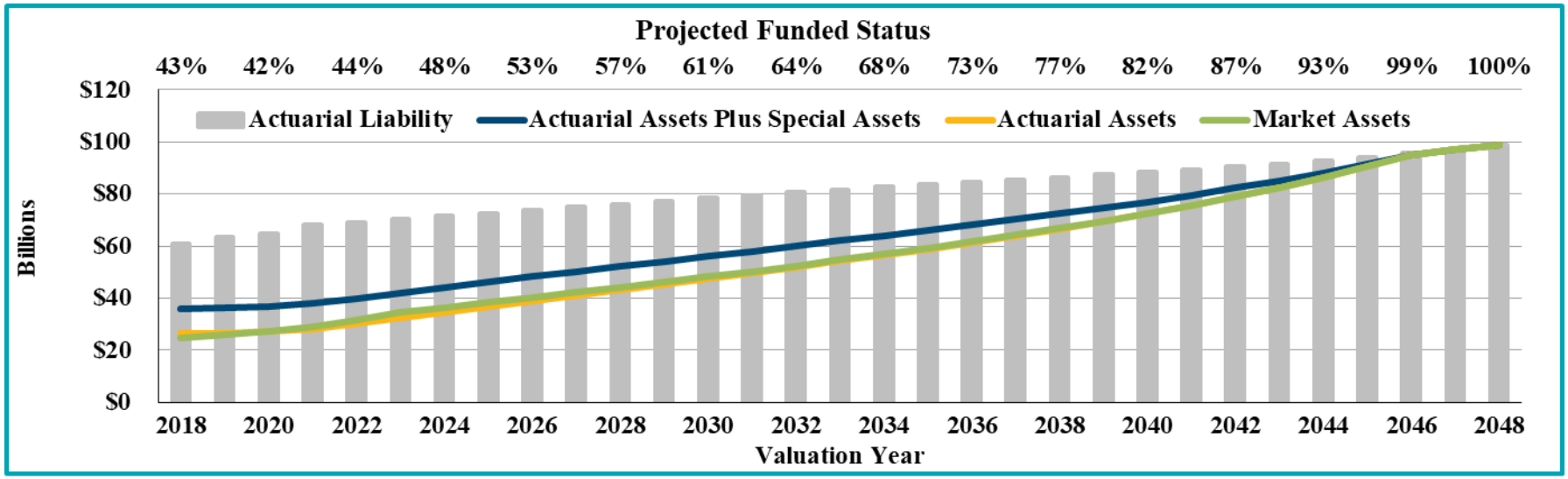
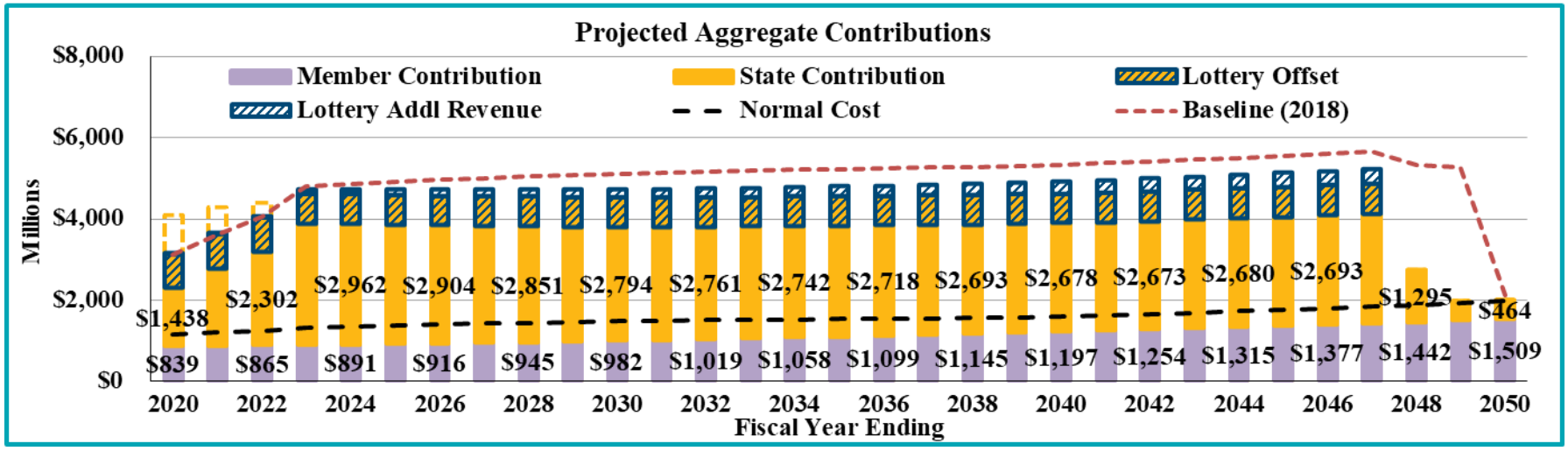
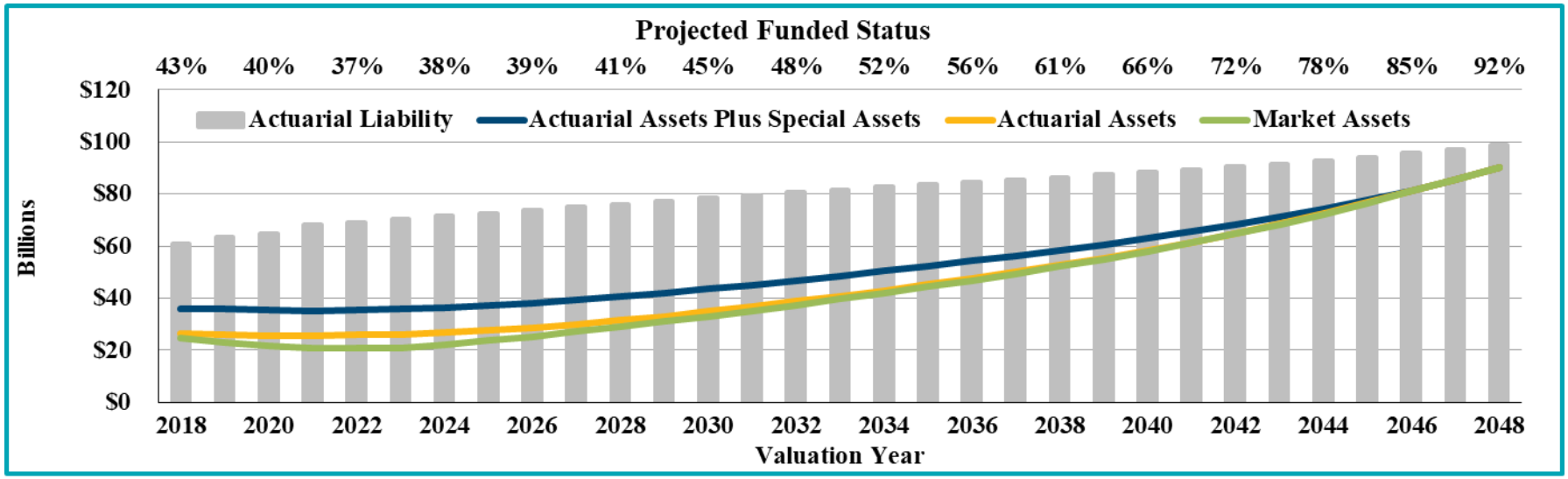
Five-Year Moderate Positive Scenario: 10.9% return FYE 2019-2023, 7.0% after

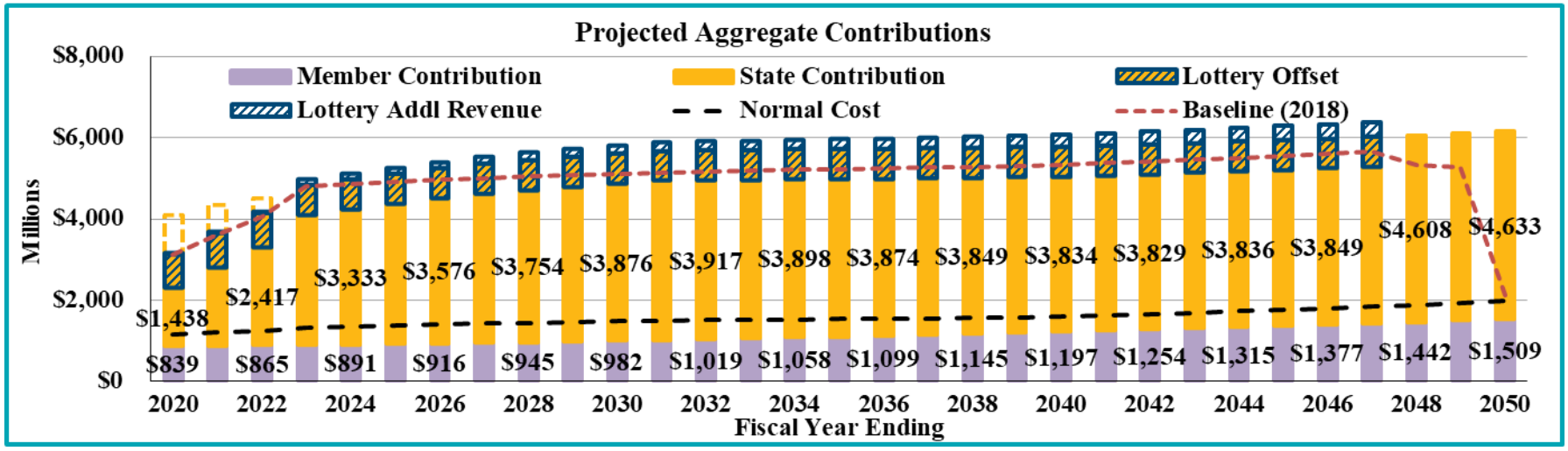




SECTION I – BOARD SUMMARY

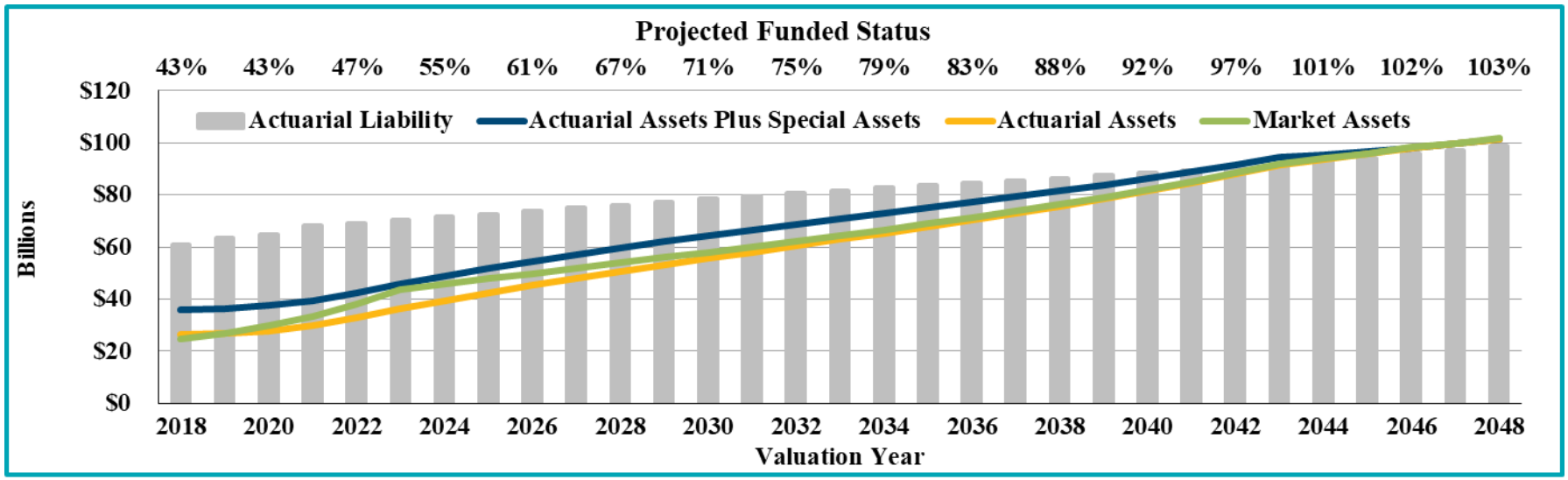
Five-Year Significant Negative Scenario: -1.4% return FYE 2019-2023, 7.0% after

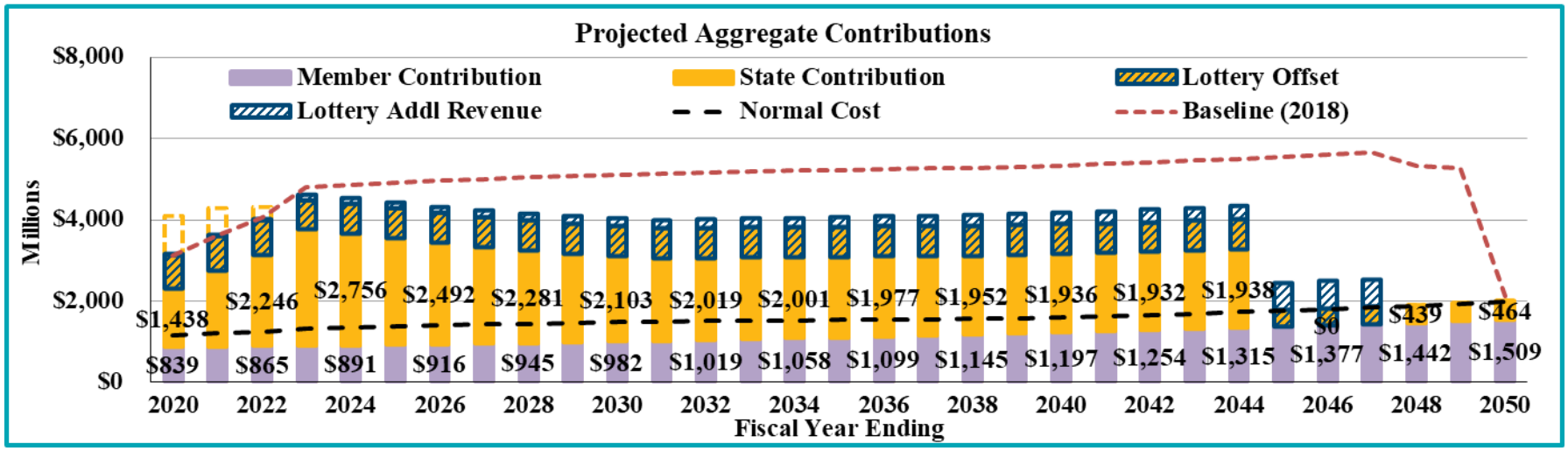




SECTION I – BOARD SUMMARY

Five-Year Significant Positive Scenario: 16.5% return FYE 2019-2023, 7.0% after





SECTION II – 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 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, 2017 and July 1, 2018,
- 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 II-1 on the following page presents the market value as of June 30, 2017 and June 30, 2018. Table II-2 presents the Fund's net cash flows from June 30, 2017 to June 30, 2018. Table II-3 presents the development of the Actuarial Value of Assets as of July 1, 2018.

SECTION II – ASSETS

Table II-1
Statement of Assets at Market Value

	June 30, 2018	June 30, 2017
Assets		
Cash	$ 371,943,696	$ 353,178,098
Investment Holdings	22,634,290,412	22,749,001,533
Employers' Contributions Receivable - NCGI	4,647,272	4,081,785
Employers' Contributions Receivable - Common L	64,557,400	0
Employers' Contributions Receivable - Local Employers	953,445	1,190,156
Employers' Contributions Receivable - Local Employers ERI	12,906,879	15,828,412
Employers' Contributions Receivable - Delayed Enrollments	483,011	449,044
Employers' Contributions Receivable - Delayed Appropriations	5,052,280	5,020,026
Members' Contributions Receivable	82,297,872	76,505,113
Accrued Interest on Investments	63,622	41,228
Accounts Receivable	4,396,946	12,647,936
Loans Receivable	275,431,126	283,207,356
Securities Lending Collateral	247,244,971	295,546,248
Total Assets	**$ 23,704,268,932**	**$ 23,796,696,935**
Liabilities		
Pension Payroll Payable	$ (299,603,246)	$ (284,081,089)
Pension Adjustment Payroll Payable	(26,115,228)	(27,162,884)
Withholdings Payable	(43,217,971)	(43,821,186)
Administrative Expenses Payable	(1,278,077)	0
Death Benefits Payable	(5,278,892)	(4,029,942)
Securities Lending Collateral & Rebates Payable	(247,237,955)	(295,459,009)
Other Accounts Payable	(90,420,723)	(85,980,996)
Total Liabilities	**$ (713,152,092)**	**$ (740,535,106)**
Preliminary Market Value of Assets	**$ 22,991,116,840**	**$ 23,056,161,829**
Discounted Receivables		
State Appropriations	$ 1,068,977,365	$ 688,754,934
Expected Lottery Revenue	778,387,120	750,386,420
Market Value of Assets	**$ 24,838,481,325**	**$ 24,495,303,183**

SECTION II – ASSETS

Fund Cash Flows as of June 30, 2018

Table II-2 Changes in Market Value for FYE June 30, 2018		
Additions		
Contributions		
Member Contributions	$	810,899,751
Member Transfer Contributions		10,372,267
State Appropriations		721,230,000
State Lottery		759,134,509
NCGI Contributions		35,766,941
Transfers from Other Systems		2,720,197
Other Contributions - Delayed Enrollments		313,642
Other Contributions - Delayed Appropriations		32,255
Total Contributions	$	2,340,469,562
Net Investment Income		2,016,316,929
Total Additions	**$**	**4,356,786,491**
Deductions		
Withdrawal of Member Contributions	$	55,940,903
Withdrawal of Member Transfer Contributions		6,246,820
Withdrawal of Transfer Contributions		1,159,351
Adjustment for Member Loans		(33,747)
Retirement Allowances		4,005,287,888
Pension Adjustment Benefits		304,241,146
NGCI Premiums		35,766,941
Administrative Expenses		13,222,178
Total Deductions	**$**	**4,421,831,480**
Net Increase/(Decrease)	**$**	**(65,044,989)**
Preliminary Market Value of Assets Beginning of Year	**$**	**23,056,161,829**
Preliminary Market Value of Assets End of Year	**$**	**22,991,116,840**
Discounted Receivables		
State Appropriations	$	1,068,977,365
Expected Lottery Revenue		778,387,120
Market Value of Assets End of Year	**$**	**24,838,481,325**
Approximate Return		**9.19%**

SECTION II – 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 II-3
Development of Actuarial Value of Assets as of July 1, 2018

1.	Preliminary Actuarial Value of Assets as of July 1, 2017[1]	$	25,110,268,861
2.	Net Cash Flow excluding Investment Income		(2,081,361,918)
3.	Expected Investment Income[2]		1,800,051,934
4.	Expected Actuarial Value of Assets as of July 1, 2018: [1 + 2 + 3]	$	24,828,958,877
5.	Preliminary Market Value as of June 30, 2018	$	22,991,116,840
6.	20% of Difference from MVA = [(5-4) x 0.2]	$	(367,568,407)
7.	Preliminary Actuarial Value of Assets as of July 1, 2018[1]: [4 + 6]	$	24,461,390,470
8.	Discounted Receivables		
	State Appropriations	$	1,068,977,365
	Expected Lottery Revenue		778,387,120
	Total	$	1,847,364,485
9.	Actuarial Value of Assets as of July 1, 2018: [7 + 8 + 9]	$	26,308,754,955
10.	Rate of Return on Actuarial Value of Assets		5.97%

[1] Excludes discounted State appropriations receivable

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

SECTION II – ASSETS

Investment Performance

The market value of assets rate of return was 9.19% for the year ending June 30, 2018. This is compared to an assumed return of 7.50% for the same period. On an actuarial value of assets basis, the return for FYE 2018 was 5.97%. In the table below, we show historical asset returns compared to the investment return assumption.

Table II-4
Annual Rates of Return

Year Ended June 30	Investment Return Assumption	Market Value	Actuarial Value
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%
10-Year Compound Average		**6.66%**	**4.65%**
5-Year Compound Average		**8.18%**	**5.81%**

SECTION II – 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 II-5 shows the development of the special asset value as of July 1, 2018.

Table II-5
Development of Special Asset Value for July 1, 2018

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, 2019[1]		13,570,171,451
3.	Discounted Value as of July 1, 2018 at 7.50%		12,623,415,303
4.	Allocation to TPAF		77.78%
5.	Special Asset Value as of July 1, 2018	$	9,818,492,423

[1] Provided by the Division of Pensions and Benefits

SECTION II – ASSETS

Actuarial Balance Sheet

Table II-6
Actuarial Balance Sheet as of June 30, 2018

Assets			
Retirement Fund Reserve (RFR)			
Credited to Fund with Distribution of Income	$	39,481,435,510	
Add/(Deduct) reserve transferable from/(to) ECR[1]		660,208,232	
Adjusted RFR[2]	$	40,141,643,742	[3]
Members' Contributions Reserve (MCR)[2]	$	7,226,019,763	
Accumulative Interest Reserve (AIR) with Distribution of Income[2]	$	6,128,256,750	
Employers' Contributions Reserve (ECR)			
Credited to Fund with Distribution of Income	$	(26,526,957,068)	
Add/(Deduct) reserve transferable from/(to) RFR		(660,208,232)	
Adjusted CRF[2]	$	(27,187,165,300)	
Benefit Enhancement Fund (BEF)[2]	$	0	
Special Asset Value as of July 1, 2018	$	9,818,492,423	
Present Value of Prospective Contributions to ECR and BEF	$	24,844,671,937	
Total Assets	**$**	**60,971,919,315**	
Liabilities			
Payable from RFR			
Retirees, Disableds, and Beneficiaries currently receiving benefits	$	40,141,643,742	[3]
Payable from Annuity Savings Fund and ECR			
Active and Deferred Vested Members due a future benefit	$	20,830,275,573	
Total Liabilities	**$**	**60,971,919,315**	

[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 $9,101,829.

SECTION III – LIABILITIES

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

- Disclosure of liabilities at July 1, 2017 and July 1, 2018,
- 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.

SECTION III – LIABILITIES

Table III-1 shows the actuarial liability and unfunded actuarial liability as of July 1, 2018, and July 1, 2017 for the Fund. The unfunded actuarial liability (UAL) shown in the table is based on the actuarial value of assets plus the special asset value and is different from the UAL used in determining the Statutory contributions.

Table III-1
Disclosure of Liabilities

	July 1, 2018	July 1, 2017
Actuarial Liability		
Contributing Actives	$ 19,973,993,069	$ 19,897,291,944
Non-Contributing Actives	826,022,665	832,286,244
Deferred Vested	30,259,839	30,412,593
Retirees	37,868,375,403	37,032,905,665
Disabled	926,626,341	890,148,755
Beneficiaries	1,346,641,998	1,271,503,499
Total Actuarial Liability	$ 60,971,919,315	$ 59,954,548,700
Actuarial Value of Assets + Special Asset Value	$ 36,127,247,378	$ 36,367,511,298
Unfunded Actuarial Liability/(Surplus)	$ 24,844,671,937	$ 23,587,037,402
Funded Ratio	59.3%	60.7%

SECTION III – LIABILITIES

Table III-2 and Table III-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, 2018.

Table III-2
Contributing Active Liabilities by Tier

	Number of Members	Appropriation Payroll[1]	Actuarial Liability	Gross Normal Cost
Tier 1	81,416	$ 7,157,147,775	$ 18,351,588,845	$ 826,470,306
Tier 2	10,446	711,766,029	692,495,766	63,389,718
Tier 3	5,184	341,104,057	270,852,800	29,066,078
Tier 4	3,038	195,893,162	110,582,058	13,668,547
Tier 5	41,044	2,417,593,774	548,473,600	135,721,130
Total	141,128	$ 10,823,504,797	$ 19,973,993,069	$ 1,068,315,779

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

Table III-3
Non-Contributing Member Liabilities by Tier

	Number of Members	Last Reported Payroll	Actuarial Liability	Gross Normal Cost
Tier 1	7,932	$ 464,817,285	$ 727,657,370	$ 0
Tier 2	1,072	59,233,360	31,568,118	0
Tier 3	580	32,957,741	14,890,342	0
Tier 4	318	19,144,971	7,159,099	0
Tier 5	4,466	241,558,869	44,747,736	0
Total	14,368	$ 817,712,226	$ 826,022,665	$ 0

SECTION III – LIABILITIES

Tables III-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.

SECTION III – LIABILITIES

Table III-4
Development of 2018 Experience (Gain)/Loss

		Actuarial Liability	Actuarial Value of Assets	Unfunded Actuarial Liability
1.	Value as of July 1, 2017	$ 59,954,548,700	$ (26,549,410,215)	$ 33,405,138,485
2.	Additions			
	Normal Cost	$ 1,104,576,314	$ 0	$ 1,104,576,314
	Statutory State Contributions	0	(3,208,116,552)	(3,208,116,552)
	Exp. Member Contributions	0	(779,070,361)	(779,070,361)
	Total Additions	$ 1,104,576,314	$ (3,987,186,913)	$ (2,882,610,599)
3.	Decreases			
	Benefit Payments	$ (4,365,436,190)	$ 4,365,436,190	$ 0
	Exp. Admin. Expenses	0	0	0
	Total Deductions	$ (4,365,436,190)	$ 4,365,436,190	$ 0
4.	Net Transfers from Other Systems			
	Employer Contributions	$ 1,560,846	$ (1,560,846)	$ 0
	Member Contributions	4,125,447	(4,125,447)	0
	Total Net Transfers	$ 5,686,293	$ (5,686,293)	$ 0
5.	Expected Interest	$ 4,418,899,370	$ (1,859,357,742)	$ 2,559,541,628
6.	Expected Value as of July 1, 2018: [1 + 2 + 3 + 4 + 5]	$ 61,118,274,487	$ (28,036,204,973)	$ 33,082,069,514
7.	Other Changes			
	Appropriation Adjustment	$ 0	$ 1,283,246,129	$ 1,283,246,129
	Contribution Timing	0	76,500,675	76,500,675
	Actual Lottery Revenue	0	19,785,810	19,785,810
	Other Employer Contributions	0	(358,634)	(358,634)
	Actual Member Contributions	0	(33,001,414)	(33,001,414)
	Conversion from Prior Actuary	260,197,358	0	260,197,358
	Change in Methods/Assumptions	(546,993,395)	0	(546,993,395)
	Change in Benefits	0	0	0
	Total Other Changes	$ (286,796,037)	$ 1,346,172,566	$ 1,059,376,529
8.	Expected Value after Changes: [6 + 7]	$ 60,831,478,450	$ (26,690,032,407)	$ 34,141,446,043
9.	Actual Value as of July 1, 2018	$ 60,971,919,315	$ (26,308,754,955)	$ 34,663,164,360
10.	Actuarial (Gain)/Loss: [9 - 8]	$ 140,440,865	$ 381,277,452	$ 521,718,317

SECTION III – LIABILITIES

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

Table III-5
Actuarial (Gain)/Loss Analysis

Components	July 1, 2018
Actuarial Value of Assets	
Investment Return	$ 367,568,407
Administrative Expenses	13,709,045
Total	$ 381,277,452
Actuarial Liability	
Salary Increases	$ 35,896,638
New Entrants	50,709,843
Demographic Experience and Census Data Updates	
Contributing Actives	56,354,670
Non-Contributing Actives	(53,985,381)
Inactives	57,360,769
Sub-Total	$ 146,336,539
Impact of Net Transfers from Other Systems	(5,895,674)
Total	$ 140,440,865
Actuarial (Gain)/Loss	**$ 521,718,317**

SECTION IV – 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 and are unable to evaluate whether the investment rate of return assumption includes an appropriate adjustment for administrative expenses.

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, the unfunded actuarial liability as of July 1, 2018 was amortized over an open 30 year period as a level dollar amount. Beginning with the July 1, 2019 valuation, the unfunded actuarial liability will be amortized over a closed 30 year period as a level dollar amount.

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, 2018 valuation, 28 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.

SECTION IV – CONTRIBUTIONS

Table IV-1 shows the development of the Lottery Enterprise contribution offset. Per 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 IV-1
Development of Lottery Enterprise Contribution Offset for Fiscal Year 2020

For Fiscal Years Through 2022		
1. Special Asset Adjustment for FY 2020[1]	$	1,070,451,102
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, 2019 [1 x 2 x 3]	$	832,596,867
For Fiscal Years Beginning 2023		
5. Special Asset Value Allocated to TPAF as of July 1, 2018	$	9,818,492,423
6. 28-Year Level Dollar Amortization payable June 30, 2019	$	848,368,794
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, 2019 [lesser of 2 and 4]	$	840,156,036
10. Adjustment Percentage		88.27%
11. Funded Ratio based on Actuarial Value + Special Asset Value		59.25%
12. Applicable Adjustment Percentage [If 11. < 50%, 10. - 3 x (50% - 11.), otherwise 10.]		88.27%

[1] This adjustment will be $1,084,354,841 for FY 2021 and $1,095,871,137 for FY 2022.

SECTION IV – CONTRIBUTIONS

Table IV-2 shows the development of the Statutory pension contributions for the FYE 2020 and 2019 in dollar amounts. Table IV-3 shows the components of the Statutory pension contribution as a percent of appropriation payroll.

Table IV-2
Development of Statutory Pension Contributions

Valuation Date Fiscal Year Ending	July 1, 2018 2020	July 1, 2017 2019
1. Unfunded Actuarial Liability Contribution[1]		
a. Actuarial Liability	$ 60,971,919,315	$ 59,954,548,700
b. Actuarial Value of Assets	26,308,754,955	26,549,410,215
c. Unfunded Actuarial Liability (UAL): [a - b]	$ 34,663,164,360	$ 33,405,138,485
d. Amortization Period (years)	30	30
e. Amortization of UAL Payable at Valuation Date (Level Dollar)	$ 2,730,207,406	$ 2,631,120,332
f. UAL Contribution Payable Beginning of Fiscal Year [1e x 1.075]	$ 2,934,972,961	$ 2,828,454,357
2. Normal Cost Contribution		
a. Gross Basic Normal Cost	$ 996,553,500	$ 1,036,127,978
b. Expected Member Contributions	(780,835,827)	(751,402,179)
c. State Basic Normal Cost	$ 215,717,673	$ 284,725,799
d. Chapter 133, P.L. 2001	71,762,279	68,448,336
e. State Normal Cost at Valuation Date	$ 287,479,952	$ 353,174,135
f. State Normal Cost Payable Beginning of Fiscal Year [2e x 1.075]	$ 309,040,948	$ 379,662,195
3. Total Statutory Pension Contribution as of Beginning of Fiscal Year [1 + 2]	**$ 3,244,013,909**	**$ 3,208,116,552**
4. Lottery Enterprise Contribution Offset	**$ (832,596,867)**	**$ (806,694,169)**
5. Net Pension Contribution as of Beginnig of Fiscal Year [3 + 4]	**$ 2,411,417,042**	**$ 2,401,422,383**

[1] Includes UAL contributions due to State ERI programs.

Table IV-3
Statutory Pension Contributions as a Percent of Appropriation Payroll

Valuation Date Fiscal Year Ending	July 1, 2018 2020	July 1, 2017 2019
State Basic Normal Cost Rate	2.14%	2.88%
Chapter 133, P.L. 2001 Rate	0.71%	0.69%
UAL Contribution Rate[1]	27.12%	26.59%
Total Statutory Pension Contribution	29.97%	30.16%

[1] Includes UAL contributions due to State ERI programs.

On the following page, Table IV-4 shows the breakdown of the Statutory contributions payable by various State departments and certain State colleges.

SECTION IV – CONTRIBUTIONS

Table IV-4
Fiscal Year Ending 2020 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	$ 78,034	$ 0	$ 78,034
Rowan University	0	0	0	0	65,820	0	65,820
New Jersey University	0	0	0	0	388,040	0	388,040
Kean University	104,170	2,232	742	28,210	202,967	(8,013)	226,138
William Patterson University	390,329	8,363	2,782	105,704	74,943	(30,026)	161,766
Monclair State University	0	0	0	0	160,568	0	160,568
The College of NJ	0	0	0	0	41,270	0	41,270
Stockton State College	0	0	0	0	0	0	0
Total Certain State Colleges	**$ 494,499**	**$ 10,595**	**$ 3,524**	**$ 133,914**	**$ 1,011,642**	**$ (38,039)**	**$ 1,121,636**
State							
Department of Higher Education	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Department of Education	10,053,004	215,388	71,653	2,722,429	2,875,378	(773,326)	5,111,522
County Colleges	561,370	12,028	4,001	152,023	0	(43,183)	124,869
Charter Schools	255,951,835	5,483,837	1,824,295	69,313,669	0	(19,689,066)	56,932,735
Other	10,556,444,089	226,174,650	75,240,977	2,858,763,906	0	(812,053,253)	2,348,126,280
Total State	**$ 10,823,010,298**	**$ 231,885,903**	**$ 77,140,926**	**$ 2,930,952,027**	**$ 2,875,378**	**$ (832,558,828)**	**$ 2,410,295,406**
Total System	**$ 10,823,504,797**	**$ 231,896,498**	**$ 77,144,450**	**$ 2,931,085,941**	**$ 3,887,020**	**$ (832,596,867)**	**$ 2,411,417,042**

APPENDIX A – MEMBERSHIP INFORMATION

The data for this valuation was provided by the Division of Pensions and Benefits as of July 1, 2018. 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

APPENDIX A – MEMBERSHIP INFORMATION

Table A-1
Contributing Active Member Data by Tier

	July 1, 2018	July 1, 2017	% Change		July 1, 2018	July 1, 2017	% Change
Tier 1				**Tier 2**			
Count	81,416	85,615	-4.9%	Count	10,446	10,688	-2.3%
Average Age	49.5	49.0	0.9%	Average Age	41.0	40.1	2.3%
Average Service	19.4	18.7	3.6%	Average Service	10.4	9.4	10.7%
Average Appropriation Pay	$ 87,908	$ 85,534	2.8%	Average Appropriation Pay	$ 68,138	$ 65,400	4.2%
Total Appropriation Payroll	$ 7,157,147,775	$ 7,322,957,003	-2.3%	Total Appropriation Payroll	$ 711,766,029	$ 698,999,887	1.8%
Tier 3				**Tier 4**			
Count	5,184	5,340	-2.9%	Count	3,038	3,124	-2.8%
Average Age	39.9	38.9	2.5%	Average Age	38.0	36.9	2.9%
Average Service	8.9	7.9	12.7%	Average Service	7.7	6.7	14.9%
Average Appropriation Pay	$ 65,799	$ 63,150	4.2%	Average Appropriation Pay	$ 64,481	$ 62,115	3.8%
Total Appropriation Payroll	$ 341,104,057	$ 337,222,479	1.2%	Total Appropriation Payroll	$ 195,893,162	$ 194,047,326	1.0%
Tier 5				**Total**			
Count	41,044	36,221	13.3%	Count	141,128	140,988	0.1%
Average Age	34.6	34.0	1.8%	Average Age	43.9	43.9	0.2%
Average Service	3.6	3.1	15.7%	Average Service	13.5	13.3	1.3%
Average Appropriation Pay	$ 58,902	$ 57,502	2.4%	Average Appropriation Pay	$ 76,693	$ 75,439	1.7%
Total Appropriation Payroll	$ 2,417,593,774	$ 2,082,791,174	16.1%	Total Appropriation Payroll	$ 10,823,504,797	$ 10,636,017,869	1.8%

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

APPENDIX A – MEMBERSHIP INFORMATION

Table A-2
Non-Contributing Member Data by Tier

	July 1, 2018	July 1, 2017	% Change		July 1, 2018	July 1, 2017	% Change
Tier 1				**Tier 2**			
Count	7,932	8,035	-1.3%	Count	1,072	1,103	-2.8%
Average Age	50.3	49.7	1.3%	Average Age	41.0	40.2	2.1%
Average Service	12.4	12.0	2.9%	Average Service	6.9	6.2	11.4%
Average Last Reported Pay	$ 63,060	$ 61,675	2.2%	Average Last Reported Pay	$ 57,230	$ 56,430	1.4%
Total Last Reported Pay	$ 464,817,285	$ 458,063,840	1.5%	Total Last Reported Pay	$ 59,233,360	$ 59,985,417	-1.3%
Tier 3				**Tier 4**			
Count	580	578	0.3%	Count	318	325	-2.2%
Average Age	40.6	39.5	2.6%	Average Age	38.2	37.2	2.4%
Average Service	6.1	5.3	16.3%	Average Service	5.7	5.0	15.2%
Average Last Reported Pay	$ 57,518	$ 54,820	4.9%	Average Last Reported Pay	$ 60,585	$ 57,844	4.7%
Total Last Reported Pay	$ 32,957,741	$ 31,192,706	5.7%	Total Last Reported Pay	$ 19,144,971	$ 18,625,806	2.8%
Tier 5				**Total**			
Count	4,466	3,829	16.6%	Count	14,368	13,870	3.6%
Average Age	36.2	35.9	0.9%	Average Age	44.6	44.4	0.4%
Average Service	2.6	2.2	17.6%	Average Service	8.5	8.4	1.4%
Average Last Reported Pay	$ 55,176	$ 55,898	-1.3%	Average Last Reported Pay	$ 59,805	$ 59,245	0.9%
Total Last Reported Pay	$ 241,558,869	$ 201,848,079	19.7%	Total Last Reported Pay	$ 817,712,226	$ 769,715,848	6.2%

Average pay calculations exclude 695 and 878 members with no reported pay information as of July 1, 2018 and July 1, 2017, respectively.

APPENDIX A – MEMBERSHIP INFORMATION

Table A-3
Inactive Member Data by Status

	July 1, 2018	July 1, 2017	% Change
Retirees			
Count	94,434	92,711	1.9%
Annual Retirement Allowances	$ 4,011,000,750	$ 3,914,034,990	2.5%
Average Retirement Allowance	$ 42,474	$ 42,218	0.6%
Beneficiaries			
Count	6,628	6,316	4.9%
Annual Retirement Allowances	$ 176,461,487	$ 166,622,557	5.9%
Average Retirement Allowance	$ 26,624	$ 26,381	0.9%
Ordinary Disability			
Count	3,372	3,289	2.5%
Annual Retirement Allowances	$ 95,893,508	$ 92,207,746	4.0%
Average Retirement Allowance	$ 28,438	$ 28,035	1.4%
Accidental Disability			
Count	269	264	1.9%
Annual Retirement Allowances	$ 12,090,936	$ 11,796,882	2.5%
Average Retirement Allowance	$ 44,948	$ 44,685	0.6%
In-Pay Total			
Count	**104,703**	**102,580**	2.1%
Annual Retirement Allowances	**$ 4,295,446,681**	**$ 4,184,662,175**	2.6%
Average Retirement Allowance	**$ 41,025**	**$ 40,794**	0.6%
Deferred Vested Members			
Count	219	206	6.3%
Annual Retirement Allowances	$ 3,570,312	$ 3,305,904	8.0%
Average Retirement Allowance	$ 16,303	$ 16,048	1.6%

QDRO benefits included with member records for valuation purposes.

APPENDIX A – MEMBERSHIP INFORMATION

Table A-4
Reconciliation of Plan Membership from July 1, 2017 to July 1, 2018

	Contributing Actives	Non-Contrib. Actives	Deferred Vested	Retired	Disabled	Beneficiaries	Total
1. July 1, 2017	**140,988**	**13,870**	**206**	**92,711**	**3,553**	**6,316**	**257,644**
2. Additions							
a. New entrants	7,085	300					7,385
b. New dependents						9	9
c. Data corrections	32			11	0	114	157
d. Total	7,117	300	0	11	0	123	7,551
3. Reductions							
a. Withdrawals	(669)	(2,085)					(2,754)
b. Died without beneficiary				(1,605)	(80)	(318)	(2,003)
c. Data corrections		(1)	(9)			(10)	(20)
d. Total	(669)	(2,086)	(9)	(1,605)	(80)	(328)	(4,777)
4. Changes in Status							
a. Contributing Actives	1,789	(1,789)	0				0
b. Non-Contributing Actives	(4,488)	4,488					0
c. Deferred Vested		(100)	100				0
e. Retired	(3,472)	(234)	(78)	3,784			0
f. Disabled	(122)	(77)		(1)	200		0
g. Died with beneficiary	(15)	(4)		(466)	(32)	517	0
h. Total	(6,308)	2,284	22	3,317	168	517	0
5. July 1, 2018	**141,128**	**14,368**	**219**	**94,434**	**3,641**	**6,628**	**260,418**

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

QDRO benefits included with member records for valuation purposes.

APPENDIX A – MEMBERSHIP INFORMATION

Table A-5
Age / Service Distribution of Contributing Active Members

Attained Age	Years of Service								
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & up	Total
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Under 30	835	12,306	3,355	12	0	0	0	0	16,508
30 to 34	289	5,260	10,051	3,517	9	0	0	0	19,126
35 to 39	200	2,608	4,012	11,634	3,568	5	0	0	22,027
40 to 44	174	1,927	2,096	4,891	10,291	1,621	3	1	21,004
45 to 49	141	1,613	1,878	3,029	5,753	6,235	1,120	3	19,772
50 to 54	95	963	1,391	2,466	3,269	2,960	3,262	929	15,335
55 & up	101	832	1,364	3,792	6,615	5,359	3,695	5,598	27,356
Total	1,835	25,509	24,147	29,341	29,505	16,180	8,080	6,531	141,128

Table A-6
Age / Service Distribution of Contributing Active Members

Attained Age	Years of Service								
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & up	Total
	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.
Under 30	$ 53,836	$ 55,076	$ 58,830	$ 54,976	$ 0	$ 0	$ 0	$ 0	$ 55,776
30 to 34	57,672	57,344	61,344	67,964	61,722	0	0	0	61,406
35 to 39	59,604	60,192	63,813	72,234	83,701	98,887	0	0	71,023
40 to 44	60,443	61,306	66,805	74,963	87,188	97,851	72,830	64,210	80,531
45 to 49	62,319	62,421	66,297	75,661	87,300	97,743	103,206	110,427	85,512
50 to 54	62,283	61,672	65,305	74,242	85,940	96,025	99,905	102,046	86,409
55 & up	64,876	65,022	67,415	76,015	85,831	92,908	97,609	105,285	89,800
Total	$ 57,392	$ 57,575	$ 62,835	$ 73,181	$ 86,338	$ 95,838	$ 99,303	$ 104,820	$ 76,693

APPENDIX A – MEMBERSHIP INFORMATION

Table A-7
Counts by Age and Status of Inactive Members

Attained Age	Status				
	Retiree	Beneficiary	Ordinary Disability	Accidental Disability	Total
Under 45	0	97	94	5	196
45 to 49	18	58	136	1	213
50 to 54	321	94	191	13	619
55 to 59	2,701	147	328	23	3,199
60 to 64	11,014	363	593	41	12,011
65 to 69	24,341	758	734	60	25,893
70 to 74	24,543	1,204	618	64	26,429
75 to 79	14,610	1,205	372	35	16,222
80 to 84	8,182	1,110	189	19	9,500
85 & up	8,704	1,592	117	8	10,421
Total	94,434	6,628	3,372	269	104,703

Table A-8
Average Retirement Allowances by Age and Status of Inactive Members

Attained Age	Status				
	Retiree	Beneficiary	Ordinary Disability	Accidental Disability	Total
Under 45	$ 0	$ 12,974	$ 26,824	$ 42,783	$ 20,377
45 to 49	40,371	21,085	30,853	41,560	29,048
50 to 54	40,741	20,039	30,088	54,816	34,605
55 to 59	49,128	24,498	30,647	44,039	46,065
60 to 64	44,758	25,801	30,365	48,904	43,488
65 to 69	45,065	28,777	29,089	44,646	44,134
70 to 74	43,642	28,393	28,030	45,600	42,587
75 to 79	41,642	28,352	26,109	45,487	40,307
80 to 84	38,939	28,140	24,746	38,339	37,393
85 & up	31,770	23,701	19,719	23,408	30,395
Total	$ 42,474	$ 26,624	$ 28,438	$ 44,948	$ 41,025

QDRO benefits included with member records for valuation purposes.

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

A. Actuarial Assumptions

1. Investment Rate of Return

7.50% 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

7.50% per annum, compounded annually.

4. Cost-of-Living Adjustments (COLAs

No future COLAs are assumed. Previously granted COLAs are included in the data.

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
0-8	3.80%	4.90%
9-12	4.55	5.45
13	4.30	5.30
14	4.15	4.95
15	3.95	4.55
16	3.40	4.00
17	3.15	3.65
18	2.85	3.45
19	2.70	3.20
20	2.50	3.10
21	2.25	2.75
22	2.00	2.60
23-25	1.90	2.45
26-30	1.70	2.30
31+	1.55	2.00

Salary increases are assumed to occur on October 1.

6. 401(a)(17) Pay Limit

$275,000 in 2018 increasing 2.30% per annum, compounded annually.

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

7. Social Security Wage Base

$128,400 in 2018 increasing 3.30% per annum, compounded annually.

8. Termination

Representative termination rates are as follows:

Less than 10 Years of Service			
Years of Service	Male	Female	
		<Age 40	Age 40+
0	10.23%	9.66%	10.96%
1	7.64	6.80	7.57
2	6.89	6.58	6.85
3	5.12	5.39	5.16
4	3.46	4.76	3.18
5	2.77	4.49	2.75
6	2.09	4.30	2.07
7	1.85	3.98	1.78
8	1.50	3.80	1.38
9	1.25	3.23	1.39

	10-14 Years of Service		15-19 Years of Service		20-24 Years of Service	
Age	Male	Female	Male	Female	Male	Female
30	1.12%	3.07%	0.78%	2.77%	0.45%	0.74%
35	1.05	2.50	0.70	1.87	0.45	0.74
40	0.99	1.56	0.63	0.94	0.44	0.57
45	1.05	0.99	0.61	0.61	0.41	0.36
50	1.10	0.96	0.72	0.64	0.44	0.37
55	1.38	1.41	1.04	0.94	0.67	0.62

No termination is assumed after attainment of retirement eligibility.

Members with 10 or more years of service at termination are assumed to elect a deferred retirement benefit at the following rates:

Age	Male	Female
Under 50	60%	75%
50 – 54	70	75
55 or Older	80	85

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

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

9. Disability

Representative disability rates are as follows:

	Ordinary		Accidental	
Age	Male	Female	Male	Female
25	0.0301%	0.0379%	0.0060%	0.0060%
30	0.0473	0.0550	0.0060	0.0060
35	0.0609	0.0674	0.0060	0.0060
40	0.0701	0.0893	0.0060	0.0060
45	0.1023	0.1317	0.0060	0.0060
50	0.1421	0.1759	0.0060	0.0060
55	0.4686	0.3506	0.0060	0.0060

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.

10. Mortality

Pre-Retirement Mortality: RP-2006 Employee White Collar Mortality Tables, set back 3 years for males and 5 years for females, projected on a generational basis from a base year of 2006 using a 60-year average of improvement rates based on Social Security data from 1953 to 2013.

All pre-retirement deaths are assumed to be ordinary deaths.

Post-Retirement Healthy Mortality: RP-2006 Healthy Annuitant White Collar Mortality Tables, with adjustments as described in the latest experience study, projected on a generational basis from a base year of 2006 using a 60-year average of improvement rates based on Social Security data from 1953 to 2013.

Disabled Mortality: RP-2006 Disabled Retiree Mortality Tables with rates adjusted by 90%. No mortality improvement is assumed for disabled retiree mortality.

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

11. Retirement

Representative retirement rates for Tier 1 members are as follows:

	Less Than Age 55 or Less Than 25 Years of Service		Attainment of Age 55 and 25 Years of Service			
			First Eligible		After First Eligible	
Age	Male	Female	Male	Female	Male	Female
<48	1.20%	1.20%	N/A	N/A	N/A	N/A
48	1.45	1.45	N/A	N/A	N/A	N/A
49	1.65	1.65	N/A	N/A	N/A	N/A
50	1.95	1.95	N/A	N/A	N/A	N/A
51	2.35	2.35	N/A	N/A	N/A	N/A
52	2.75	2.75	N/A	N/A	N/A	N/A
53	3.75	3.75	N/A	N/A	N/A	N/A
54	4.75	4.75	N/A	N/A	N/A	N/A
55	N/A	N/A	15.00%	17.00%	N/A	N/A
56	N/A	N/A	22.00	19.00	12.00%	13.00%
57	N/A	N/A	22.00	19.00	13.00	14.00
58	N/A	N/A	28.00	27.00	14.00	15.00
59	N/A	N/A	28.00	27.00	16.00	17.00
60	7.00	5.00	35.00	33.00	20.00	21.00
61	6.50	5.00	32.00	38.00	22.50	23.00
62	8.00	7.50	45.00	50.00	35.00	32.00
63	9.00	7.50	45.00	50.00	30.00	29.00
64	9.00	7.50	45.00	50.00	30.00	29.00
65	14.00	12.00	50.00	55.00	33.00	33.00
66-70	18.00	15.00	55.00	55.00	30.00	30.00
71-74	19.00	16.00	55.00	55.00	27.00	30.00
75	100.00	100.00	100.00	100.00	100.00	100.00

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

Representative retirement rates for Tier 2 members are as follows:

	Less Than Age 60 or Less Than 25 Years of Service		Attainment of Age 60 and 25 Years of Service			
			First Eligible		After First Eligible	
Age	Male	Female	Male	Female	Male	Female
<48	0.60%	0.60%	N/A	N/A	N/A	N/A
48	0.75	0.75	N/A	N/A	N/A	N/A
49	0.85	0.85	N/A	N/A	N/A	N/A
50	1.00	1.00	N/A	N/A	N/A	N/A
51	1.20	1.20	N/A	N/A	N/A	N/A
52	1.40	1.40	N/A	N/A	N/A	N/A
53	1.90	1.90	N/A	N/A	N/A	N/A
54	2.40	2.40	N/A	N/A	N/A	N/A
55	11.50	11.50	N/A	N/A	N/A	N/A
56	12.00	12.00	N/A	N/A	N/A	N/A
57	12.50	12.50	N/A	N/A	N/A	N/A
58	13.50	13.50	N/A	N/A	N/A	N/A
59	14.00	14.00	N/A	N/A	N/A	N/A
60	7.00	5.00	32.00%	31.00%	N/A	N/A
61	6.50	5.00	32.00	38.00	22.50%	23.00%
62	8.00	7.50	45.00	50.00	35.00	32.00
63	9.00	7.50	45.00	50.00	30.00	29.00
64	9.00	7.50	45.00	50.00	30.00	29.00
65	14.00	12.00	50.00	55.00	33.00	33.00
66-70	18.00	15.00	55.00	55.00	30.00	30.00
71-74	19.00	16.00	55.00	55.00	27.00	30.00
75	100.00	100.00	100.00	100.00	100.00	100.00

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

Representative retirement rates for Tier 3 and Tier 4 members are as follows:

	Less Than Age 62 or Less Than 25 Years of Service		Attainment of Age 62 and 25 Years of Service			
			First Eligible		After First Eligible	
Age	Male	Female	Male	Female	Male	Female
<48	0.55%	0.55%	N/A	N/A	N/A	N/A
48	0.70	0.70	N/A	N/A	N/A	N/A
49	0.75	0.75	N/A	N/A	N/A	N/A
50	0.90	0.90	N/A	N/A	N/A	N/A
51	1.10	1.10	N/A	N/A	N/A	N/A
52	1.25	1.25	N/A	N/A	N/A	N/A
53	1.70	1.70	N/A	N/A	N/A	N/A
54	2.15	2.15	N/A	N/A	N/A	N/A
55	10.50	10.50	N/A	N/A	N/A	N/A
56	10.75	10.75	N/A	N/A	N/A	N/A
57	11.00	11.00	N/A	N/A	N/A	N/A
58	12.00	12.00	N/A	N/A	N/A	N/A
59	12.50	12.50	N/A	N/A	N/A	N/A
60	20.00	20.00	N/A	N/A	N/A	N/A
61	22.00	22.00	N/A	N/A	N/A	N/A
62	30.00	24.00	50.00%	46.00%	N/A	N/A
63	9.00	7.50	45.00	50.00	30.00%	29.00%
64	9.00	7.50	45.00	50.00	30.00	29.00
65	14.00	12.00	50.00	55.00	33.00	33.00
66-70	18.00	15.00	55.00	55.00	30.00	30.00
71-74	19.00	16.00	55.00	55.00	27.00	30.00
75	100.00	100.00	100.00	100.00	100.00	100.00

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

Representative retirement rates for Tier 5 members are as follows:

	Less Than Age 65 or Less Than 30 Years of Service		Attainment of Age 65 and 30 Years of Service			
			First Eligible		After First Eligible	
Age	Male	Female	Male	Female	Male	Female
<48	0.30%	0.30%	N/A	N/A	N/A	N/A
48	0.35	0.35	N/A	N/A	N/A	N/A
49	0.40	0.40	N/A	N/A	N/A	N/A
50	0.45	0.45	N/A	N/A	N/A	N/A
51	0.55	0.55	N/A	N/A	N/A	N/A
52	0.65	0.65	N/A	N/A	N/A	N/A
53	0.85	0.85	N/A	N/A	N/A	N/A
54	1.10	1.10	N/A	N/A	N/A	N/A
55	5.00	5.00	N/A	N/A	N/A	N/A
56	6.00	6.00	N/A	N/A	N/A	N/A
57	7.00	7.00	N/A	N/A	N/A	N/A
58	8.00	8.00	N/A	N/A	N/A	N/A
59	9.00	9.00	N/A	N/A	N/A	N/A
60	15.00	15.00	N/A	N/A	N/A	N/A
61	16.00	16.00	N/A	N/A	N/A	N/A
62	36.00	32.00	N/A	N/A	N/A	N/A
63	28.00	28.00	N/A	N/A	N/A	N/A
64	28.00	28.00	N/A	N/A	N/A	N/A
65	40.00	40.00	50.00%	55.00%	N/A	N/A
66-70	18.00	15.00	55.00	55.00	30.00%	30.00%
71-74	19.00	16.00	55.00	55.00	27.00	30.00
75	100.00	100.00	100.00	100.00	100.00	100.00

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 reported ASF and last known salary. For non-contributing members with incomplete information, the benefit is based on the ASF.

For current beneficiaries with incomplete information, reasonable assumptions were made based on information available in prior years.

Inactive participants receiving benefits according to the 2017 data but omitted from the 2018 data are assumed to have died without a beneficiary.

15. Rationale for Assumptions

The July 1, 2018 valuation results are based on the same actuarial assumptions as used in the July 1, 2017 valuation produced by the prior actuary. The demographic assumptions were based on the July 1, 2012 – June 30, 2015 Experience Study prepared by the prior actuary, which were subsequently approved by the Board of Trustees. The investment return assumption is based on the State Treasurer's recommendation. Cheiron has reviewed the demographic and economic assumptions. While we consider these assumptions to be generally reasonable, we have not yet performed our own actuarial experience study.

16. Changes in Assumptions Since Last Valuation

None.

APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

B. Projection Assumptions

1. Investment Rate of Return

- July 1, 2019 valuation: 7.30% per annum, compounded annually.
- July 1, 2020 valuation: 7.30% per annum, compounded annually.
- July 1, 2021 and later valuations: 7.00% per annum, compounded annually.
- Accumulated deductions with interest are projected at the ultimate investment rate of return of 7.00%.

2. Appropriation Percentages

The State is assumed to appropriate 70% of the Statutory contribution in FYE 2020, and to increase the percent by 10% a year, until reaching 100% of the Statutory contribution beginning with FYE 2023.

3. Administrative Expenses

0.30% of expected pension benefit payments for the year.

4. New Entrants

- Contributing active population assumed to remain at 2018 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 2018 data.
- New entrant salary assumed to increase with the 31+ years of service salary increase rates.

5. Demographic Assumptions

Same as those used for valuation purposes.

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 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.

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, 2018, there are no assets in the BEF.

4. Changes since the last valuation

Based on clarification from the Division of Pensions and Benefits, the actuarial liability is based solely on the formula benefit without any comparison to the value of the estimated member annuity.

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.

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.

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. 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 causes it to increase by 1/7 of 1% each July thereafter until it attains an ultimate rate of 7.5% on July 1, 2018.

9. 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.

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.

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.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

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.

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.

10. 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.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

11. 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.

12. Changes in Plan Provisions Since Last Valuation

None.

APPENDIX D – HISTORICAL DATA

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	Funded Ratio Actuarial + Special Asset Value [1]
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%
2010	25,763,644,836	33,136,475,630	48,417,932,345	53.21%	68.44%
2009	24,973,886,910	34,708,001,341	53,418,328,576	46.75%	64.97%

[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
2019[2]	$ 3,208,116,552	$ 1,118,175,762	$ 807,048,943	$ 1,282,891,847	60.01%
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%
2011	1,826,722,370	0	0	1,826,722,370	0.00%
2010	1,526,168,830	0	0	1,526,168,830	0.00%

[1]Excludes contributions for NCGI

[2]Reflects the State's planned contribution of 60% 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.

APPENDIX E – EARLY RETIREMENT INCENTIVE CONTRIBUTION SCHEDULE

Table E-1
ERI Contribution Schedule - Local Employers

Group	Location Number	Location Name	ERI 1 Information Fiscal Year 2020 Payment	ERI 1 Information Present Value as of 7/1/2018	ERI 2 Information Fiscal Year 2020 Payment	ERI 2 Information Present Value as of 7/1/2018
3	981	NJ Institute of Techonology	$ 24,884	$ 42,322	$ 35,427	$ 340,683
6	911	Allamuchy Board of Education	N/A	N/A	10,013	80,511
6	300	Asbury Park Board of Education	404,153	687,371	N/A	N/A
6	969	Atlantic County Vocational Schools	24,313	41,351	N/A	N/A
6	4015	Berlin Township Board of Education	23,145	39,365	N/A	N/A
6	412	Boonton Township Board of Education	15,762	26,807	N/A	N/A
6	774	Byram Township Board of Education	27,724	47,151	N/A	N/A
6	4017	Chesilhurst Borough Board of Education	3,518	5,984	N/A	N/A
6	4018	Clementon Board of Education	13,093	22,268	N/A	N/A
6	753	Green Brook Board of Education	36,819	62,620	N/A	N/A
6	8082	Guttenberg Board of Education	19,802	33,679	N/A	N/A
6	956	Hudson County Vocational Schools	N/A	N/A	67,258	540,820
6	521	Lakehurst Borough Board of Education	10,345	17,594	N/A	N/A
6	645	Lake and Regional	93,013	158,194	N/A	N/A
6	111	Mercer County Special Services	45,989	78,216	N/A	N/A
6	346	Monmouth Beach Board of Education	12,610	21,447	N/A	N/A
6	987	Monmouth County Vocational Schools	74,410	126,554	N/A	N/A
6	4069	Pine Hill Borough Board of Education	33,477	56,936	N/A	N/A
6	5071	Shiloh Township	1,376	2,340	N/A	N/A
6	8070	West New York Township Board of Education	N/A	N/A	236,175	1,899,077
6	934	White Township Board of Education	26,008	44,233	N/A	N/A
		Total	**$ 890,441**	**$ 1,514,432**	**$ 348,873**	**$ 2,861,091**

Consistent with established methodology, payment amounts calculated using a payment date 21 months after the valuation date.
Present values as of July 1, 2018 exclude expected payments for fiscal year ending 2019.

APPENDIX E – EARLY RETIREMENT INCENTIVE CONTRIBUTION SCHEDULE

Table E-2
ERI Contribution Schedule - State Locations and Local Employers[1]

Group	Location Number	Location Name	ERI 3 Information: Fiscal Year 2020 Payment	ERI 3 Information: Present Value as of 7/1/2018	ERI 4 Information: Fiscal Year 2020 Payment	ERI 4 Information: Present Value as of 7/1/2018
2	90400	Education Department	$ 1,868,979	$ 20,533,362	N/A	N/A
2	90416	Marie Katzenback School for Deaf	332,596	3,654,040	N/A	N/A
2	90207	Office of Adm. Law	78,693	864,558	N/A	N/A
3	981	NJ Institute of Techonology	78,034	857,317	N/A	N/A
4	90411	New Jersey University	388,040	4,263,170	N/A	N/A
4	90412	Kean University	202,967	2,229,874	N/A	N/A
4	90414	Montclair State University	160,568	1,764,067	N/A	N/A
4	90410	Rowan University	65,820	723,129	N/A	N/A
4	90415	The College of New Jersey	41,270	453,409	N/A	N/A
4	90413	William Paterson University	74,943	823,353	N/A	N/A
4	8083	Harrison Township Board of Education	N/A	N/A	196,665	334,482
6	956	Hudson County Vocational Schools	N/A	N/A	155,022	263,656
6	620	Passaic Board of Education	N/A	N/A	2,427,239	4,128,168
		Total	**$ 3,291,910**	**$ 36,166,279**	**$ 2,778,926**	**$ 4,726,306**

[1] ERI 3 is applicable to State locations, and ERI 4 is applicable to Local employers.

Consistent with established methodology, payment amounts calculated using payment dates 24 and 21 months after the valuation date for State and Local employers, respectively.
Present values as of July 1, 2018 exclude expected payments for fiscal year ending 2019.

APPENDIX E – EARLY RETIREMENT INCENTIVE CONTRIBUTION SCHEDULE

Table E-3
ERI Contribution Schedule - State Locations

Group	Location Number	Location Name	ERI 5 Information Fiscal Year 2020 Payment	ERI 5 Information Present Value as of 7/1/2018
2	90400	Education Department	$ 460,419	$ 5,058,347
2	90416	Marie Katzenback School for Deaf	134,691	1,479,772
		Total	**$ 595,110**	**$ 6,538,119**

Consistent with established methodology, payment amounts calculated using a payment date 24 months after the valuation date.
Present values as of July 1, 2018 exclude expected payments for fiscal year ending 2019.

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:

Amount		Probability of Payment		1/(1+Investment Return)		
$100	x	(1 - .01)	x	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.

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.