

Public School Teachers' Pension and Retirement Fund of Chicago

Actuarial Valuation Report as of June 30, 2019



October 9, 2019

Board of Trustees
Public School Teachers' Pension and Retirement Fund of Chicago
203 North LaSalle Street, Suite 2600
Chicago, Illinois 60601

**Re: Public School Teachers' Pension and Retirement Fund of Chicago Actuarial Valuation as of
June 30, 2019**

Dear Members of the Board:

The results of the June 30, 2019, Annual Actuarial Valuation of the Public School Teachers' Pension and Retirement Fund of Chicago (commonly known as the Chicago Teachers' Pension Fund, "CTPF" or "Fund") are presented in this report.

This report was prepared at the request of the Board and is intended for use by the Fund and those designated or approved by the Board. This report may be provided to parties other than the Fund only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

The purposes of the actuarial valuation are to measure the Fund's funding progress, and to determine the contribution requirements for the fiscal year beginning July 1, 2020, and ending June 30, 2021. The employer's contribution requirement has been determined in accordance with Illinois State Statutes, in particular under 40 ILCS Sections 5/17-127, 5/17-127.2, and 5/17-129. Information required by Governmental Accounting Standards Board ("GASB") Statement Nos. 67 and 68 is provided in a separate report. This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different.

The contribution requirement in this report is determined using the actuarial assumptions and methods disclosed in Section G of this report. This report includes risk metrics beginning on page 17, but does not include a more robust assessment of the risks if future experience deviates from the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

This actuarial valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

The findings in this report are based on data and other information through June 30, 2019. The actuarial valuation was based upon information furnished by CTPF staff, concerning Retirement Fund benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by CTPF staff.

This report was prepared using actuarial assumptions adopted by the Board as authorized under the Illinois Pension Code. The actuarial assumptions used for the June 30, 2019 actuarial valuation are based on an experience study for the five-year period from July 1, 2012 through June 30, 2017, the 2018 investment return assumption review and the 2019 Actuarial Assumption Study, performed by GRS. All actuarial assumptions used in this report are reasonable for the purposes of this actuarial valuation. Additional information about the actuarial assumptions is included in Section G of this report entitled Actuarial Methods and Assumptions.

The benefit provisions for members hired on or after January 1, 2011, were changed under Public Act 96-0889. Public Act 100-0023 created a third tier of benefits for new members provided that adoption by a resolution or ordinance occurs. Given this uncertainty, GRS has not valued the benefits provided under Public Act 100-0023. Members hired on or after this date and the assumed new hires in the projections were valued under Public Act 96-0889 benefit provisions.

Although the statutory contribution requirements were met, in our opinion the statutory funding method generates a contribution requirement that is less than a reasonable actuarially determined contribution ("ADC"). Meeting the statutory requirement does not mean that the undersigned agree that adequate actuarial funding has been achieved. We recommend the adherence to a funding policy, such as the Board policy used to calculate the ADC under GASB Statement Nos. 67 and 68, which funds the normal cost of the plan as well as an amortization payment that seeks to pay off 100 percent of the unfunded accrued liability over a closed period of 30 years, beginning July 1, 2013.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents the actuarial position of the CTPF as of the actuarial valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

Lance J. Weiss and Amy Williams are Members of the American Academy of Actuaries and meet the American Academy of Actuaries Qualification Standards to render the actuarial opinions contained herein.

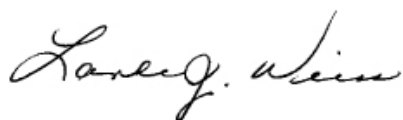
The signing actuaries are independent of the plan sponsor.



Gabriel, Roeder, Smith & Company will be pleased to review this actuarial valuation and report with the Board of Trustees and to answer any questions pertaining to the actuarial valuation.

Respectfully submitted,

GABRIEL, ROEDER, SMITH & COMPANY



Lance J. Weiss, EA, MAAA, FCA
Senior Consultant and Team Leader



Amy Williams, ASA, MAAA, FCA
Senior Consultant

Table of Contents

<u>Page</u>	
1	<u>Section A - Executive Summary</u>
	<u>Section B - Summary of the Actuarial Valuation</u>
2	Introduction
2	Assumptions and Methods
2-3	Report Highlights
3-4	Experience during 2019
4-5	Asset Information
5	Funding Status
6	Appropriation Requirements under P.A. 90-0655, P.A. 91-0357, P.A. 96-0889 and P.A. 100-0465
7-9	Employer Contribution Requirement for Fiscal Year 2021
10	Method of Calculation for Appropriation Requirements
11-16	Recommendations and Future Considerations
17-19	Risks Associated with Measuring the Accrued Liability and Total Required Employer Contribution
	<u>Section C - Actuarial Determinations</u>
20-21	Table 1 — Results of Actuarial Valuation as of June 30, 2019
22	Table 2 — Components of Actuarial Accrued Liability and Normal Cost by Tier
23	Table 3 — Analysis of Change in Unfunded Actuarial Accrued Liability
24	Table 4 — Analysis of Financial (Gains) and Losses in Unfunded Actuarial Accrued Liability for Fiscal Year Ending June 30, 2019
25	Graph 1 — Financial (Gains) and Losses in Unfunded Actuarial Accrued Liability for Fiscal Year Ending June 30, 2019, by Source
26	Table 5a — Historical Financial (Gains) and Losses in Unfunded Actuarial Accrued
27	Table 5b — Historical Normal Cost Amounts (\$ and % of Pay)
	<u>Section D - Actuarial Projections</u>
28-29	Table 6 — Baseline Projections
30	Graph 2 — Projected Actuarial Accrued Liabilities
31	Graph 3 — Projected Benefit Payments
32	Graph 4 — Projected Statutory Contributions vs. Contributions under Alternate Policy
33	Graph 5 — Actual and Projected Employer Contributions
	<u>Section E - Fund Assets</u>
34	Table 7 — Statement of Fiduciary Net Position for Years Ended June 30, 2019, and 2018
35	Table 8 — Statement of Changes in Fiduciary Net Position for Years Ended June 30, 2019, and 2018
36	Table 9 — Development of the Actuarial Value of Assets
37	Graph 6 — Historical Asset Values from June 30, 2010 — 2019
38	Table 10 — Historical Investment Returns

Table of Contents

Page

Section F - Participant Data

39	Graph 7 — Active Members Classified by Age and Service
40	Graph 8 — Retirees Classified by Benefit Amount and Age
41	Table 11 — Summary of Fund Membership
42	Table 12 — Member Population and Ratio of Non-Actives to Actives
43	Table 13 — Total Lives and Annual Salaries of Active Members Classified by Age and Years of Service as of June 30, 2019
44	Table 14 — Reconciliation of Member Data as of June 30, 2019
45	Table 15 — History of Retirees and Beneficiaries Added to Rolls During Fiscal Year
46	Table 16 — Number of Annuitants Classified by Benefit Type and Amount as of June 30, 2019
47	Table 17 — Initial Year of Retirement Analysis

48-58 **Section G - Actuarial Methods and Assumptions**

59-65 **Section H - Summary of Plan Provisions**

66-68 **Section I - Glossary of Terms**

Section J - Additional Projection Details

69	Table 18 — Projection of the Actuarial Accrued Liability
70	Table 19 — Projection of Benefit Payments
71	Table 20 — Administrative Expenses and Health Insurance Subsidy
72	Table 21 — Projection of Active Population, Payroll, Employee Contributions and Normal Costs

SECTION A

EXECUTIVE SUMMARY

Executive Summary

Actuarial Valuation Date:	June 30, 2019	June 30, 2018
Required Employer Contributions for Fiscal Year Ending:	June 30, 2021	June 30, 2020
Estimated Required Employer Contributions:		
· Required Board of Education Contributions	\$ 605,852,000	\$ 584,504,000
· Additional Board of Education Contributions (0.58 percent of pay)	13,149,000	12,647,000
· Additional State Contributions (0.544 percent of pay)	12,333,000	11,862,000
· State Contributions Pursuant to P.A. 100-0465 (Normal Cost) ^a	254,560,000	245,487,000
· Total Required Employer Contributions	\$ 885,894,000	\$ 854,500,000
· Percentage of Projected Capped Payroll	39.076%	39.187%
Actuarial Valuation Date:	June 30, 2019	June 30, 2018
Actuarial Information for Fiscal Year Ending:	June 30, 2020	June 30, 2019
Actuarially Determined Contribution^b as of the Actuarial Valuation Date:		
· Annual Amount	\$ 1,147,030,511	\$ 1,097,170,031
· Percentage of Projected Capped Payroll for Upcoming Year	52.07%	51.80%
Membership:		
· Number of		
- Active Members ^c	29,295	28,958
- Members Receiving Payments	28,317	28,549
- Vested Former Members Eligible for Deferred Benefits	9,926	9,398
- Non-vested Former Members Eligible for Refunds Only	20,621	20,282
- Total	88,159	87,187
· Covered Payroll as of the Actuarial Valuation Date	\$ 2,196,918,127	\$ 2,111,982,104
· Projected Capped Payroll for Upcoming Year	\$ 2,203,055,500	\$ 2,118,062,176
· Projected Capped Payroll for Upcoming Year + 1	\$ 2,267,106,915	\$ 2,180,577,527
· Annualized Benefit Payments	\$ 1,469,042,542	\$ 1,444,085,794
Assets:		
· Market Value of Assets (MVA)	\$ 11,038,837,459	\$ 11,104,765,514
· Actuarial Value of Assets (AVA)	\$ 11,021,811,634	\$ 10,969,085,523
· Approximate Return on Market Value of Assets	4.75%	8.54%
· Approximate Return on Actuarial Value of Assets	5.92%	5.84%
· Ratio – Actuarial Value of Assets to Market Value of Assets	99.85%	98.78%
Basic Results:		
· Total Normal Cost Amount (Including Admin. Expenses)	\$ 382,994,837	\$ 366,153,498
· Employer's Normal Cost Amount (Including Admin. Expenses)	\$ 184,719,842	\$ 175,527,902
· Employer's Normal Cost Amount (Including Admin. Expenses and Health Insurance Subsidy) ^d	\$ 249,719,842	\$ 240,527,902
· Actuarial Accrued Liability (AAL)	\$ 23,252,163,307	\$ 22,922,992,558
· Unfunded Actuarial Accrued Liability (UAAL)	\$ 12,230,351,673	\$ 11,953,907,035
· Funded Ratio based on Actuarial Value of Assets	47.40%	47.85%
· UAAL as % of Covered Payroll	556.70%	566.00%
· Funded Ratio based on Market Value of Assets	47.47%	48.44%

^a State Normal Cost contribution represents the projected employer Normal Cost for fiscal years 2020 and 2021, including \$65 million for the health insurance subsidy.

^b The policy adopted by the Board calculates the Actuarially Determined Contribution (ADC) as the Normal Cost plus a 30-year level percent of payroll closed-period (beginning June 30, 2013) amortization of the Unfunded Accrued Liability. As of June 30, 2019, the remaining amortization period is 24 years. The ADC is used for financial reporting purposes only.

^c Active count excludes members expected to be hired to replace retirements and terminations that occurred in June.

^d Used for calculation of the ADC.

SECTION B

SUMMARY OF THE ACTUARIAL VALUATION

Summary of the Actuarial Valuation

Introduction

The law governing the Public School Teachers' Pension and Retirement Fund of Chicago requires the Actuary, as the technical advisor to the Board of Trustees to determine the amount of Board of Education contributions required for each fiscal year.

“The Board Shall determine the amount of Board of Education contributions required for each fiscal year on the basis of the actuarial tables and other assumptions adopted by the Board and the recommendations of the actuary, in order to meet the minimum contribution requirements of subsections (a) and (b). Annually, on or before February 28, the Board shall certify to the Board of Education the amount of the required Board of Education contribution for the coming fiscal year. The certification shall include a copy of the actuarial recommendations upon which it is based. (40 ILCS Section 5/17 - 129(c)).”

Gabriel, Roeder, Smith & Company has been retained by the CTPF Board of Trustees to perform an actuarial valuation as of June 30, 2019. In this report, we present the results of the actuarial valuation and the appropriation requirements under Public Act 96-0889, Public Act 90-0655, Public Act 91-0357, and Public Act 100-0465 for the fiscal year ending June 30, 2021.

Accounting information required by GASB Statement Nos. 67 and 68 is provided in a separate report.

The actuarial valuation was completed based upon membership and financial data provided by the administrative staff of the CTPF. The cost method used to determine the benefit liabilities for statutory funding is the Projected Unit Credit Cost Method as required by statute. For actuarial valuation purposes, as well as for projection purposes, the actuarial value of assets is based on a four-year smoothing method.

Assumptions and Methods

The actuarial assumptions used for the June 30, 2019 actuarial valuation remain unchanged from the last actuarial valuation as of June 30, 2018. The actuarial assumptions were adopted by the Board (including CPS's requested modifications) during the September 20, 2018, Board meeting, and were based on the recommendations from the experience study for the five-year period from July 1, 2012 through June 30, 2017, the 2018 investment return assumption review performed by GRS, and the requested modifications of Chicago Public Schools (“CPS”).

The actuarial assumptions can be found in Section G of the report.

Report Highlights

The employer's contribution requirement for FY 2021 is \$885.9 million. The 2018 actuarial valuation had projected the statutory contribution would increase from \$854.5 million for FY 2020 to \$877.1 million for FY 2021. The key reason for the \$8.8 million increase in the employer's contribution requirement of \$885.9 million over the projected amount from the prior actuarial valuation of \$877.1 million is unfavorable investment experience.

Summary of the Actuarial Valuation

Over the past 10 years, CTPF experienced investment gains on a market value basis (compared to the actuarial assumption) in fiscal years 2010, 2011, 2013, 2014, 2017 and 2018. However, CTPF incurred investment losses (or shortfalls in return compared to the actuarial assumption) in fiscal years 2012, 2015, 2016 and 2019. The return on market value for the year ending June 30, 2019, was approximately 4.75 percent compared to a return of 8.54 percent in FY 2018. The average market value investment return over the most recent 10 years has been approximately 9.54 percent. Table 10 on page 38 provides historical investment returns (on an MVA and AVA basis) over the past 25 years.

The funded ratio decreased from 48.4 percent as of June 30, 2018 to 47.5 percent as of June 30, 2019, based on the market value of assets, and decreased from 47.9 percent as of June 30, 2018, to 47.4 percent as of June 30, 2019, based on the actuarial value of assets. There are net deferred asset gains of \$21.8 million which will be recognized in the actuarial value of assets over the next three years.

The funded ratio and unfunded actuarial accrued liability are useful for assessing the need for and amount of future contributions other than normal cost contributions. They are not appropriate, however, for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

Experience during 2019

The Fund assets earned approximately 4.75 percent on a market value basis during FY 2019 which was less than the investment return assumption of 7.00 percent for FY 2019. The Fund assets earned approximately 5.92 percent on an actuarial value of assets basis during FY 2019, due to recognition of net deferred investment losses under the asset smoothing method. Since 5.92 percent is less than the assumed rate of investment return of 7.00 percent for FY 2019, there was an asset loss of \$91.71 million on the actuarial value of assets.

There was also a net gain of \$80.12 million from actuarial liabilities, which is comprised of a gain of approximately \$17.26 million from demographic experience, and a gain of \$62.86 million from lower than expected pay increases.

Summary of the Actuarial Valuation

The total loss from liabilities for the Fund is calculated as follows (dollars in millions):

1. Actuarial Accrued Liability ("AAL") - Prior Year (Pensions Only)	\$	22,922.99
2. Total Normal Cost - Prior Year ^a		366.15
3. Benefits and Administrative Expenses Paid in FY 2019 ^b		(1,521.72)
4. Interest on the above items, 1, 2 and 3		1,564.85
5. Expected AAL 06/30/2019 (1+2+3+4)		23,332.28
6. Impact of Change in Actuarial Assumptions and Methods		-
7. Expected AAL 06/30/2019 After Assumption Changes (5+6)		23,332.28
8. Actual AAL 06/30/2019		23,252.16
9. Actuarial (Gain)/Loss on Liabilities (8-7) (Pensions Only)	\$	(80.12)

^aTotal Normal Cost from the previous actuarial valuation includes both employee and employer portion. The employee portion is based on actual contributions.

^bIncludes refund of insurance premiums.

Numbers may not add due to rounding.

CTPF experienced an overall actuarial loss of \$11.59 million. The total net actuarial loss is the total of the loss from assets and the net gain from liabilities. The total actuarial loss for the year is as follows (dollars in millions):

1. Actuarial (Gain)/Loss on Assets	\$	91.71
2. Actuarial (Gain)/Loss on Liabilities		(80.12)
3. Total Actuarial (Gain)/Loss (1+2)		11.59

The experience of the population determines the liability gain or loss for the year. There was a gain on salaries, due to lower salary increases than assumed. From the last year to this year, there were small gains or losses on retirement, disability experience, active mortality and retiree mortality. There was a gain due to termination experience, and there was a new entrant loss. New entrant losses will occur each year but are offset by additional contributions to the assets. Deviations from other assumptions generated an actuarial gain.

See Table 4 (page 24), Section C, for detail of the gains and losses by source.

Asset Information

The market value of the assets of the Fund that are available for benefits decreased from \$11,104.8 million as of June 30, 2018, to \$11,038.8 million as of June 30, 2019. The actuarial value of assets as of June 30, 2019, is \$11,021.8 million, which is \$17.0 million lower than the market value of assets. This difference is due to the continuing recognition of deferred investment gains and losses. Twenty-five percent of these gains and losses are recognized each year. There are net deferred asset gains of \$21.8 million which will be recognized in the actuarial value of assets over the next three years (a \$95.5 million gain in FY 2020, a \$19.1 million loss in FY 2021 and a \$54.7 million loss in FY 2022).

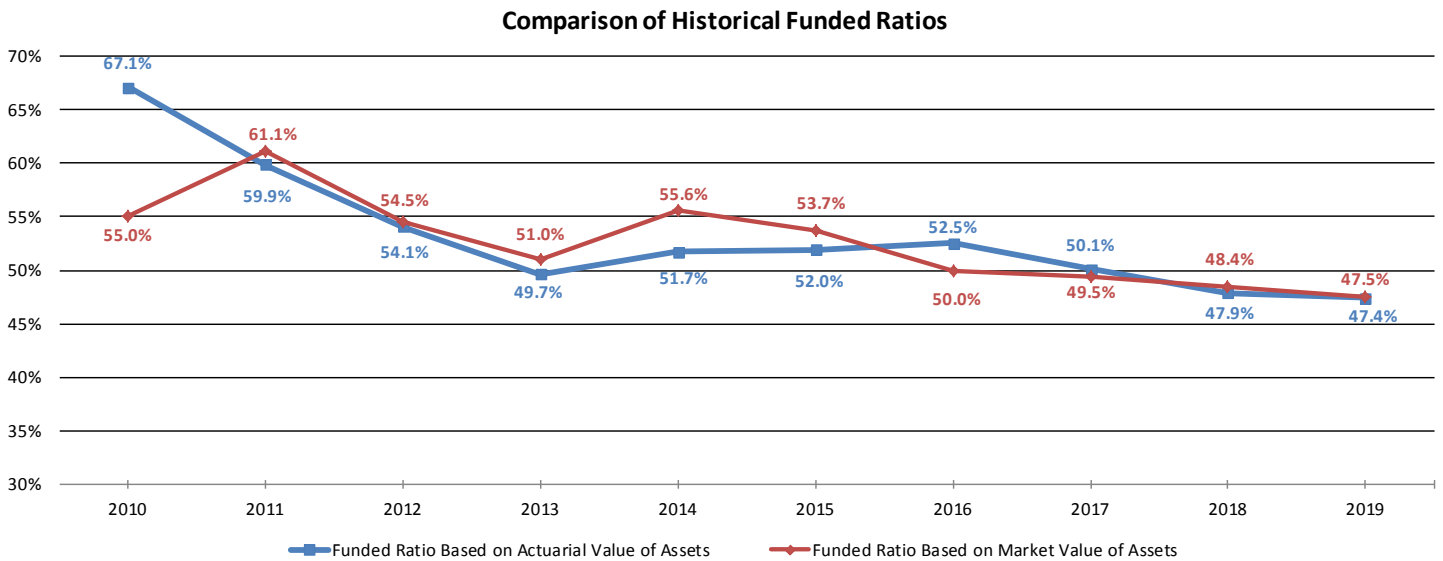
Summary of the Actuarial Valuation

The detailed determinations of asset values utilized in this valuation and the change in assets in the last year are set out in Section E.

Funding Status

The funding status of CTPF is measured by the Funded Ratio. The Funded Ratio is the ratio of the assets available for benefits compared to the actuarial accrued liability of the Fund. Thus, it reflects the portion of benefits earned to date by CTPF members, which are covered by current Fund assets. A funded ratio of 100 percent means that all of the benefits earned to date by CTPF members are covered by assets. By monitoring changes in the funded ratio each year we can determine whether or not funding progress is being made.

Below is a comparison of funded ratios determined on a market value basis and an actuarial value basis over the last 10 years.



Appropriation Requirements under P.A. 90-0655, P.A. 91-0357, P.A. 96-0889 and P.A. 100-0465

The law governing the Fund under P.A. 96-0889 provides that:

For fiscal years 2014 through 2059, the minimum contribution to the Fund to be made by the Board of Education in each fiscal year shall be an amount determined by the Fund to be sufficient to bring the total assets of the Fund up to 90 percent of the total actuarial liabilities of the Fund by the end of fiscal year 2059. In making these determinations, the required Board of Education contribution shall be calculated each year as a level percentage of the applicable employee payrolls over the years remaining to and including fiscal year 2059 and shall be determined under the Projected Unit Credit actuarial cost method. Beginning in fiscal year 2060, the minimum Board of Education contribution for each fiscal year shall be the amount needed to maintain the total assets of the Fund at 90 percent of the total actuarial liabilities of the Fund.

The above calculation provides the basis for calculating the appropriation requirements under P.A. 96-0889. Beginning in State fiscal year 1999, P.A. 90-0655 provides additional State contributions of 0.544 percent of the Fund's total teacher payroll to the Fund to offset the portion of the cost of benefit increases enacted under P.A. 90-0582, except that no additional contributions are required if the Board has certified in the previous fiscal year that the Fund is at least 90 percent funded.

Pursuant to P.A. 91-0357, beginning on and after July 1, 1999, the Board of Education shall make additional contributions of 0.58 percent of the Fund's total teacher payroll to the Fund to offset the portion of the cost of benefit increases enacted under P.A. 90-0582, except that no additional contributions are required if the Board has certified in the previous fiscal year that the Fund is at least 90 percent funded.

Pursuant to P.A. 100-0465, beginning with fiscal year 2018, the State shall contribute for each fiscal year an amount to be determined by the Fund, equal to the employer normal cost for that fiscal year, plus the retiree health insurance reimbursement subsidy. In addition, the Board of Education's property tax levy capped rate was increased from 0.383 percent to 0.567 percent, with proceeds dedicated solely for CTPF.

According to Section 17-129(b)(vii) of the Illinois Pension Code, any contribution by the State to or for the benefit of the Fund, shall be a credit against any contribution required to be made by the Board of Education.

Employer Contribution Requirement for Fiscal Year 2021

The funded ratio as of the June 30, 2019 actuarial valuation on an actuarial value basis is 47.4 percent. Therefore, additional contributions by the Board of Education and State will be required for fiscal year 2021. The projected payroll for fiscal year 2021 is \$2,267,106,915. Based on the projected payroll for fiscal year 2021, and the additional State and Board of Education contribution rates of 0.544 percent and 0.58 percent of payroll, respectively, the additional State and Board of Education contributions for fiscal year 2021 are as follows:

Development of Additional Contributions under Section 17-127 and 17-127.2 of the Illinois Pension Code	Fiscal Year 2021	Fiscal Year 2020
Projected Total Capped Payroll	\$ 2,267,106,915	\$ 2,180,577,527
Additional State Contributions under Section 17-127 of Illinois Pension Code (% of Projected Capped Payroll)	\$ 12,333,000 0.544%	\$ 11,862,000 0.544%
Additional Board of Education Contributions Under Section 17-127.2 of the Illinois Pension Code (% of Projected Capped Payroll)	\$ 13,149,000 0.580%	\$ 12,647,000 0.580%

Pursuant to P.A. 100-0465, the State shall contribute for each fiscal year an amount to be determined by the Fund, equal to the employer normal cost for that fiscal year, plus the retiree health insurance reimbursement subsidy. The following table provides the development of the State contribution requirement under P.A. 100-0465:

Development of Normal Cost State Contributions under Section 17-127(d)(1) of the Illinois Pension Code	Fiscal Year 2021	Fiscal Year 2020*
Total Normal Cost	\$ 364,412,000	\$ 355,394,000
Projected Administrative Expenses	<u>29,188,000</u>	<u>27,600,000</u>
Total Normal Cost Including Administrative Expenses	\$ 393,600,000	\$ 382,994,000
Expected Employee Contributions	<u>204,040,000</u>	<u>198,275,000</u>
Employer Normal Cost	\$ 189,560,000	\$ 184,719,000
Health Insurance Subsidy	<u>65,000,000</u>	<u>65,000,000</u>
State Contributions Under Section 17-127(d)(1) of the Illinois Pension Code	\$ 254,560,000	\$ 249,719,000

*Fiscal year 2020 numbers are presented for illustrative and comparative purposes only. They are only used to develop the Actuarially Determined Contribution (ADC).

Employer Contribution Requirement for Fiscal Year 2021

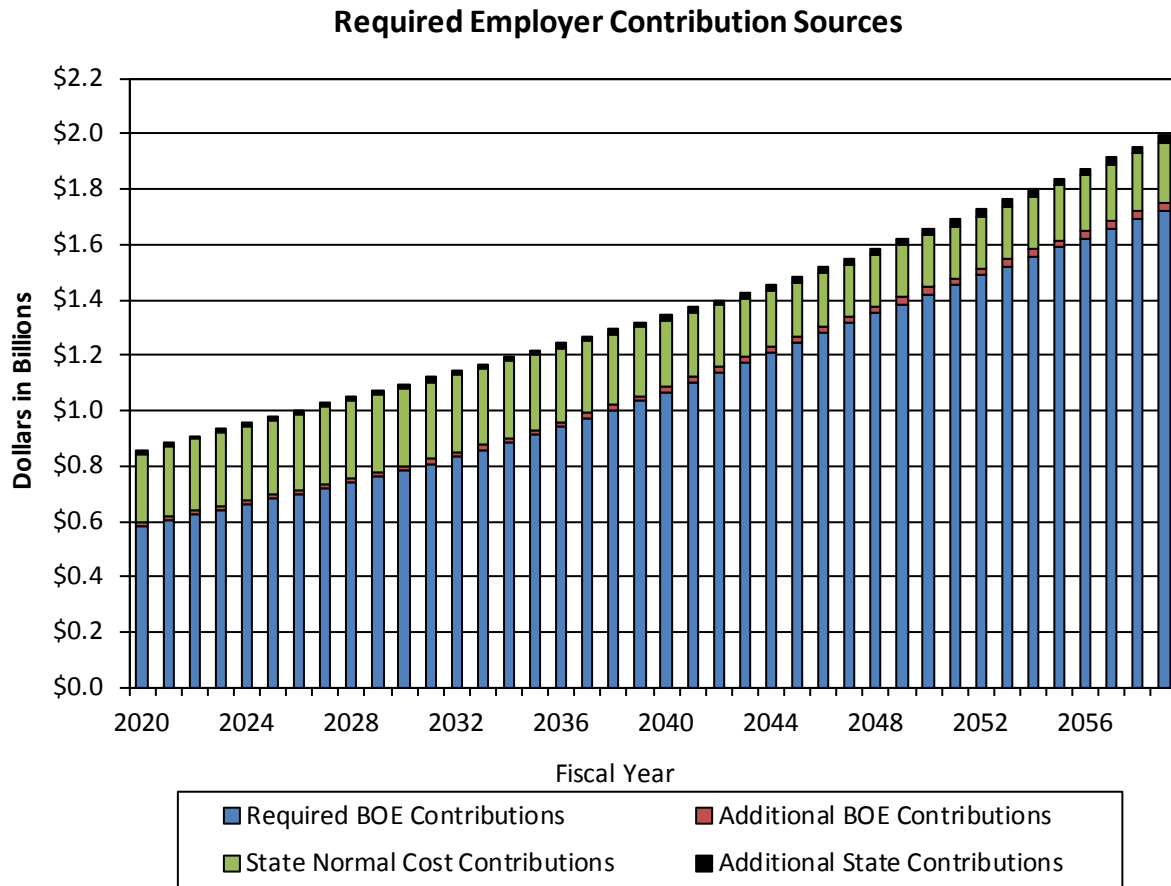
Pursuant to P.A. 96-0889, the Board of Education contribution requirement in each fiscal year shall be an amount determined by the Fund to be sufficient to bring the total assets of the Fund up to 90 percent of the total actuarial liabilities of the Fund by the end of fiscal year 2059. In making these determinations, the required Board of Education contribution shall be calculated each year as a level percentage of the applicable employee payrolls over the years remaining to and including fiscal year 2059 and shall be determined under the Projected Unit Credit actuarial cost method. Based on the funding projections provided in Section D of this report, the Board of Education's required contribution for fiscal year 2021 is equal to \$605,852,000, (net of Additional State and Board of Education Contributions).

The fiscal year ending June 30, 2020, and June 30, 2021, certified contribution requirements and projected future year required contribution amounts are shown below:

Fiscal Year Ending June 30,	Required Board of Education Contributions	Additional Board of Education Contributions	Additional State Contributions	State Contributions Pursuant to P.A. 100-0465	Total Required Employer Contributions
2020	\$584,504,000	\$ 12,647,000	\$ 11,862,000	\$245,487,000	\$ 854,500,000
2021	605,852,000	13,149,000	12,333,000	254,560,000	885,894,000
2022	623,477,000	13,494,000	12,656,000	259,474,000	909,101,000
2023	641,557,000	13,840,000	12,981,000	264,061,000	932,439,000
2024	660,406,000	14,189,000	13,308,000	268,032,000	955,935,000
2025	679,692,000	14,537,000	13,635,000	271,520,000	979,384,000
2026	699,333,000	14,882,000	13,959,000	274,490,000	1,002,664,000
2027	719,494,000	15,228,000	14,283,000	276,941,000	1,025,946,000
2028	740,365,000	15,575,000	14,608,000	278,746,000	1,049,294,000
2029	761,898,000	15,921,000	14,933,000	279,879,000	1,072,631,000
2030	784,639,000	16,275,000	15,265,000	280,288,000	1,096,467,000

Employer Contribution Requirement for Fiscal Year 2021

The following graph details the projected employer contribution requirements by Source for fiscal years 2020 through 2059.



Method of Calculation for Appropriation Requirements

The actuarial valuation results are based on the Projected Unit Credit actuarial cost method, the data provided and actuarial assumptions used for the June 30, 2019 actuarial valuation. In order to determine projected contribution amounts, the following additional assumptions were used:

- Total employer contributions of \$854,500,000 for fiscal year 2020.
- Administrative expenses of \$26,099,731 for fiscal year 2019, as provided by the Fund. Administrative expenses are assumed to increase 5.75 percent annually for the first 15 years and then increase in line with projected capped payroll after 15 years.
- New entrants whose average age is 32.22 and average pay is \$48,984 (2019 dollars).
- The active member population is assumed to remain level at 29,437 (includes 142 expected new hires) for all years of the 40-year projection. The projection is based on assuming that new active members are hired to replace the current members who leave active membership (through termination, retirement, death or disability). As shown in Table 12 on page 42, the number of active members decreased by about 10 percent between 2008 and 2017, which is an average annualized decrease of about 1.0 percent. The number of actives increased in 2018 by less than 1.0 percent and increased again in 2019 by 1.2 percent. We will continue to review the assumption regarding the projected active member population annually.
- Projected benefits for members hired on or after January 1, 2011, are based on the new provisions established in P.A. 96-0889.
- Additional State contributions of 0.544 percent of pay are assumed to occur mid-year.
- State contributions of the employer's normal cost (includes administrative expenses and \$65 million health insurance subsidy) are assumed to occur mid-year.
- Additional Board of Education contributions of 0.58 percent of pay are assumed to occur end of year.
- 55 percent of the Board of Education's previous year's special tax levy is assumed to occur March 1st each year. This amount is equal to \$180,612,283 in fiscal year 2020 and is assumed to increase three percent per year.
- The remaining Board of Education required contribution is assumed to occur end of year.

The average increase in total uncapped payroll for the 40-year projection period is approximately 3.00 percent per year. It is important to note that benefits for new hires are based on capped payroll which is ultimately projected to grow at 1.25 percent per year. All results in this actuarial valuation assume that employer contributions will be made on capped pay.

Recommendations and Future Considerations

Measuring the statutory contribution against a policy such as the Actuarially Determined Contribution (“ADC”) helps evaluate the funding adequacy of the current statutory funding method. Therefore, the Board adopted a policy to calculate the ADC. Under this policy, the ADC is calculated as the Normal Cost plus a 30-year level percent of payroll closed-period amortization of the Unfunded Accrued Liability as of June 30, 2013. The remaining amortization period as of June 30, 2019, actuarial valuation is 24 years.

A key objective of the ADC is to accrue costs over the working lifetime of plan members to ensure that benefit obligations are satisfied and intergenerational equity is promoted. Although the ADC is solely an accounting provision, in certain circumstances it could represent a reasonable annual funding target and therefore is used by some plan sponsors as their “de facto” funding requirement. Note that the statutory funding policy differs significantly from the ADC approach, and results in “back-loading,” meaning that contributions are deferred into the future. Back-loading could result in an underfunding of the fund.

The ADC for fiscal years 2019 and 2020, as well as the statutory employer contribution for fiscal years 2019 and 2020, are shown below as a percentage of projected capped payroll. The ADC for 2019 and statutory employer contribution for 2020 are based on the results of the June 30, 2018, actuarial valuation.

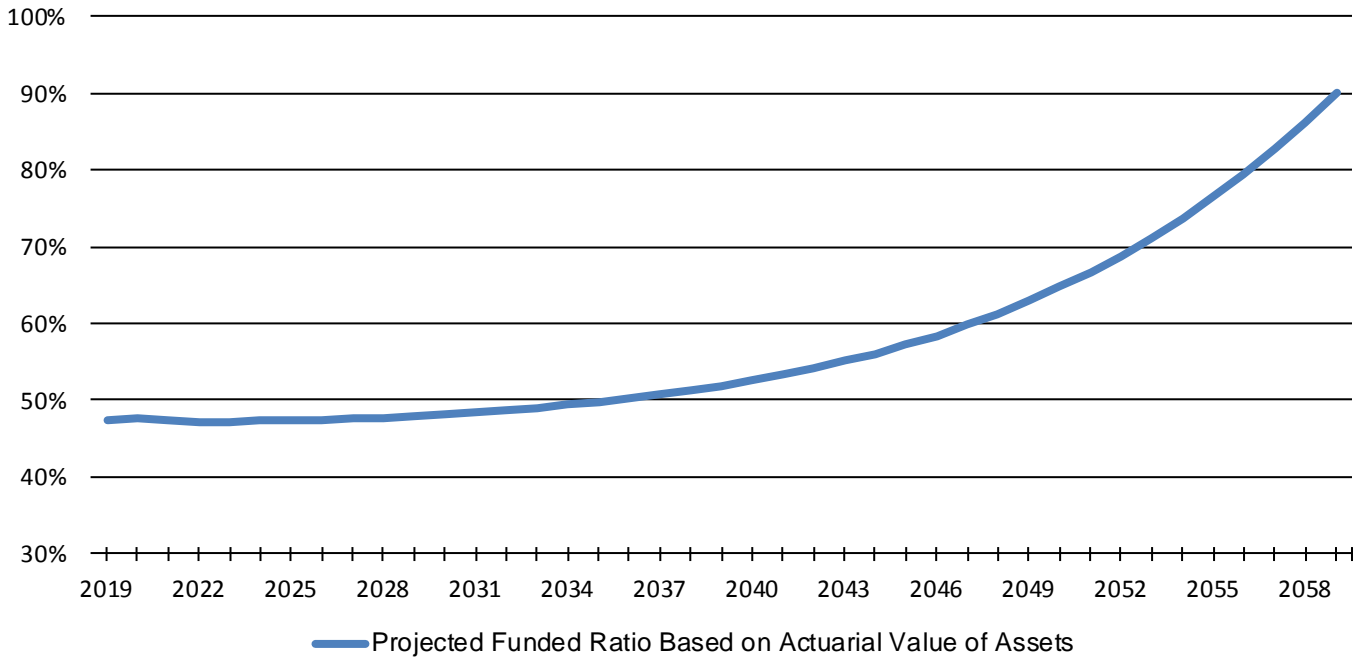
Actuarial Valuation Date:	June 30, 2019	June 30, 2018
Actuarially Determined Contributions for Fiscal Year Ending:	June 30, 2020	June 30, 2019
1. Actuarial Accrued Liability	\$ 23,252,163,307	\$ 22,922,992,558
2. Actuarial Value of Assets	\$ 11,021,811,634	\$ 10,969,085,523
3. Unfunded Actuarial Accrued Liability (1. – 2.)	\$ 12,230,351,673	\$ 11,953,907,035
4. Employer Normal Cost (Including Administrative Expenses and Health Insurance Subsidy)	\$ 249,719,842	\$ 240,527,902
5. Employer Normal Cost Adjusted for Contribution Timing	\$ 254,477,830	\$ 245,621,046
6. Amount to Amortize the Unfunded Liability over a 30-year Closed-period, Beginning July 1, 2013, as a Level Percentage of Payroll	<u>\$ 892,552,681</u>	<u>\$ 851,548,985</u>
7. Actuarially Determined Contribution Requirement [5. + 6.]	\$ 1,147,030,511	\$ 1,097,170,031
8. Projected Capped Payroll For Fiscal Year	\$ 2,203,055,500	\$ 2,118,062,176
9. Actuarially Determined Contribution as a Percentage of Projected Capped Payroll [7./8.]	52.07%	51.80%
10. Total Required Employer Contribution Including Health Insurance Subsidy	\$ 854,500,000	\$ 808,570,000
11. Total Required Employer Contribution as a Percentage of Projected Capped Payroll [10./8.]	38.79%	38.17%
12. Total Required Employer Contribution as a Percentage of Actuarially Determined Contribution [10./7.]	74.50%	73.70%

The fiscal year 2020 Actuarially Determined Contribution is based on an amortization factor which reflects 24 years remaining in the amortization period, an interest rate of 7.00 percent, an annualized assumed rate of increase in total capped payroll of 2.20 percent (which is consistent with the projected increase in total payroll from the projections used to calculate the statutory contribution requirements). The Employer Normal Cost and Amortization Payment are adjusted for expected contribution timing.

Recommendations and Future Considerations

The statutory funding policy required for CTPF provides for level percent of pay funding that produces a funding target of 90 percent by 2059, assuming an open group projection. The following graph shows the projected funded ratio. A key observation is that the funded ratio does not grow markedly until after 2039. That is, a majority of the funding occurs between 2040 and 2059. This illustrates how significantly the current funding policy defers or back-loads contributions into the future.

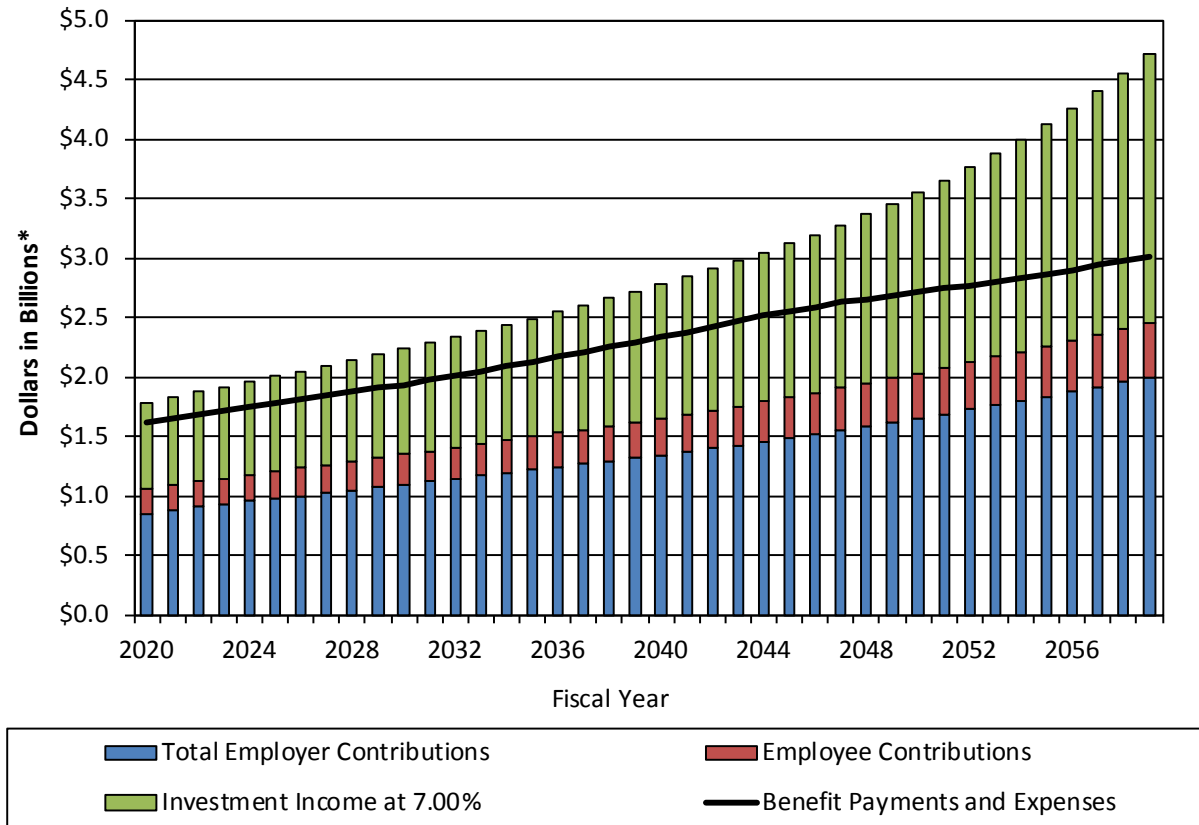
Funded Ratio



Recommendations and Future Considerations

The following graph compares the projected benefits and expenses against employer contributions, employee contributions and investment income. From 2020 to 2059, the percentage of investment income needed to pay ongoing benefits decreases from 77.8 percent to 24.8 percent. This implies that a lower level of investment income is projected to be available for potential asset growth in the beginning of the projection period.

Comparison of Cash Flows



**Future dollar amounts are based on assumed inflationary increases.*

We are concerned about potential cash flow problems for CTPF. This is because the assets in the plan (\$11,038.8 billion on a market value basis) are not sufficient to cover current retiree liabilities (\$16,996.7 billion) and the ratio of market value of assets to retiree benefit payments and expenses is approximately 7.3. This means that approximately seven to eight years of retiree benefit payments can be paid from current assets; the ability to make such payments beyond that period is heavily dependent upon future employer contributions and future investment return.

Recommendations and Future Considerations

The calculations in this report were prepared based on the methods required by the statutory funding policy. GRS does not endorse this funding policy because the statutory funding policy defers funding for these benefits into the future and places a higher burden on future generations of taxpayers.

We recommend the following changes:

1. Implementing a funding policy that contributes normal cost plus closed period amortization as a level percentage of capped payroll amortization of the unfunded liability. (A policy which recognizes the unfunded liability at the valuation date and not a projected liability in the year 2059.)
2. Changing the actuarial cost method for calculating liabilities from the Projected Unit Credit to the Entry Age Normal method.

Change Funding Policy to a More Actuarially Sound Funding Method

We recommend a funding policy that contributes normal cost plus closed period amortization as a level percentage of capped payroll for paying off the current unfunded accrued liability (i.e., the amortization period declines by one year with each actuarial valuation) such that the funded ratio is projected to be 100 percent funded in 30 years or sooner. A 30-year closed amortization period (at the actuarial valuation as of June 30, 2013) methodology pays off the unfunded accrued liability in full by the end of the 30-year period in 2043. The fiscal year 2020 contribution would be \$1,147.03 million under this funding policy. The current statutory contribution does not comply with this recommendation. Underfunding the Fund creates the risk that ultimately benefit obligations cannot be met from the trust, and will require a greater amount of funding from other City and State resources. In addition, continually underfunding the Fund also creates more of a funding need from contributions and less is available from investment return – thereby creating a more expensive plan.

Change the Actuarial Cost Method to the Entry Age Normal Method

The current actuarial cost method is the Projected Unit Credit method, which is required by statute. The Projected Unit Credit method recognizes costs such that the normal cost for an individual member increases as a percentage of payroll throughout his/her career. The Entry Age Normal cost method is the most commonly used method in the public sector. It is also the method required to be used for financial reporting under GASB Statement Nos. 67 and 68. The Entry Age Normal method recognizes costs as a level percentage of payroll over a member's career. We recommend a change to the Entry Age Normal method.

We recognize that the State Statute governs the funding policy of the Fund. The purpose of these comments is to highlight the difference between the statutory appropriation methodology and an actuarially sound funding policy and to highlight the risks and additional costs of continuing to underfund the Fund.

Recommendations and Future Considerations

Future Considerations

Changes (such as the addition of a new benefit tier and delaying the 90 percent funding target year from 2045 to 2059) have had the effect of reducing the statutory contribution amounts that would have otherwise been made. However, recent changes in the investment return assumption and other demographic assumption changes to more closely align the actuarial assumptions with current market expectations have increased the contribution amounts that would otherwise have been made. Assuming the statutory contributions are received (and the actuarial assumptions are met including a 7.00 percent investment rate of return, each year through 2059) CTPF is currently projected to have contributions sufficient to increase the funded ratio from the current level of 47.4 percent to 90.0 percent by 2059.

This is a severely underfunded plan and the ability of the plan to reach 90 percent funding by 2059 is heavily dependent on the State and the Board of Education contributing the statutory contributions each and every year until 2059. Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, we are not able to assess the ability of the State and/or the Board of Education to make contributions when due.

Number of Projected Future Active Members

The total required employer contribution is based on performing an open group projection through the year 2059. The projection is based on assuming that new active members are hired to replace the current members who leave active membership (through termination, retirement, death or disability). As shown in Table 12 on page 42, the number of active members decreased by about 10 percent between 2008 and 2017, which is an average annualized decrease of about 1.0 percent. The number of actives increased in 2018 by less than 1.0 percent and increased again in 2019 by 1.2 percent.

Currently, the actuarial valuation assumes that the total number of active members in the future will be equal to the number active in the current actuarial valuation. Although there is only two years of experience where the number of active members has increased, we believe that it is reasonable to maintain the current level future active member population assumption, but continue to annually monitor the number of active members in the coming years. Given the decrease in the number of active members between 2008 and 2017, if future valuations show additional declines in the active population, the Board may want to consider an update to the population projection assumption to include a decreasing population in the near term before reaching an equilibrium number of active members long term.

Recommendations and Future Considerations

Actuarial Standards of Practice (ASOP) No. 4 Disclosures

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.00 percent on the actuarial value of assets), it is expected that:

1. The combined State and BOE contribution rate will be level as a percentage of payroll through 2059 (after all deferred asset gains and losses are fully recognized);
2. The unfunded liability will increase in dollar amount through 2039 before it begins to decrease;
3. The unfunded actuarial accrued liabilities will never be fully amortized; and
4. The funded status of the plan will increase gradually towards a 90 percent funded ratio in 2059.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

1. The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words of transferring the obligations to a unrelated third party in an arm's length market value type transaction.
2. The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions.
3. A funded status measurement in this report of 100 percent is not synonymous with no required future contributions. If the funded status were 100 percent, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
4. The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets.

Limitation of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

Risks Associated with Measuring the Accrued Liability and Total Required Employer Contribution

The determination of the accrued liability and the total required employer contribution requires the use of actuarial assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the actuarial assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the total required employer contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the Fund's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the Fund's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the Fund's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The statutory contribution for fiscal year 2021 shown on page 8 should be considered as the minimum contribution that complies with the funding policy governed by State statute (Section 17-129(b)(vi) of the Illinois Pension Code). The timely receipt of the statutory contribution is critical to support the financial

Risks Associated with Measuring the Accrued Liability and Total Required Employer Contribution

health of the Fund. Users of this report should be aware that contributions made at the statutorily determined amount do not necessarily guarantee benefit security.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	2019	2018
Ratio of the Market Value of Assets to Payroll	5.02	5.26
Ratio of Actuarial Accrued Liability to Payroll	10.58	10.85
Ratio of Actives to Retirees and Beneficiaries	1.03	1.01
Ratio of Net Cash Flow to Market Value of Assets	-5.25%	-5.27%

Ratios exclude inactive members not receiving benefits.

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 5.0 times the payroll, a return on assets 5 percent different than assumed would equal 25 percent of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100 percent is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 11 times the payroll, a change in liability 2 percent other than assumed would equal 22 percent of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Risks Associated with Measuring the Accrued Liability and Total Required Employer Contribution

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability. At the Board's request, we conducted additional risk assessment of investment and contribution risk through stress testing the investment return assumption and future active population growth.

SECTION C

ACTUARIAL DETERMINATIONS

Table 1

Results of Actuarial Valuation as of June 30, 2019

1. Number of Members		
a. Active ^a		29,295
b. Inactive:		
i. Eligible for deferred vested pension benefits		9,926
ii. Eligible for return of contributions only		20,621
c. Current Benefit Recipients:		
i. Retirement annuities		24,631
ii. Survivor annuities		3,217
iii. Disability annuities		469
d. Total		88,159
2. Covered Payroll		
a. As of the Actuarial Valuation Date	\$	2,196,918,127
b. Projected Capped Payroll for Fiscal Year 2020		2,203,055,500
c. Projected Capped Payroll for Fiscal Year 2021		2,267,106,915
3. Annualized Benefit Payments Currently Being Made		
a. Retirement annuities	\$	1,373,459,588
b. Survivor annuities		77,424,498
c. Disability annuities		18,158,456
d. Total	\$	1,469,042,542
4. Actuarial Accrued Liability—Annuitants		
a. Current Benefit Recipients:		
i. Retirement annuities	\$	16,102,437,924
ii. Survivor annuities		692,161,536
iii. Disability annuities		202,115,317
b. Total	\$	16,996,714,777
5. Actuarial Accrued Liability—Inactive Members		
a. Eligible for Deferred Vested Pension Benefits	\$	449,280,620
b. Eligible for Return of Contributions Only		86,869,126
c. Total	\$	536,149,746

Active count excludes 142 members expected to be hired to replace retirements and terminations that occurred in June 2019.

Table 1 (Continued)

Results of Actuarial Valuation as of June 30, 2019

	Normal Cost	Actuarial Accrued Liability
6. Active Members		
a. Retirement Benefits	\$ 271,774,168	\$ 4,852,667,787
b. Withdrawal	71,756,704	704,325,764
c. Death Benefits	4,913,776	69,468,495
d. Disability	6,949,723	92,836,738
e. Administrative Expenses	27,600,466	-
f. Total	\$ 382,994,837	\$ 5,719,298,784
7. Total Actuarial Accrued Liability (4. + 5. + 6.)		\$ 23,252,163,307
8. Market Value of Assets (MVA)		\$ 11,038,837,459
9. Unfunded Actuarial Accrued Liability Based on MVA (7. – 8.)		\$ 12,213,325,848
10. Funded Percentage Based on MVA (8. ÷ 7.) ^a		47.47%
11. Actuarial Value of Assets (AVA)		\$ 11,021,811,634
12. Unfunded Actuarial Accrued Liability Based on AVA (7. – 11.)		\$ 12,230,351,673
13. Funded Percentage Based on AVA (11. ÷ 7.) ^a		47.40%
14. Total Normal Cost	\$ 382,994,837	
15. Expected Employee Contributions	\$ 198,274,995	
16. Annual Employer Normal Cost (% of Projected Capped Payroll for Fiscal Year 2020)	\$ 184,719,842 8.38%	
17. Health Insurance Subsidy	\$ 65,000,000	
18. Annual Employer Normal Cost, including Health Insurance Reimbursement (16. + 17.) % of Projected Capped Payroll for Fiscal Year 2020 ^b	\$ 249,719,842 11.34%	

^a The funded status measure is appropriate for assessing the need for future contributions. The funded status is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

^b Used for calculation of the ADC.

Table 2

Components of Actuarial Accrued Liability and Normal Cost by Tier

Actuarial Valuation Results	Tier 1		Tier 2 ^a		Total	
1. Count	18,632		10,663		29,295	
2. Covered Payroll						
a. As of the Valuation Date	\$ 1,611,924,815		\$ 584,993,311		\$ 2,196,918,127	
b. Projected Capped Payroll for Fiscal Year 2020	1,611,924,815		591,130,684		2,203,055,500	
c. Projected Capped Payroll for Fiscal Year 2021	1,583,323,050		683,783,865		2,267,106,915	
3. Actuarial Accrued Liability						
a. Retirement Benefits	\$ 4,787,616,390		\$ 65,051,397		\$ 4,852,667,787	
b. Withdrawal	617,643,241		86,682,523		704,325,764	
c. Death Benefits	65,535,687		3,932,808		69,468,495	
d. Disability	86,145,554		6,691,184		92,836,738	
e. Total	\$ 5,556,940,872		\$ 162,357,912		\$ 5,719,298,784	
4. Normal Cost	Amount	% of Payroll	Amount	% of Payroll	Amount	% of Payroll
a. Retirement Benefits	\$ 256,620,461	15.92%	\$ 15,153,707	2.56%	\$ 271,774,168	12.34%
b. Withdrawal	47,573,316	2.95%	24,183,388	4.09%	71,756,704	3.26%
c. Death Benefits	3,964,802	0.25%	948,974	0.16%	4,913,776	0.23%
d. Disability	5,440,011	0.34%	1,509,712	0.26%	6,949,723	0.32%
e. Administrative Expenses	20,194,623	1.25%	7,405,842	1.25%	27,600,466	1.25%
f. Total	\$ 333,793,213	20.71%	\$ 49,201,623	8.32%	\$ 382,994,837	17.38%
5. Expected Employee Contributions	\$ 145,073,233	9.00%	\$ 53,201,763	9.00%	\$ 198,274,995	9.00%
6. Annual Employer Normal Cost	\$ 188,719,981	11.71%	\$ (4,000,139)	-0.68%	\$ 184,719,842	8.38%

^aThe actuarial accrued liability, normal cost, projected capped payroll and expected employee contributions include the results for 142 members expected to be hired to replace retirements and terminations that occurred in June 2019. Active count excludes 142 members expected to be hired to replace retirements and terminations that occurred in June 2019.

Actuarial Accrued Liability and Normal Cost are determined under the Projected Unit Credit actuarial cost method.

Normal Cost rates as a percent of pay under the Projected Unit Credit actuarial cost method increase over a member's career.

Table 3

Analysis of Change in Unfunded Actuarial Accrued Liability

In addition to the expected change in the unfunded accrued actuarial liability, changes in membership demographics and fund assets have affected the actuarial valuation results. The increase in the unfunded actuarial accrued liability (UAAL) of \$276,444,638 was due to the following:

1. Unfunded Actuarial Accrued Liability (UAAL) at 06/30/2018	\$ 11,953,907,035
2. Contributions	
a. Contributions due (Normal Cost plus interest on the UAAL)	
i interest on item 1.	\$ 836,773,492
ii members contributions	190,565,220
iii employer normal cost (middle of year)	240,588,278
iv interest on ii and iii	14,835,148
v total due	\$ 1,282,762,138
b. Contributions paid (Actual)	
i member contributions	\$ 190,565,220
ii employer	808,570,000
iii interest on i and ii ^a	18,775,610
iv total paid	\$ 1,017,910,830
c. Expected increase in Unfunded Actuarial Accrued Liability	\$ 264,851,308
3. Expected Unfunded Actuarial Accrued Liability at 06/30/2019	\$ 12,218,758,343
4. (Gains)/Losses	
a. investment income	\$ 98,317,079
b. retiree health insurance cash flows	(6,608,283)
c. salary increases	(62,859,630)
d. demographic	(17,255,836)
e. total	\$ 11,593,330
5. Plan Provision Changes	\$ -
6. Assumption Changes	\$ -
7. Total Change in UAAL	\$ 276,444,638
8. UAAL at 06/30/2019	\$ 12,230,351,673

^aInterest on employer contributions is estimated based on a weighted timing of middle of year, 8/12^{ths} of a year, and end of year.

Table 4

Analysis of Financial (Gains) and Losses in Unfunded Actuarial Accrued Liability for Fiscal Year Ending June 30, 2019

Activity	(Gain)/Loss	% of 06/30/2018 AAL
1. Actuarial (Gain)/Loss		
a. Retirements	\$ 1,996,977	0.01%
b. Incidence of Disability	(966,542)	0.00%
c. In-Service Mortality	123,792	0.00%
d. Retiree Mortality	5,854,235	0.03%
e. Salary Increases	(62,859,630)	-0.27%
f. Terminations	(46,251,276)	-0.20%
g. Investment Return	98,317,079	0.43%
h. Retiree Health Insurance Cash Flows	(6,608,283)	-0.03%
i. New Entrant Liability	44,926,283	0.20%
j. Other	(22,939,305)	-0.10%
k. Total Actuarial (Gain)/Loss	\$ 11,593,330	0.07%
2. Plan Provision Changes	\$ -	0.00%
3. Assumption Changes	\$ -	0.00%
4. Contribution (Excess)/Shortfall ^a	\$ 264,851,308	1.16%
5. Total Financial (Gain)/Loss	\$ 276,444,638	1.23%

^a Represents the increase in the Unfunded Actuarial Accrued Liability due to actual contributions being less than the Normal Cost plus interest on the beginning of year Unfunded Actuarial Accrued Liability.

Graph 1

Financial (Gains) and Losses in Unfunded Actuarial Accrued Liability for Fiscal Year Ending June 30, 2019, by Source

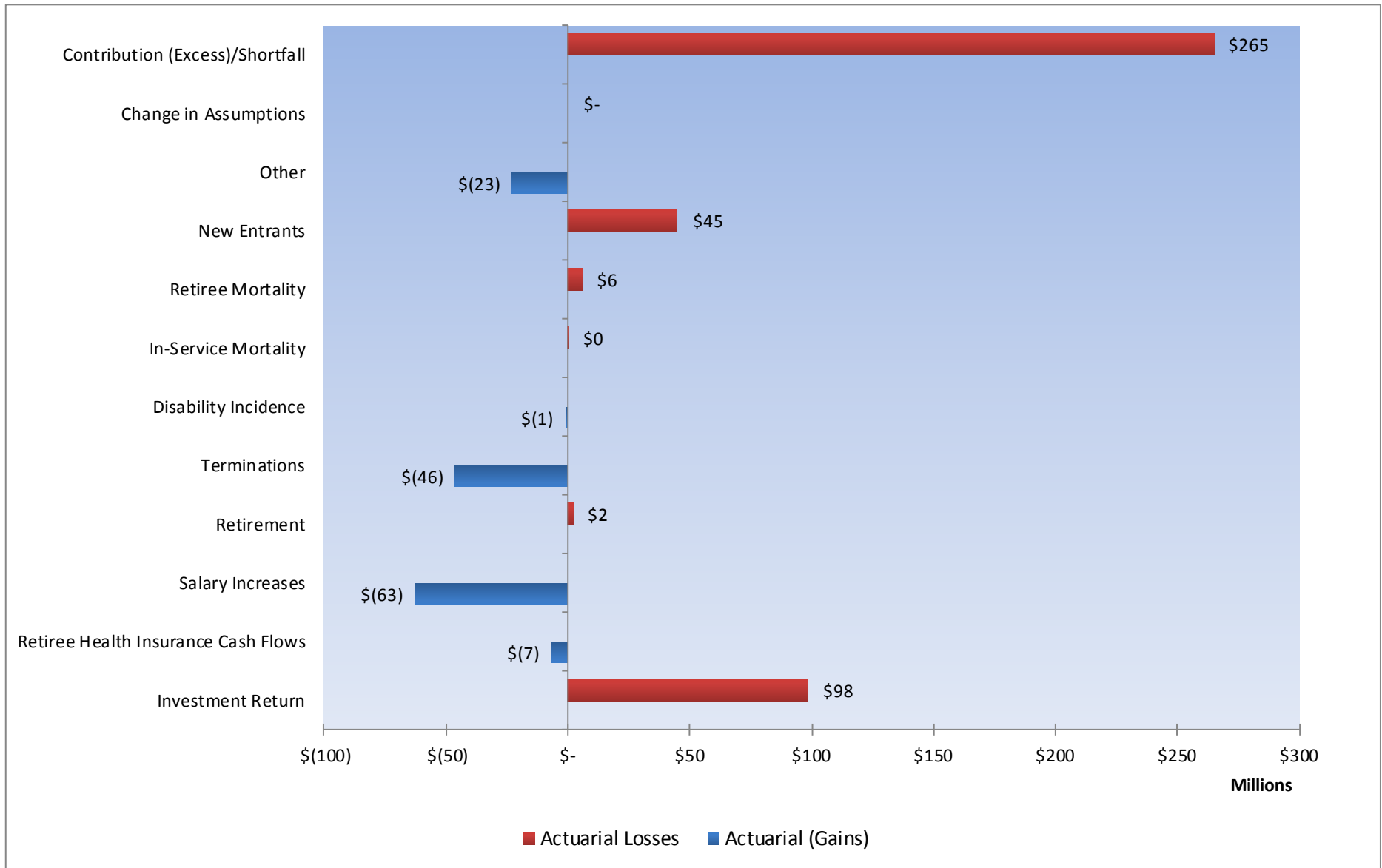


Table 5a

Historical Financial (Gains) and Losses in Unfunded Actuarial Accrued Liability

	Amount of (Gain) or Loss					Total Five-year Change
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	
Investment Return (AVA Basis)	\$ (45,212,951)	\$ (81,129,490)	\$ (80,937,857)	\$ 131,839,730	\$ 98,317,079	\$ 22,876,511
Retiree Health Insurance Cash Flows	9,833,404	1,673,226	(17,178,251)	1,381,154	(6,608,283)	(10,898,750)
Salary Increases	(79,584,326)	(264,801,612)	(180,217,505)	6,927,266	(62,859,630)	(580,535,807)
Retirements	66,015,157	47,235,684	32,846,858	27,778,569	1,996,977	175,873,245
Terminations	(10,625,923)	(6,458,419)	(7,478,652)	(39,625,292)	(46,251,276)	(110,439,562)
Disability Incidence	-	-	(685,126)	(1,010,548)	(966,542)	(2,662,216)
In-Service Mortality	-	-	657,829	1,253,670	123,792	2,035,291
Retiree Mortality	(28,722,389)	15,811,894	14,544,206	70,809,472	5,854,235	78,297,418
New Entrants	-	-	32,961,135	38,467,726	44,926,283	116,355,144
Other ^a	9,963,968	57,480,517	(54,889,992)	(28,017,087)	(22,939,305)	(38,401,899)
Total Actuarial (Gain)/Loss	\$ (78,333,060)	\$ (230,188,200)	\$ (260,377,355)	\$ 209,804,660	\$ 11,593,330	\$ (347,500,625)
(Gain)/Loss as a % of BOY AAL	(0.4)%	(1.2)%	(1.3)%	1.0%	0.1%	
Total Non-Investment (Gain)/Loss	\$ (33,120,109)	\$ (149,058,710)	\$ (179,439,498)	\$ 77,964,930	\$ (86,723,749)	\$ (370,377,136)
(Gain)/Loss as a % of BOY AAL	(0.2)%	(0.7)%	(0.9)%	0.4%	(0.4)%	
(Gain)/Loss Due to Plan Provisions Changes	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(Gain)/Loss as a % of BOY AAL	-	-	-	-	-	
(Gain)/Loss Due to Assumption Changes	\$ -	\$ -	\$ 1,074,523,844	\$ 621,772,494	\$ -	\$ 1,696,296,338
(Gain)/Loss as a % of BOY AAL	0.0%	0.0%	5.2%	2.8%	0.0%	
(Gain)/Loss Due to Contribution (Excess)/Shortfall	\$ 241,161,140	\$ 260,150,252	\$ 220,857,399	\$ 233,351,269	\$ 264,851,308	\$ 1,220,371,368
(Gain)/Loss as a % of BOY AAL	1.2%	1.3%	1.1%	1.1%	1.2%	
Total Financial (Gain)/Loss	\$ 162,828,080	\$ 29,962,052	\$ 1,035,003,888	\$ 1,064,928,423	\$ 276,444,638	\$ 2,569,167,081
(Gain)/Loss as a % of BOY AAL	0.8%	0.2%	5.1%	4.9%	1.2%	
BOY Actuarial Accrued Liability (AAL)	\$ 19,503,893,632	\$ 19,951,289,974	\$ 20,484,951,277	\$ 21,822,010,297	\$ 22,922,992,558	

^a Includes other experience such as deviations between actual and expected benefit payments and unexpected changes in service.

Results prior to fiscal year 2017 were obtained from the prior Actuary's actuarial valuation reports.

Table 5b
Historical Normal Cost Amounts (\$ and % of Pay)

Actuarial Valuation Date: Required Employer Contributions for Fiscal Year Ending:	June 30, 2018 June 30, 2019		June 30, 2019 June 30, 2020		Projected from June 30, 2019 June 30, 2021	
1. Projected Capped Payroll for the Fiscal Year	\$ 2,118,062,176		\$ 2,203,055,500		\$2,267,106,915	
2. Normal Cost	Amount	% of Payroll	Amount	% of Payroll	Amount	% of Payroll
a. Retirement Benefits	\$ 260,820,464	12.31%	\$ 271,774,168	12.34%	\$ 280,717,561	12.38%
b. Withdrawal	70,518,812	3.33%	71,756,704	3.26%	71,646,778	3.16%
c. Death Benefits	4,759,090	0.22%	4,913,776	0.22%	4,956,865	0.22%
d. Disability	6,731,606	0.32%	6,949,723	0.32%	7,090,471	0.31%
e. Administrative Expenses	23,323,526	1.10%	27,600,466	1.25%	29,188,000	1.29%
f. Total	\$ 366,153,498	17.29%	\$ 382,994,837	17.38%	\$ 393,599,675	17.36%
3. Expected Employee Contributions	\$ 190,625,596	9.00%	\$ 198,274,995	9.00%	\$ 204,039,622	9.00%
4. Annual Employer Normal Cost	\$ 175,527,903	8.29%	\$ 184,719,842	8.38%	\$ 189,560,052	8.36%

SECTION D

ACTUARIAL PROJECTIONS

Table 6

**Baseline Projections — Employer Contributions Determined under Public Act 90-0655,
Public Act 91-0357, Public Act 96-0889 and Public Act 100-0465
Investment Return of 7.00% Each Year (\$ in Millions)**

Fiscal Year	Actuarial Accrued Liability	Actuarial Value of Assets	Unfunded Liability	Funded Ratio	Pensionable Payroll	Annual Normal Cost				Total Employer Contributions						Total Expenses
						Total	Employee Contribution	Normal Cost	Percent of Pay	Required Employer Contribution	Additional State Contributions	State Normal Cost	Additional Board of Education Contributions	Required Board of Education Contributions	Percent of Pay	
2020	\$23,661.7	\$11,275.4	\$12,386.2	47.65%	\$2,203.1	\$448.0	\$198.3	\$249.7	11.33%	\$854.5	\$11.9	\$245.5	\$12.6	\$584.5	38.79%	\$1,625.6
2021	24,079.2	11,441.8	12,637.4	47.52%	2,267.1	458.6	204.0	254.6	11.23%	885.9	12.3	254.6	13.1	605.9	39.08%	1,656.2
2022	24,506.6	11,582.4	12,924.2	47.26%	2,326.5	468.9	209.4	259.5	11.15%	909.1	12.7	259.5	13.5	623.5	39.08%	1,685.2
2023	24,944.0	11,786.4	13,157.6	47.25%	2,386.2	478.8	214.8	264.1	11.07%	932.4	13.0	264.1	13.8	641.6	39.08%	1,714.3
2024	25,389.9	12,001.8	13,388.1	47.27%	2,446.4	488.2	220.2	268.0	10.95%	955.9	13.3	268.0	14.2	660.4	39.08%	1,745.2
2025	25,843.9	12,230.6	13,613.3	47.32%	2,506.4	497.1	225.6	271.5	10.83%	979.4	13.6	271.5	14.5	679.7	39.08%	1,776.3
2026	26,304.8	12,471.9	13,832.9	47.41%	2,565.9	505.4	230.9	274.5	10.70%	1,002.7	14.0	274.5	14.9	699.3	39.08%	1,808.8
2027	26,771.8	12,725.0	14,046.8	47.53%	2,625.5	513.2	236.3	276.9	10.55%	1,025.9	14.3	276.9	15.2	719.5	39.08%	1,841.9
2028	27,244.0	12,990.2	14,253.8	47.68%	2,685.3	520.4	241.7	278.7	10.38%	1,049.3	14.6	278.7	15.6	740.4	39.08%	1,875.6
2029	27,718.4	13,265.5	14,452.9	47.86%	2,745.0	526.9	247.0	279.9	10.20%	1,072.6	14.9	279.9	15.9	761.9	39.08%	1,911.9
2030	28,206.9	13,564.5	14,642.4	48.09%	2,806.0	532.8	252.5	280.3	9.99%	1,096.5	15.3	280.3	16.3	784.6	39.08%	1,936.4
2031	28,696.7	13,875.7	14,821.0	48.35%	2,866.9	538.2	258.0	280.2	9.77%	1,120.3	15.6	280.2	16.6	807.8	39.08%	1,973.5
2032	29,186.7	14,199.5	14,987.2	48.65%	2,928.9	543.2	263.6	279.6	9.55%	1,144.5	15.9	279.6	17.0	832.0	39.08%	2,011.4
2033	29,674.5	14,535.4	15,139.1	48.98%	2,991.6	547.7	269.2	278.4	9.31%	1,169.0	16.3	278.4	17.4	856.9	39.08%	2,051.2
2034	30,158.7	14,883.7	15,275.0	49.35%	3,054.8	551.6	274.9	276.6	9.05%	1,193.7	16.6	276.6	17.7	882.7	39.08%	2,091.6
2035	30,637.3	15,246.5	15,390.8	49.76%	3,118.1	552.6	280.6	272.0	8.72%	1,218.4	17.0	272.0	18.1	911.4	39.08%	2,130.9
2036	31,108.9	15,624.6	15,484.3	50.23%	3,181.7	553.0	286.4	266.7	8.38%	1,243.3	17.3	266.7	18.5	940.9	39.08%	2,170.3
2037	31,571.8	16,018.5	15,553.3	50.74%	3,245.4	552.7	292.1	260.6	8.03%	1,268.2	17.7	260.6	18.8	971.1	39.08%	2,210.4
2038	32,024.1	16,429.2	15,594.9	51.30%	3,309.6	551.6	297.9	253.8	7.67%	1,293.3	18.0	253.8	19.2	1,002.3	39.08%	2,250.9
2039	32,463.0	16,856.6	15,606.4	51.93%	3,374.7	550.1	303.7	246.4	7.30%	1,318.7	18.4	246.4	19.6	1,034.3	39.08%	2,292.9

Normal cost includes administrative expenses and health insurance subsidy. The health insurance subsidy is assumed to be \$65 million each year.

Total expenses shown include benefit payments, refunds, administrative expenses and health insurance subsidy.

Actuarial accrued liability and assets are measured at the end of the fiscal year. Normal Cost is measured at the middle of the fiscal year.

State contributions, benefit payments, refunds, administrative expenses and employee contributions are assumed to occur during the middle of the year.

55 percent of the Board of Education's dedicated property tax levy of 0.567 percent is assumed to be paid March 1, each fiscal year. The remaining Board of Education contributions are assumed to occur at the end of the year.

Total payroll is capped for members hired after December 31, 2010, as defined in Public Act 96-0889.

Table 6 (Continued)
**Baseline Projections — Employer Contributions Determined under Public Act 90-0655,
Public Act 91-0357, Public Act 96-0889 and Public Act 100-0465**
Investment Return of 7.00% Each Year (\$ in Millions)

Fiscal Year	Actuarial Accrued Liability	Actuarial Value of Assets	Unfunded Liability	Funded Ratio	Pensionable Payroll	Annual Normal Cost				Total Employer Contributions					Total Expenses	
						Total	Employee Contribution	Normal Cost	Percent of Pay	Required Employer Contribution	Additional State Contributions	State Normal Cost Contributions	Additional Board of Education Contributions	Required Board of Education Contributions		Percent of Pay
2040	\$32,886.6	\$17,301.9	\$15,584.7	52.61%	\$3,441.4	\$548.4	\$309.7	\$238.7	6.94%	\$1,344.8	\$18.7	\$238.7	\$20.0	\$1,067.4	39.08%	\$2,335.7
2041	33,292.3	17,766.3	15,526.0	53.36%	3,510.2	546.3	315.9	230.3	6.56%	1,371.6	19.1	230.3	20.4	1,101.8	39.08%	2,379.5
2042	33,677.5	18,250.3	15,427.2	54.19%	3,579.4	543.8	322.1	221.7	6.19%	1,398.7	19.5	221.7	20.8	1,136.8	39.08%	2,424.4
2043	34,042.1	18,756.7	15,285.4	55.10%	3,650.3	541.9	328.5	213.4	5.85%	1,426.4	19.9	213.4	21.2	1,172.0	39.08%	2,468.5
2044	34,386.7	19,290.2	15,096.5	56.10%	3,724.5	540.9	335.2	205.6	5.52%	1,455.4	20.3	205.6	21.6	1,207.9	39.08%	2,511.3
2045	34,713.2	19,855.8	14,857.4	57.20%	3,801.5	541.2	342.1	199.0	5.23%	1,485.5	20.7	199.0	22.0	1,243.7	39.08%	2,552.5
2046	35,025.6	20,461.1	14,564.5	58.42%	3,882.6	543.3	349.4	193.8	4.99%	1,517.2	21.1	193.8	22.5	1,279.7	39.08%	2,590.4
2047	35,326.7	21,112.4	14,214.3	59.76%	3,966.7	547.1	357.0	190.1	4.79%	1,550.0	21.6	190.1	23.0	1,315.3	39.08%	2,626.3
2048	35,622.0	21,818.8	13,803.2	61.25%	4,053.6	552.9	364.8	188.1	4.64%	1,584.0	22.1	188.1	23.5	1,350.3	39.08%	2,658.0
2049	35,915.3	22,587.8	13,327.5	62.89%	4,142.7	560.1	372.8	187.3	4.52%	1,618.8	22.5	187.3	24.0	1,384.9	39.08%	2,687.2
2050	36,208.9	23,426.2	12,782.7	64.70%	4,233.6	568.4	381.0	187.4	4.43%	1,654.3	23.0	187.4	24.6	1,419.4	39.08%	2,715.0
2051	36,504.7	24,340.3	12,164.4	66.68%	4,325.0	577.4	389.2	188.1	4.35%	1,690.0	23.5	188.1	25.1	1,453.3	39.08%	2,741.7
2052	36,802.1	25,334.4	11,467.7	68.84%	4,417.5	587.0	397.6	189.4	4.29%	1,726.2	24.0	189.4	25.6	1,487.2	39.08%	2,769.8
2053	37,100.5	26,413.1	10,687.4	71.19%	4,510.7	597.2	406.0	191.3	4.24%	1,762.6	24.5	191.3	26.2	1,520.6	39.08%	2,799.2
2054	37,399.1	27,581.7	9,817.4	73.75%	4,605.9	608.3	414.5	193.8	4.21%	1,799.8	25.1	193.8	26.7	1,554.3	39.08%	2,830.3
2055	37,694.8	28,843.6	8,851.2	76.52%	4,702.7	620.0	423.2	196.7	4.18%	1,837.6	25.6	196.7	27.3	1,588.0	39.08%	2,865.0
2056	37,985.1	30,203.1	7,782.0	79.51%	4,800.9	632.2	432.1	200.1	4.17%	1,876.0	26.1	200.1	27.8	1,621.9	39.08%	2,902.4
2057	38,268.9	31,666.2	6,602.7	82.75%	4,900.3	645.0	441.0	204.0	4.16%	1,914.8	26.7	204.0	28.4	1,655.8	39.08%	2,941.2
2058	38,546.9	33,241.6	5,305.3	86.24%	5,000.6	658.2	450.1	208.1	4.16%	1,954.0	27.2	208.1	29.0	1,689.7	39.08%	2,979.0
2059	38,822.5	34,940.6	3,881.9	90.00%	5,101.4	671.7	459.1	212.6	4.17%	1,993.4	27.8	212.6	29.6	1,723.5	39.08%	3,013.9

Normal cost includes administrative expenses and health insurance subsidy. The health insurance subsidy is assumed to be \$65 million each year.

Total expenses shown include benefit payments, refunds, administrative expenses and health insurance subsidy.

Actuarial accrued liability and assets are measured at the end of the fiscal year. Normal Cost is measured at the middle of the fiscal year.

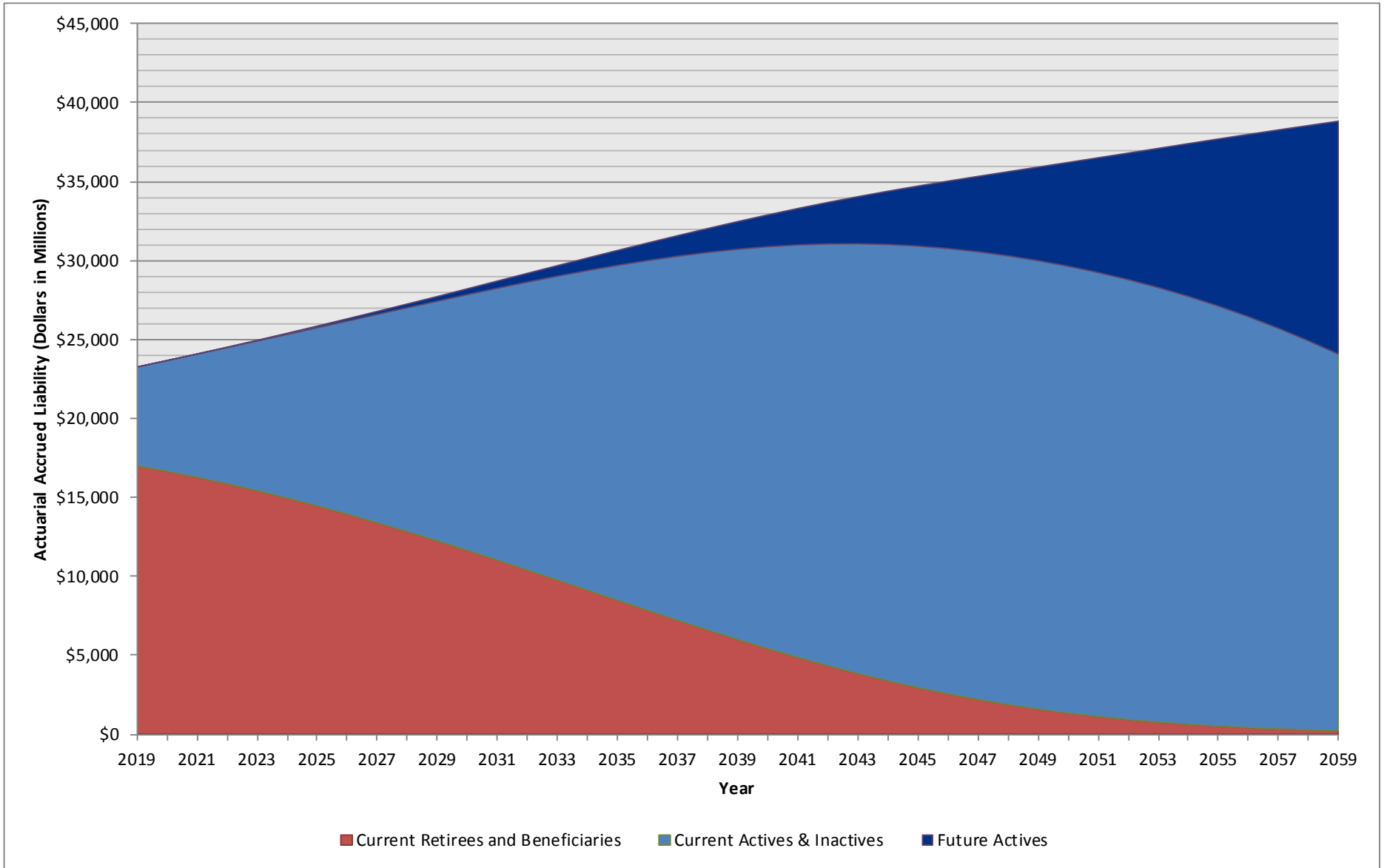
State contributions, benefit payments, refunds, administrative expenses and employee contributions are assumed to occur during the middle of the year.

55 percent of the Board of Education's dedicated property tax levy of 0.567 percent is assumed to be paid March 1, each fiscal year. The remaining Board of Education contributions are assumed to occur at the end of the year.

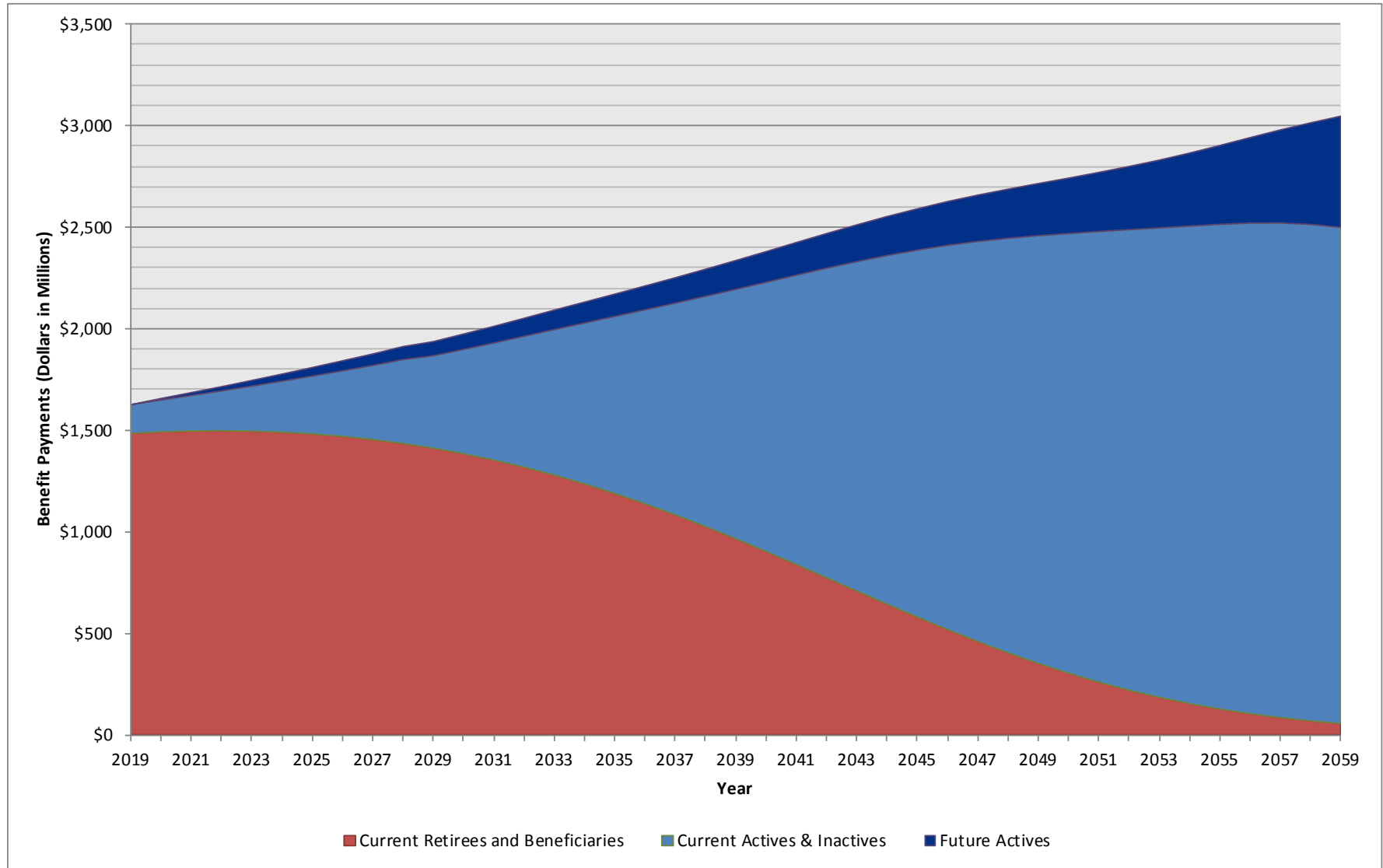
Total payroll is capped for members hired after December 31, 2010, as defined in Public Act 96-0889.

Graph 2

Projected Actuarial Accrued Liabilities Actuarial Valuation as of June 30, 2019

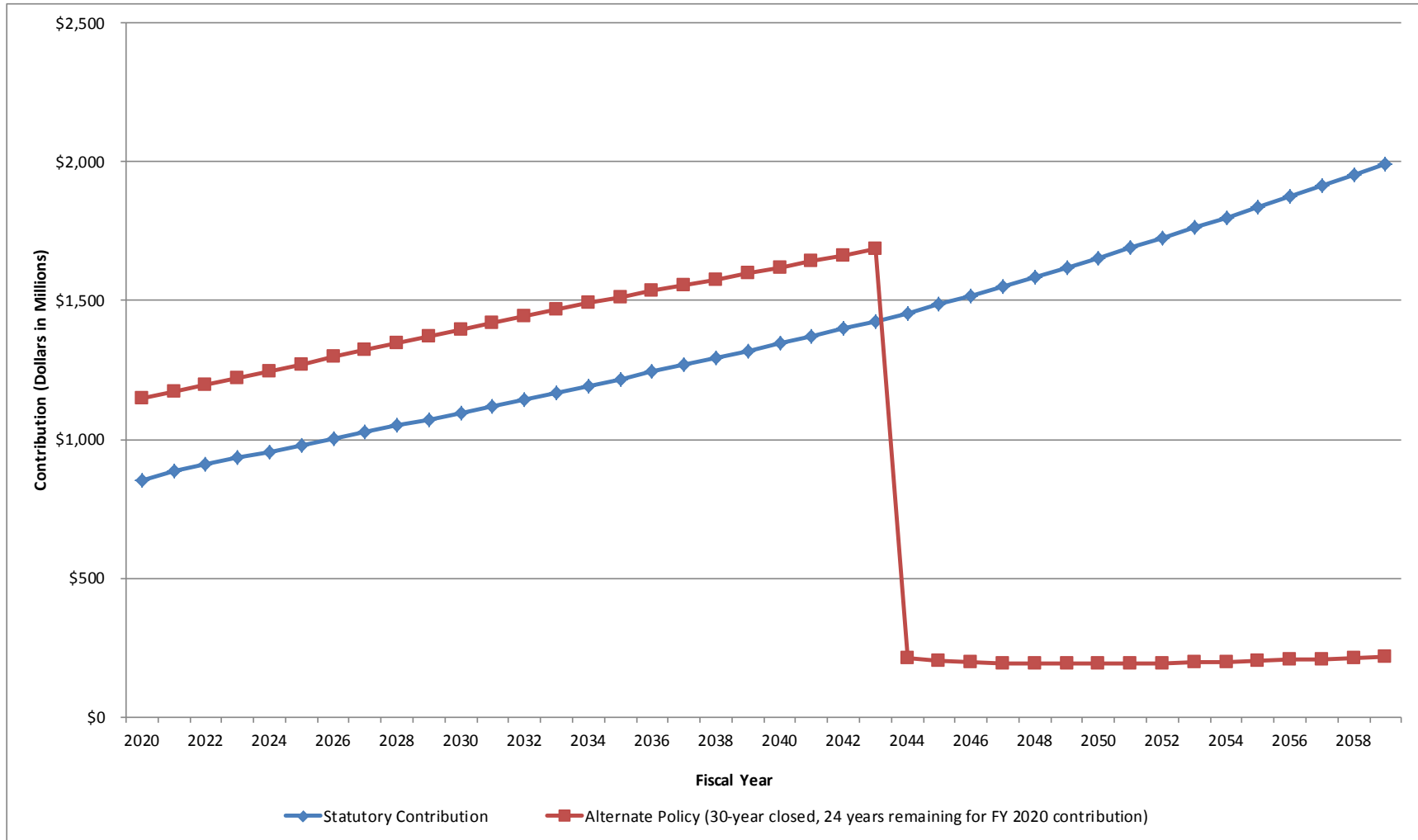


Graph 3 Projected Benefit Payments (Including Administrative Expenses and Health Insurance Subsidy) Actuarial Valuation as of June 30, 2019



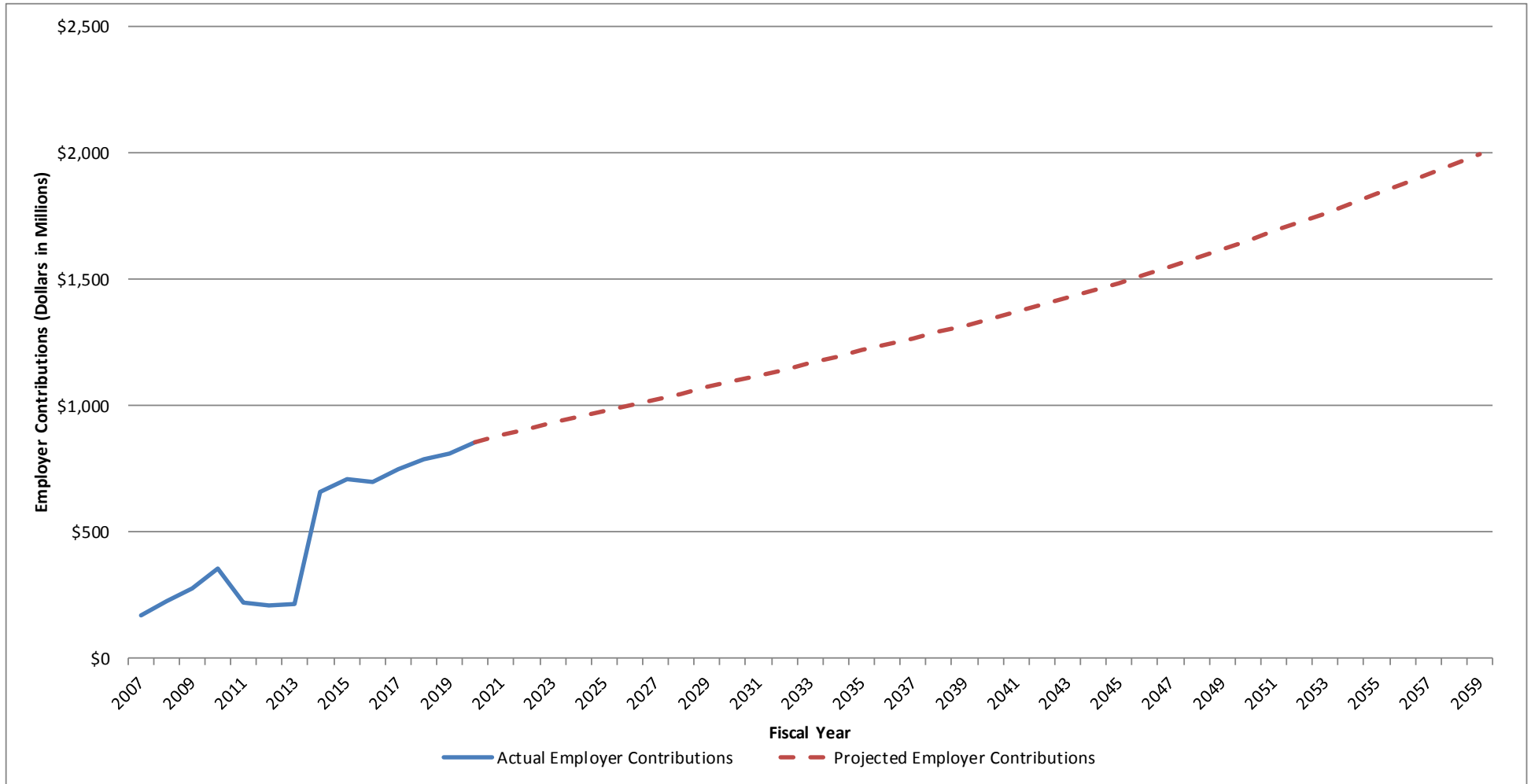
Graph 4

Projected Statutory Contributions vs. Contributions under Alternate Policy (Normal Cost Plus 30-Year Closed Period Level Percent of Pay Amortization) (24 Years Remaining in Amortization Period for FY 2020 Contribution)



Alternate funding policy of normal cost plus 30-year closed period amortization of the unfunded liability as a level percentage of capped payroll beginning in FY 2014 and 24 years remaining in FY 2020.

Graph 5 Actual and Projected Employer Contributions



SECTION E

FUND ASSETS

Table 7

Statement of Fiduciary Net Position for Years Ended June 30, 2019, and 2018

	June 30, 2019			June 30, 2018		
	Pension Fund	Health Insurance Fund	Total Fund - Pension and Health Insurance	Pension Fund	Health Insurance Fund	Total Fund - Pension and Health Insurance
Assets:						
Cash	\$ 121,996,481	\$ -	\$ 121,996,481	\$ 133,497,617	\$ -	\$ 133,497,617
Prepaid expense	324,753	-	324,753	90,787	-	90,787
Receivables:	-	-	-	-	-	-
Minimum funding requirement (Employer)	186,608,225	-	186,608,225	289,191,260	-	289,191,260
Minimum funding requirement (State)	37,797,000	-	37,797,000	30,133,667	-	30,133,667
Employee	11,247,826	-	11,247,826	9,304,638	-	9,304,638
Accrued investment income	39,268,564	-	39,268,564	37,521,126	-	37,521,126
Due from brokers	162,389,723	-	162,389,723	86,639,726	-	86,639,726
Participating teachers' accounts for contributions	4,681,191	-	4,681,191	4,636,522	-	4,636,522
Other receivables	8,364,555	4,915,284	13,279,839	5,627,642	4,688,184	10,315,826
Total receivables	450,357,084	4,915,284	455,272,368	463,054,581	4,688,184	467,742,765
Investments, at fair value:						
U.S. government and agency fixed income	1,381,549,632	-	1,381,549,632	1,299,056,547	-	1,299,056,547
U.S. corporate fixed income	1,080,629,549	-	1,080,629,549	1,060,376,104	-	1,060,376,104
Foreign fixed income securities	60,378,150	-	60,378,150	58,787,954	-	58,787,954
U.S. equities	3,115,916,532	-	3,115,916,532	3,108,323,201	-	3,108,323,201
Foreign equities	3,249,511,598	-	3,249,511,598	3,336,876,903	-	3,336,876,903
Public REITs	157,753,245	-	157,753,245	144,771,014	-	144,771,014
Pooled short-term investment funds	359,473,153	-	359,473,153	447,399,457	-	447,399,457
Real estate	719,817,831	-	719,817,831	746,521,607	-	746,521,607
Infrastructure	210,950,505	-	210,950,505	227,364,041	-	227,364,041
Private equity	379,931,583	-	379,931,583	300,228,413	-	300,228,413
Total investments	10,715,911,778	-	10,715,911,778	10,729,705,241	-	10,729,705,241
Securities lending collateral	560,663,605	-	560,663,605	947,417,427	-	947,417,427
Capital assets, net of accumulated depreciation	705,360	-	705,360	1,190,580	-	1,190,580
Total assets	11,849,959,061	4,915,284	11,854,874,345	12,274,956,233	4,688,184	12,279,644,417
Liabilities:						
Benefits payable	4,510,886	4,902,177	9,413,063	4,681,391	4,624,300	9,305,691
Refunds payable	11,502,175	-	11,502,175	10,860,495	-	10,860,495
Accounts and administrative expenses payable	14,953,962	13,107	14,967,069	11,694,890	63,884	11,758,774
Employer required contribution payable	-	-	-	10,449,000	-	10,449,000
Securities lending collateral payable	559,602,193	-	559,602,193	946,404,347	-	946,404,347
Due to brokers	220,552,386	-	220,552,386	186,100,596	-	186,100,596
Total liabilities	811,121,602	4,915,284	816,036,886	1,170,190,719	4,688,184	1,174,878,903
Net Position Restricted for Pension Benefits	\$ 11,038,837,459	\$ -	\$ 11,038,837,459	\$ 11,104,765,514	\$ -	\$ 11,104,765,514

Table 8

Statement of Changes in Fiduciary Net Position for Years Ended June 30, 2019, and 2018

	June 30, 2019			June 30, 2018		
	Pension Fund	Health Insurance Fund	Total Fund - Pension and Health Insurance	Pension Fund	Health Insurance Fund	Total Fund - Pension and Health Insurance
Additions:						
Contributions:						
Employee	\$ 190,565,220	\$ -	\$ 190,565,220	\$ 183,679,205	\$ -	\$ 183,679,205
Minimum funding requirement (Employer)	569,701,000	-	569,701,000	551,410,000	-	551,410,000
Minimum funding requirement (State)	238,869,000	-	238,869,000	232,992,000	-	232,992,000
Allocation to health insurance fund	(59,089,369)	59,089,369	-	(66,867,696)	66,867,696	-
Total contributions	940,045,851	59,089,369	999,135,220	901,213,509	66,867,696	968,081,205
Investment income:						
Net appreciation (depreciation) in fair value	255,501,019	-	255,501,019	660,578,461	-	660,578,461
Interest	92,918,909	-	92,918,909	86,397,678	-	86,397,678
Dividends	199,555,823	-	199,555,823	182,949,696	-	182,949,696
Miscellaneous	1,253,766	-	1,253,766	1,081,966	-	1,081,966
Securities lending income, net	4,845,062	-	4,845,062	4,500,198	-	4,500,198
Less investment expense:						
Investment advisory and custodial fees	(40,498,179)	-	(40,498,179)	(38,803,455)	-	(38,803,455)
Net investment income	513,576,400	-	513,576,400	896,704,544	-	896,704,544
Interest on late required contribution payments	1,449,709	-	1,449,709	1,123,915	-	1,123,915
Miscellaneous	238,261	-	238,261	351,361	-	351,361
Total additions	1,455,310,221	59,089,369	1,514,399,590	1,799,393,329	66,867,696	1,866,261,025
Deductions:						
Pension benefits	1,467,513,811	-	1,467,513,811	1,437,264,031	-	1,437,264,031
Refunds	24,133,854	-	24,133,854	24,323,083	-	24,323,083
2.2 Legislative refunds	562,230	-	562,230	742,315	-	742,315
Refund of insurance premiums	-	58,611,532	58,611,532	-	66,333,655	66,333,655
Death benefits	3,406,487	-	3,406,487	3,951,010	-	3,951,010
Total benefits payments	1,495,616,382	58,611,532	1,554,227,914	1,466,280,439	66,333,655	1,532,614,094
Administrative and miscellaneous expenses	25,621,894	477,837	26,099,731	21,521,303	534,041	22,055,344
Total deductions	1,521,238,276	59,089,369	1,580,327,645	1,487,801,742	66,867,696	1,554,669,438
Net increase	(65,928,055)	-	(65,928,055)	311,591,587	-	311,591,587
Net Position Restricted for Pension Benefits						
Beginning of the Year	11,104,765,514	-	11,104,765,514	10,793,173,927	-	10,793,173,927
Transfer of residual assets to Pension Plan	-	-	-	-	-	-
End of year	\$ 11,038,837,459	\$ -	\$ 11,038,837,459	\$ 11,104,765,514	\$ -	\$ 11,104,765,514

Table 9

Development of the Actuarial Value of Assets

Year Ending June 30	2019	2020	2021	2022
Beginning of Year:				
(1) Market Value of Assets	\$ 11,104,765,514			
(2) Actuarial Value of Assets	10,969,085,523			
End of Year:				
(3) Market Value of Assets	11,038,837,459			
(4) Contributions and Disbursements				
(4a) Actual Employer & Misc. Contributions	810,257,970			
(4b) Employee Contributions	190,565,220			
(4c) Benefit Payouts & Refunds	(1,554,227,914)			
(4d) Administrative Expenses	(26,099,731)			
(4e) Net of Contributions and Disbursements	(579,504,455)			
(5) Total Investment Income				
=(3)-(1)-(4e)	513,576,400			
(6) Projected Rate of Return		7.00%		
(7) Projected Investment Income ^a	732,235,615			
(8) Investment Income in Excess of Projected Income	(218,659,215)			
(9) Excess Investment Income Recognized This Year (4-year recognition)				
(9a) From This Year	\$ (54,664,804)			
(9b) From One Year Ago	35,555,686	\$ (54,664,804)		
(9c) From Two Years Ago	114,636,306	35,555,686	\$ (54,664,804)	
(9d) From Three Years Ago	(195,532,237)	114,636,305	35,555,685	\$ (54,664,803)
(9e) Total Recognized Investment Gain	(100,005,049)	95,527,187	(19,109,119)	(54,664,803)
(10) Change in Actuarial Value of Assets				
=(4e)+(7)+(9e)	\$ 52,726,111			
End of Year:				
(3) Market Value of Assets	\$ 11,038,837,459			
(11) Actuarial Value of Assets	\$ 11,021,811,634			
(12) Difference Between Market & Actuarial Values	\$ 17,025,825			
(13) Estimated Actuarial Value Rate of Return	5.92%			
(14) Estimated Market Value Rate of Return	4.75%			
(15) Ratio of Actuarial Value to Market Value	99.85%			

^aProjected investment income is estimated based on the actuarial value of assets and weighted timing of middle of year, 8/12^{ths} of a year, and end of year for non-investment cash flows.

Graph 6 Historical Assets Values From June 30, 2010 — 2019

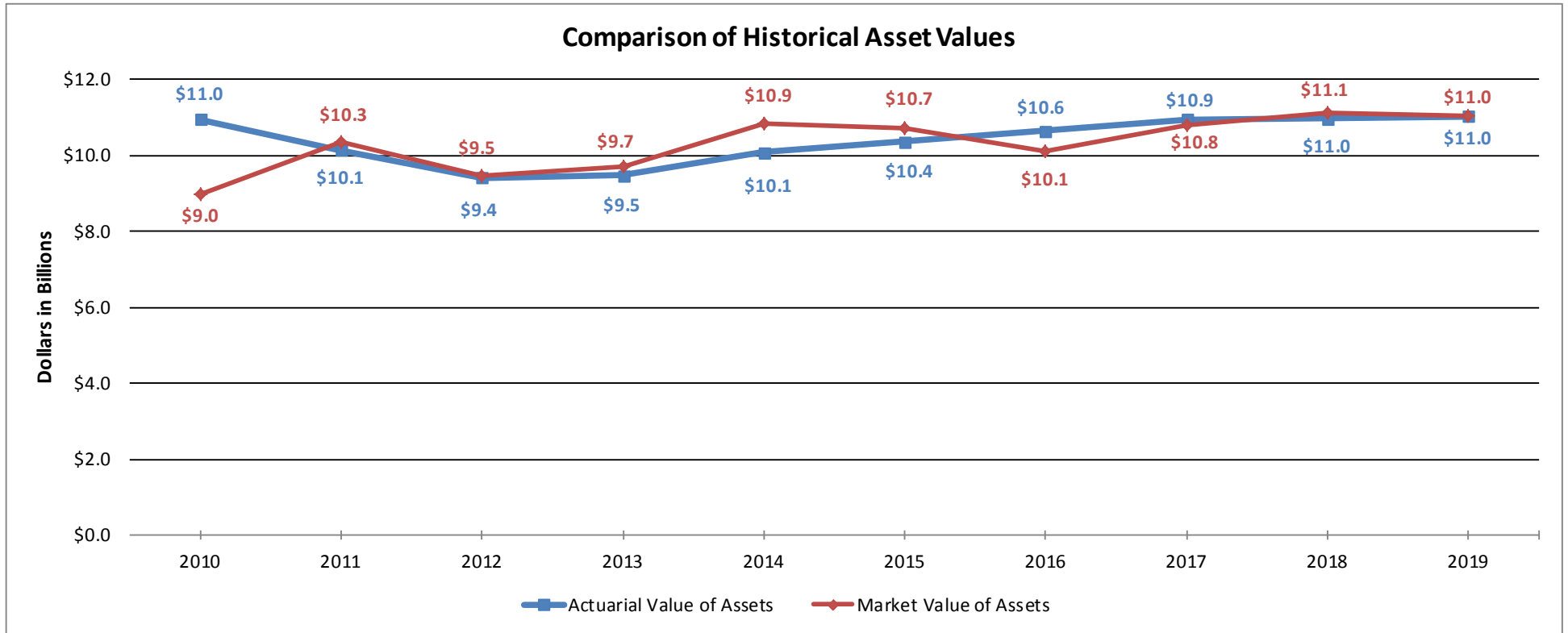
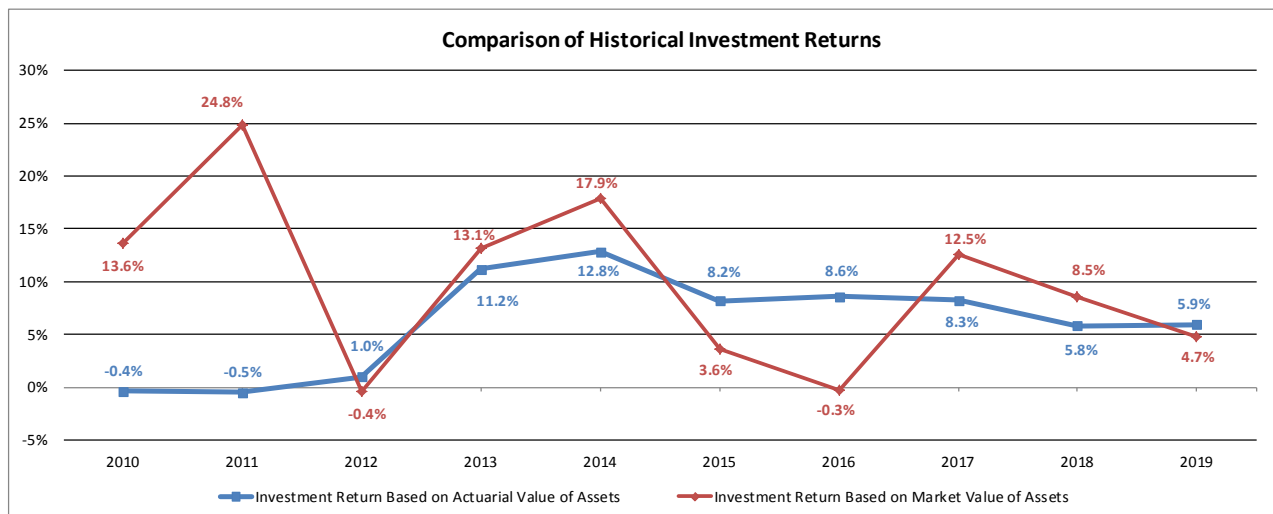


Table 10 Historical Investment Returns

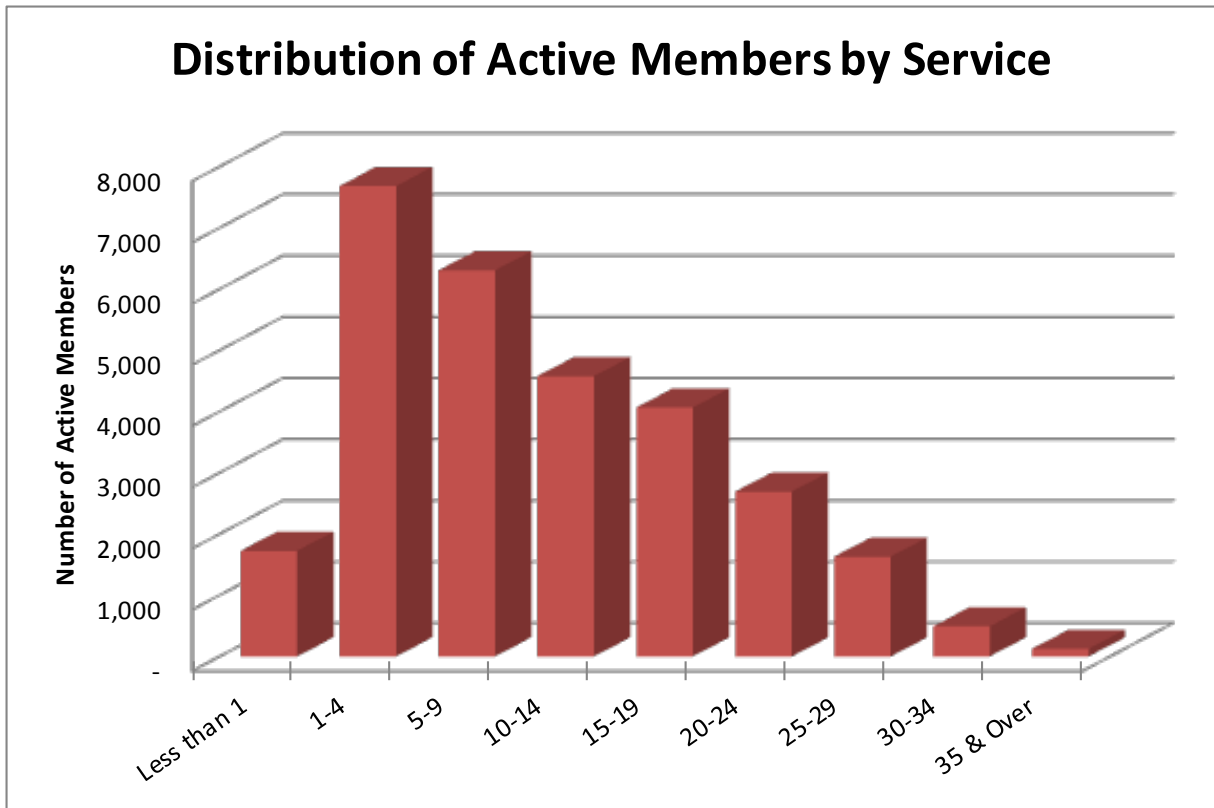
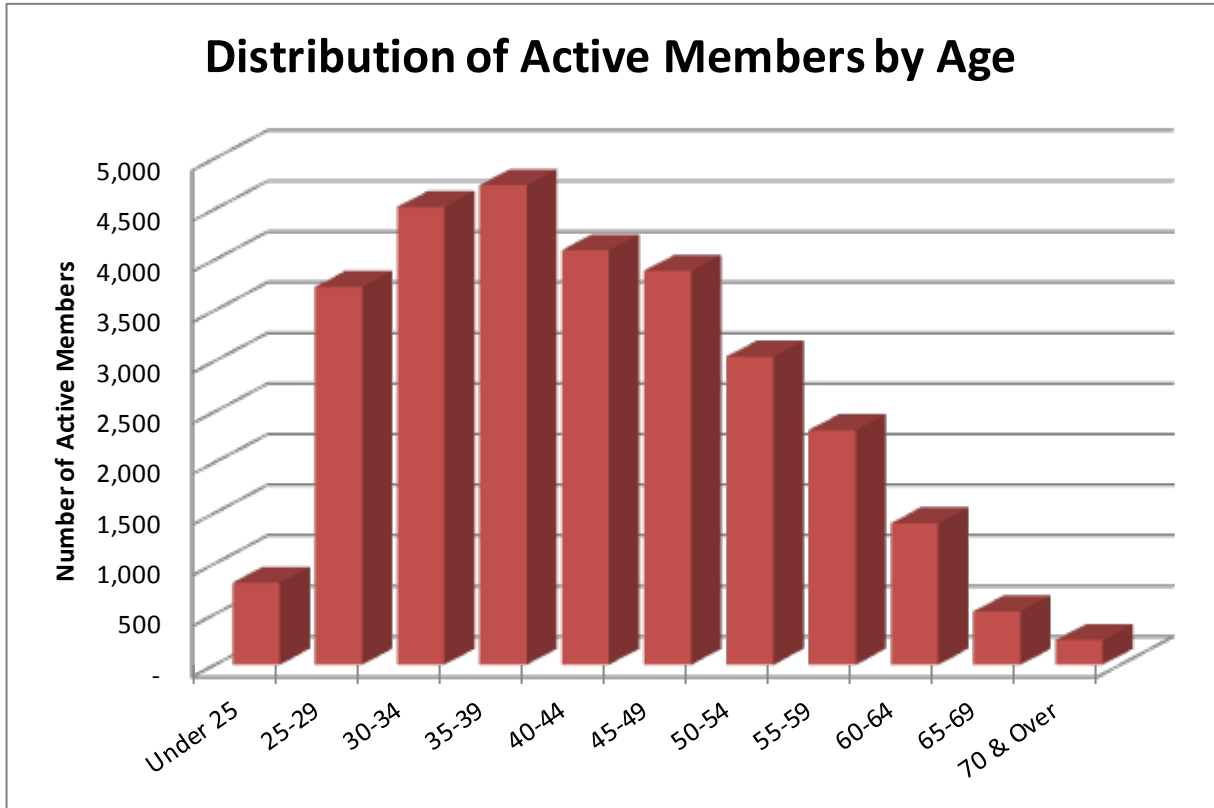
Year Ended June 30,	Market Value Return	Actuarial Value Return
1995	18.7%	n/a
1996	16.3%	n/a
1997	19.8%	n/a
1998	18.2%	n/a
1999	10.7%	n/a
2000	9.5%	n/a
2001	(1.5%)	n/a
2002	(3.3%)	n/a
2003	4.0%	2.3%
2004	15.0%	3.2%
2005	10.8%	6.0%
2006	10.7%	9.6%
2007	17.7%	13.3%
2008	(5.3%)	7.9%
2009	(22.4%)	0.2%
2010	13.6%	(0.4%)
2011	24.8%	(0.5%)
2012	(0.4%)	1.0%
2013	13.1%	11.2%
2014	17.9%	12.8%
2015	3.6%	8.2%
2016	(0.3%)	8.6%
2017	12.5%	8.3%
2018	8.5%	5.8%
2019	4.7%	5.9%
Average Returns		
Last 10 Years:	9.5%	6.0%
Last 25 Years:	8.2%	n/a



SECTION F

PARTICIPANT DATA

Graph 7 Active Members Classified by Age and Service



Graph 8 Retirees Classified by Benefit Amount and Age

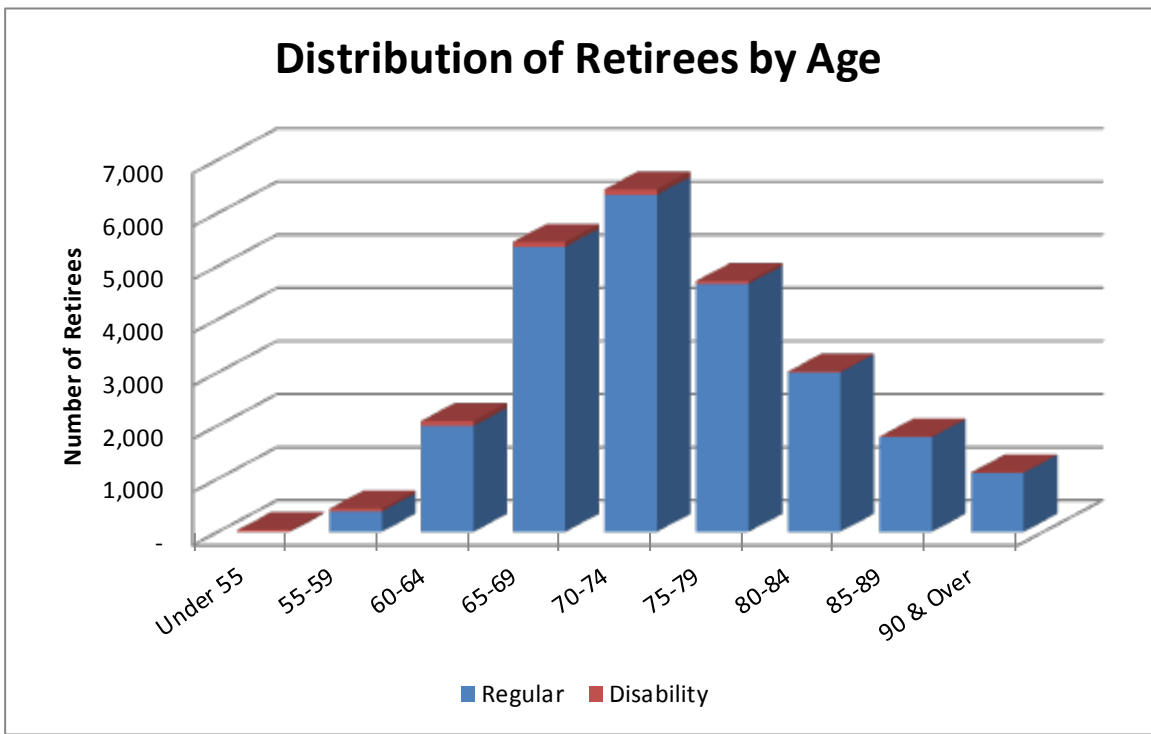
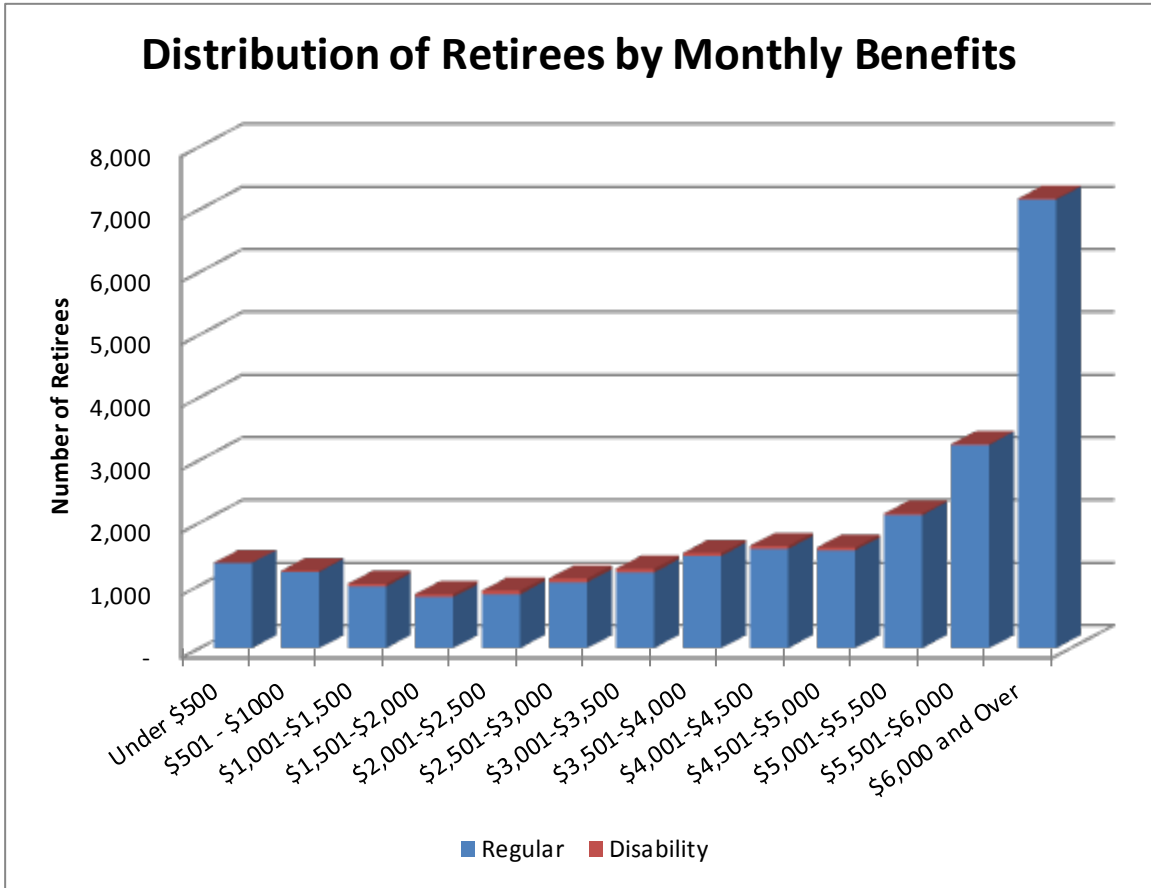


Table 11
Summary of Fund Membership

	Year Ended		Change from Prior Year
	June 30, 2019	June 30, 2018	
Active Members			
Number ^a	29,295	28,958	1.2%
Average Age	42.3	42.0	
Average Service	10.8	10.7	
Total Salary Supplied by Fund	\$2,179,054,844	\$2,094,830,446	4.0%
Average Annual Salary	\$74,383	\$72,340	2.8%
Total Active Vested Participants	16,655	17,065	-2.4%
Male Members	6,903	6,954	-0.7%
Female Members	22,392	22,004	1.8%
Tier 1 Members	18,632	19,389	-3.9%
Tier 2 Members	10,663	9,569	11.4%
Inactive Vested Members^b			
Number	9,926	9,398	5.6%
Average Age	47.2	46.6	
Average Service (Excluding Reciprocal Service)	7.7	7.8	
Inactive Non-Vested Members			
Number	20,621	20,282	1.7%
Retirees			
Number	24,631	24,897	-1.1%
Average Age	74.6	74.1	
Average Annual Benefit	\$55,761	\$54,355	2.6%
Total Annual Benefit	\$1,373,459,588	\$1,353,269,577	1.5%
Disabled Retirees			
Number	469	464	1.1%
Average Age	67.8	67.7	
Average Annual Benefit	\$38,717	\$37,682	2.7%
Total Annual Benefit	\$18,158,456	\$17,484,671	3.9%
Beneficiaries (Including Children)			
Number	3,217	3,188	0.9%
Average Age	77.0	76.6	
Average Annual Benefit	\$24,067	\$23,002	4.6%
Total Annual Benefit	\$77,424,498	\$73,331,546	5.6%
Total Members	88,159	87,187	1.1%

^a Active count excludes members expected to be hired to replace retirements and terminations that occurred in June.

^b Includes reciprocal service

Table 12
Member Population and Ratio of Non-Actives to Actives

Year Ended June 30,	Active Participants ^a	Vested Terminated Participants ^b	Retirees and Beneficiaries	Ratio of Non- Actives to Actives
2008	32,086	3,479	23,920	0.85
2009	31,905	3,056	24,218	0.85
2010	31,012	3,554	24,600	0.91
2011	30,133	4,253	25,199	0.98
2012	30,366	4,245	25,926	0.99
2013	30,969	4,502	27,440	1.03
2014	30,654	4,818	27,722	1.06
2015	29,706	5,464	28,114	1.13
2016	29,543	5,715	28,298	1.15
2017	28,855	6,062	28,439	1.20
2018	28,958	9,398	28,549	1.31
2019	29,295	9,926	28,317	1.31

^a Active count excludes members expected to be hired to replace retirements and terminations that occurred in June.

^b Excludes non-vested terminated participants due a refund of member contributions.

Table 13
Total Lives and Annual Salaries of Active Members Classified by Age
and Years of Service as of June 30, 2019

Attained Age	Completed Years of Service										Total	
	Under 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over			
Under 20	-	-	-	-	-	-	-	-	-	-	-	-
	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
20-24	182	627	-	-	-	-	-	-	-	-	809	
	\$ 2,272,208	\$ 33,287,968	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 35,560,176	\$ -
25-29	388	2,625	717	-	-	-	-	-	-	-	3,730	
	\$ 4,761,166	\$ 145,504,054	\$ 46,732,744	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 196,997,963	\$ -
30-34	235	1,690	2,204	389	-	-	-	-	-	-	4,518	
	\$ 3,012,984	\$ 96,455,717	\$ 154,608,262	\$ 33,659,422	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 287,736,385	\$ -
35-39	206	952	1,476	1,633	467	1	-	-	-	-	4,735	
	\$ 2,407,981	\$ 53,437,005	\$ 106,823,525	\$ 147,890,284	\$ 45,941,730	\$ 99,102	\$ -	\$ -	\$ -	\$ -	\$ 356,599,627	\$ -
40-44	160	544	702	1,096	1,338	252	-	-	-	-	4,092	
	\$ 1,895,693	\$ 29,134,798	\$ 50,296,115	\$ 100,197,447	\$ 132,024,310	\$ 26,678,337	\$ -	\$ -	\$ -	\$ -	\$ 340,226,701	\$ -
45-49	165	421	491	586	977	1,034	214	1	-	-	3,889	
	\$ 1,788,202	\$ 22,426,253	\$ 35,598,382	\$ 52,965,272	\$ 95,611,867	\$ 107,254,686	\$ 23,397,466	\$ 101,907	\$ -	\$ -	\$ 339,144,037	\$ -
50-54	115	286	293	364	539	654	690	99	1	-	3,041	
	\$ 1,321,504	\$ 13,764,842	\$ 21,057,252	\$ 31,147,021	\$ 51,460,276	\$ 65,857,402	\$ 73,289,876	\$ 10,488,226	\$ 101,579	\$ -	\$ 268,487,978	\$ -
55-59	102	251	190	254	377	435	429	246	32	-	2,316	
	\$ 913,415	\$ 11,021,930	\$ 12,184,947	\$ 21,570,273	\$ 34,912,590	\$ 42,587,832	\$ 44,067,970	\$ 26,608,059	\$ 3,732,730	\$ -	\$ 197,599,745	\$ -
60-64	87	159	131	159	258	233	212	107	51	-	1,397	
	\$ 527,269	\$ 5,943,308	\$ 8,025,798	\$ 11,641,840	\$ 23,401,674	\$ 22,967,785	\$ 21,422,518	\$ 11,161,600	\$ 5,727,548	\$ -	\$ 110,819,339	\$ -
65-69	48	75	67	68	82	63	64	33	25	-	525	
	\$ 314,607	\$ 1,846,272	\$ 2,803,116	\$ 4,398,636	\$ 7,193,898	\$ 6,005,581	\$ 6,554,992	\$ 3,315,175	\$ 2,591,002	\$ -	\$ 35,023,278	\$ -
70 & Over	37	54	34	29	28	19	21	5	16	-	243	
	\$ 205,836	\$ 844,554	\$ 795,191	\$ 1,254,802	\$ 1,969,111	\$ 1,546,443	\$ 1,780,536	\$ 479,719	\$ 1,983,426	\$ -	\$ 10,859,618	\$ -
Total	1,725	7,684	6,305	4,578	4,066	2,691	1,630	491	125	-	29,295	
	\$ 19,420,865	\$ 413,666,700	\$ 438,925,331	\$ 404,724,998	\$ 392,515,455	\$ 272,997,167	\$ 170,513,359	\$ 52,154,685	\$ 14,136,284	\$ -	\$ 2,179,054,844	\$ -

Total lives and annual salaries exclude 142 members expected to be hired to replace retirements and terminations that occurred in June 2019.

Table 14
Reconciliation of Member Data as of June 30, 2019

	Actives	Deferred Vested	Expected Refunds	Retirees	Disabilities	Beneficiaries	Total
Totals as of the June 30, 2018 Actuarial Valuation	28,958	9,398	20,282	24,897	464	3,188	87,187
New Entrants	2,773	-	-	-	-	-	2,773
Rehires — Members with Service	609	(220)	(389)	-	-	-	-
Non-Vested Terminations	(1,671)	(15)	1,686	-	-	-	-
Vested Terminations	(767)	1,105	(338)	-	-	-	-
Service Retirements	(275)	(178)	(5)	458	-	-	-
Disabilities	(12)	(9)	-	-	21	-	-
Deaths	(29)	(17)	(36)	(731)	(16)	(193)	(1,022)
New Beneficiaries	-	-	-	-	-	219	219
Refunds and Benefit Terminations	(291)	(149)	(798)	-	-	-	(1,238)
Data Adjustments	-	11	219	7	-	3	240
Net Change	337	528	339	(266)	5	29	972
Totals as of the June 30, 2019 Actuarial Valuation	29,295	9,926	20,621	24,631	469	3,217	88,159

Active count excludes members expected to be hired to replace retirements and terminations that occurred in June.

Table 15
History of Retirees and Beneficiaries Added to Rolls during
Fiscal Year Ended June 30, 2019

Fiscal Year	Added to Rolls		Removed from Rolls		Rolls - End of Year		Average Annual Allowances	Increase in Avg. Annual Allowance
	No.	Annual Allowance	No.	Annual Allowance	No.	Annual Allowance		
2010	1,080	\$ 67,630,266	698	\$ 21,855,794	24,600	\$ 988,162,843	\$ 40,169	3.23%
2011	1,394	86,404,558	795	26,694,342	25,199	1,047,873,059	41,584	3.52%
2012	1,579	96,719,811	852	28,511,983	25,926	1,116,080,887	43,049	3.52%
2013	2,129	130,553,477	615	21,764,846	27,440	1,224,869,518	44,638	3.69%
2014	1,006	70,963,134	724	26,376,522	27,722	1,269,456,130	45,792	2.59%
2015	1,302	85,087,053	910	34,678,799	28,114	1,319,864,384	46,947	2.52%
2016	1,101	78,909,433	917	36,891,261	28,298	1,361,882,556	48,126	2.51%
2017	1,072	79,434,960	931	37,328,244	28,439	1,403,989,272	49,368	2.58%
2018	1,025	79,219,962	915	39,123,440	28,549	1,444,085,794	50,583	2.46%
2019	708	67,514,478	940	42,557,730	28,317	1,469,042,542	51,878	2.56%

Table 16

Number of Annuitants Classified by Benefit Type and Amount as of June 30, 2019

Amount of Monthly Benefit	Retirees		Disabled Retirees		Beneficiaries		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
\$ 1 - 500	374	985	1	1	156	244	531	1,230
501 - 1000	367	851	4	10	189	339	560	1,200
1,001-1,500	307	679	12	29	149	176	468	884
1,501-2,000	225	588	7	39	156	208	388	835
2,001-2,500	220	639	13	45	149	241	382	925
2,501-3,000	248	802	8	53	210	325	466	1,180
3,001-3,500	262	946	14	44	108	252	384	1,242
3,501-4,000	301	1,171	11	35	25	96	337	1,302
4,001-4,500	302	1,280	12	37	13	64	327	1,381
4,501-5,000	328	1,232	8	37	11	47	347	1,316
5,001-5,500	513	1,609	5	19	7	23	525	1,651
5,501-6,000	764	2,481	4	5	5	15	773	2,501
6,001-6,500	728	2,269	1	6	2	5	731	2,280
6,501-7,000	307	1,123	1	1	-	1	308	1,125
7,001-7,500	206	487	1	1	-	-	207	488
7,501-8,000	174	257	2	1	-	-	176	258
8,001-8,500	95	209	-	1	-	-	95	210
8,501-9,000	95	207	1	-	-	-	96	207
9,001-9,500	75	149	-	-	-	-	75	149
Over \$9,500	265	511	-	-	-	1	265	512
Totals	6,156	18,475	105	364	1,180	2,037	7,441	20,876

Table 17
Initial Year of Retirement Analysis

	Years of Credited Service								Total
	0-4	5-9	10-14	15-19	20-24	25-29	30-34		
Fiscal Year 2015									
Avg Monthly Annuity	\$ 275	\$ 877	\$ 1,606	\$ 2,621	\$ 3,530	\$ 4,254	\$ 5,561	\$	\$ 3,398
Avg Monthly FAS	\$ 6,587	\$ 5,377	\$ 5,891	\$ 6,851	\$ 7,555	\$ 7,483	\$ 7,762	\$	\$ 7,077
Number of Retirees	47	104	117	107	269	172	240		1,056
Average Age									63.2
Fiscal Year 2016									
Avg Monthly Annuity	\$ 326	\$ 840	\$ 1,493	\$ 2,432	\$ 3,440	\$ 4,294	\$ 5,701	\$	\$ 3,286
Avg Monthly FAS	\$ 7,267	\$ 5,266	\$ 5,627	\$ 6,515	\$ 7,301	\$ 7,711	\$ 8,026	\$	\$ 7,054
Number of Retirees	61	92	77	113	184	123	202		852
Average Age									63.1
Fiscal Year 2017									
Avg Monthly Annuity	\$ 323	\$ 734	\$ 1,578	\$ 2,516	\$ 3,438	\$ 4,301	\$ 5,684	\$	\$ 3,466
Avg Monthly FAS	\$ 6,255	\$ 4,332	\$ 5,819	\$ 6,705	\$ 7,268	\$ 7,612	\$ 7,975	\$	\$ 6,961
Number of Retirees	38	80	83	99	167	129	219		815
Average Age									63.7
Fiscal Year 2018									
Avg Monthly Annuity	\$ 336	\$ 823	\$ 1,503	\$ 2,578	\$ 3,471	\$ 4,505	\$ 5,867	\$	\$ 3,382
Avg Monthly FAS	\$ 6,507	\$ 5,349	\$ 5,502	\$ 6,738	\$ 7,407	\$ 7,927	\$ 8,166	\$	\$ 7,089
Number of Retirees	39	92	81	88	175	122	171		768
Average Age									63.2
Fiscal Year 2019									
Avg Monthly Annuity	\$ 305	\$ 699	\$ 1,634	\$ 2,547	\$ 3,672	\$ 4,789	\$ 6,009	\$	\$ 3,150
Avg Monthly FAS	\$ 6,069	\$ 4,827	\$ 6,098	\$ 6,673	\$ 7,644	\$ 8,482	\$ 8,446	\$	\$ 7,046
Number of Retirees	42	64	64	62	77	62	94		465
Average Age									63.7

SECTION G

ACTUARIAL METHODS AND ASSUMPTIONS

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Actuarial Cost Method as Mandated by 40 ILCS 5/17-129, Adopted August 31, 1991

The Projected Unit Credit normal cost method is used. Under this method, the projected pension at retirement age is first calculated and the present value at the individual member's current or attained age is determined. The normal cost for the member for the current year is equal to the actuarial present value divided by the member's projected service at retirement. The normal cost for the plan for the year is the sum of the individual normal costs.

The actuarial liability at any point in time is the present value of the projected pensions at that time less the present value of future normal costs.

For ancillary benefits for active members, in particular death and survivor benefits, termination benefits and the postretirement increases, the same procedure as outlined above is followed.

Estimated annual administrative expenses are added to the normal cost.

For actuarial valuation purposes, as well as projection purposes, an actuarial value of assets is used.

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Actuarial Assumptions

Actuarial assumptions are set by the Board of Trustees. All actuarial assumptions are expectations of future experience and are not market measures. The rationale for the actuarial assumptions may be found in the 2018 Actuarial Experience Study issued on May 25, 2018, the 2018 Investment Return Assumption Review issued on July 25, 2018 and the 2019 Actuarial Assumption Study issued on September 10, 2019.

Rate of Investment Return

7.00 percent per year, compounded annually, net of investment expenses.

Price Inflation (Increase in Consumer Price Index “CPI”)

2.50 percent per annum, compounded annually.

This assumption serves as the basis for the determination of annual increases in pension and the pensionable salary cap for Tier 2 members.

Cost of Living Adjustment “COLA”

The assumed rate is 3.00 percent per year for members hired before January 1, 2011, based on the benefit provision of 3.00 percent annual compound increases. The assumed rate is 1.25 percent for members hired on and after January 1, 2011, based on the benefit provision of increases equal to ½ of the increase in CPI-U with a maximum increase of 3.00 percent.

Wage Inflation

3.00 percent per annum, compounded annually.

Calculation of the Actuarially Determined Contribution

The amortization factor used to calculate the ADC is based on the Fund’s assumed interest rate of 7.00 percent and an annualized assumed rate of increase in total capped payroll of 2.20 percent (which is consistent with the projected increase in total payroll from the projections used to calculate the statutory contribution requirements). The Employer Normal Cost and Amortization Payment are adjusted for expected contribution timing.

Total Payroll

Unless stated otherwise, total payroll includes employee contributions of 7.00 percent of salary picked up by the Board of Education for employees hired prior to January 1, 2017. All contributions are calculated based on total payroll.

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Mortality

Applicable Group	Base Mortality Table	Male Scaling Factor	Female Scaling Factor
Pre-retirement Mortality	RP-2014 White Collar Employee, sex distinct	98%	113%
Post-retirement Disabled Mortality	RP-2014 Disabled Annuitant, sex distinct	103%	106%
Post-retirement Healthy Mortality	RP-2014 White Collar Healthy Annuitant, sex distinct	108%	94%

Future mortality improvements are reflected by projecting the base mortality tables back from the year 2014 to the year 2006 using the Society of Actuaries (SOA) MP-2014 (referred to as the RP-2006 base mortality tables) and projecting from 2006 using the MP-2017 projection scale. The assumptions are generational mortality tables and include a margin for improvement.

Age	Future Life Expectancy (years) in 2019				Future Life Expectancy (years) in 2030			
	Post-retirement Healthy		Post-retirement Disabled		Post-retirement Healthy		Post-retirement Disabled	
	Male	Female	Male	Female	Male	Female	Male	Female
35	51.05	54.32	34.14	40.53	52.13	55.34	35.90	42.14
40	45.88	49.13	30.45	36.10	46.93	50.13	32.03	37.60
45	40.79	44.00	27.16	32.01	41.81	44.98	28.60	33.41
50	35.79	38.91	23.98	28.05	36.79	39.87	25.34	29.37
55	30.91	33.87	20.89	24.30	31.88	34.81	22.16	25.53
60	26.17	28.96	17.90	20.84	27.09	29.86	19.03	21.93
65	21.62	24.25	15.09	17.50	22.46	25.09	16.03	18.44
70	17.31	19.75	12.39	14.19	18.06	20.53	13.18	15.02
75	13.32	15.50	9.80	11.09	13.99	16.22	10.48	11.84

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Termination

Service-based termination rates were used. Sample rates are as follows:

Termination			
Service (Beginning of Year)	Rate (%)	Service (Beginning of Year)	Rate (%)
0	30.00%	16	2.25%
1	16.00%	17	2.25%
2	13.00%	18	2.25%
3	12.00%	19	2.25%
4	9.00%	20	2.25%
5	9.00%	21	2.25%
6	8.00%	22	2.25%
7	6.00%	23	2.25%
8	5.00%	24	2.25%
9	5.00%	25	2.25%
10	4.00%	26	2.25%
11	3.00%	27	2.25%
12	3.00%	28	2.25%
13	3.00%	29	2.25%
14	3.00%	30	1.75%
15	3.00%	31+	1.75%

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Salary Increases

Illustrative rates of increase per individual employee per year, compounded annually:

Age	Annual Increase
20	12.85%
25	7.75%
30	6.25%
35	5.50%
40	4.50%
45	3.75%
50	3.25%
55	3.00%
60	3.00%
65	3.00%
70	3.00%

The underlying salary increase assumption is based on a wage inflation assumption of 3.00 percent per year.

Disability

Disability rates, based on recent experience of the Fund, were applied to members with at least 10 years of service. All disabilities are assumed to be non-duty disabilities. Sample rates are as follows:

Age	Rate (%)
20	0.04%
25	0.04%
30	0.04%
35	0.05%
40	0.06%
45	0.08%
50	0.19%
55	0.24%
60	0.29%

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Retirement

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age.

Retirement Rates for Tier 1 Employees		
Age	<34 Years of Service Rate (%)	34+ Years of Service Rate (%)
55	5.00%	20.00%
56	5.00%	20.00%
57	5.00%	20.00%
58	5.00%	20.00%
59	7.00%	20.00%
60	9.00%	22.50%
61	11.00%	22.50%
62	12.00%	22.50%
63	13.00%	22.50%
64	14.00%	22.50%
65	15.00%	25.00%
66	16.00%	25.00%
67	17.00%	25.00%
68	18.00%	27.50%
69	19.00%	27.50%
70	20.00%	30.00%
71	20.00%	30.00%
72	20.00%	30.00%
73	20.00%	30.00%
74	20.00%	30.00%
75	100.00%	100.00%

Retirement Rates for Tier 2 Employees	
Age	Rate (%)
62	40.00%
63	25.00%
64	25.00%
65	30.00%
66	25.00%
67	30.00%
68	20.00%
69	20.00%
70	20.00%
71	20.00%
72	20.00%
73	20.00%
74	20.00%
75	100.00%

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Active Member Population as of the Actuarial Valuation Date

The Tier 2 active population as of the actuarial valuation date of June 30, 2019, was increased by 142 members in order to estimate the total expected number of active members that will be working and making contributions in the upcoming fiscal year. Members who retire at the end of the school year have June retirement dates and are already reflected as retirees in the data received as of June 30, but new active members to replace these members are not hired until August or September and are not included in the census data until the following fiscal year. These members are assumed to have a similar demographic profile as new entrants who have been hired in the last three years.

Population Projection

For purposes of determining annual appropriation as a percent of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the actuarial valuation date including expected new hires, or 29,437. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have a similar demographic profile of recent new entrants to the Fund. The average increase in uncapped payroll for the projection period is 3.00 percent per year.

New Entrant Profile		
Age Group	No.	Salary
Under 20		
20-24	1,063	\$ 51,493,871
25-29	1,500	75,145,249
30-34	785	40,666,028
35-39	457	23,069,777
40-44	294	14,606,436
45-49	250	12,373,168
50-54	169	7,184,922
55-59	149	6,104,574
60-64	82	2,358,889
65-69	11	158,700
70 & Over		
Total	4,760	\$ 233,161,614
Avg. Salary		\$ 48,984
Avg. Age		32.22
Percent Female		76%

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Assets

The asset values used for the actuarial valuation were based on asset information contained in the financial statements for the year ended June 30, 2019, prepared by the Fund. The actuarial value of assets was determined by smoothing unexpected gains or losses over a period of four years. The investment gain or loss for a year is calculated as the total investment income on the market value of assets, minus expected investment return on the prior actuarial value of assets. The final actuarial value is equal to the expected actuarial value plus (or minus) 25 percent of the calculated gain (or loss) in the prior four years.

Expenses

Administrative expenses included in the normal cost are based on the previous year's administrative expenses increased by 5.75 percent. Future administrative expenses are assumed to increase by 5.75 percent per year for 15 years and then increase at a rate consistent with the increase in projected capped payroll thereafter.

Marriage Assumption

75.0 percent of active male participants and 65.0 percent of active female participants are assumed to be married. Actual marital status at benefit commencement is used for retirees.

Spouse's Age

The female spouse is assumed to be two years younger than the male spouse.

Total Service at Retirement

A teacher's total service credit at retirement is assumed to be 103.3 percent of the teacher's regular period of service at retirement.

Valuation of Inactive Members Eligible for Deferred Vested Pension Benefits

Benefits for inactive deferred vested members were determined by projecting the accumulated contribution balance to retirement (age 62) with interest at the assumed investment rate of return, converted to an annuity, and then loaded by 35 percent.

Assumption for Missing Data

Members whose gender was not provided are assumed to be female.

Actuarial Methods and Assumptions (Most Adopted Effective with the June 30, 2018 Actuarial Valuation)

Contribution Timing

Projected employer contributions are assumed to occur based on the following timing:

1. Additional Board of Education Contribution (0.58 percent of pay) — June 30th (End of Year)
2. Additional State Contribution (0.544 percent of pay) — Monthly (Middle of Year)
3. State Normal Cost Contribution — Monthly (Middle of Year)
4. Board of Education Early Payment of Special Tax Levy — March 1st, annually
 - a. 55 percent of prior year's tax levy is assumed to occur each March 1st
 - i. This amount is assumed to be \$180,612,283 for fiscal year 2020 and increased each year by three percent.
5. Remaining Board of Education Contribution — June 30th (End of Year)

Decrement Timing

All decrements are assumed to occur during the middle of the year.

Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

Decrement Operation

Turnover decrements do not operate after a member reaches retirement eligibility. Disability decrements do not operate after a member reaches normal retirement eligibility.

Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

Assumptions as a Result of Public Act 96-0889

Members hired on or after January 1, 2011, are assumed to make contributions on salary up to the final average compensation cap in a given year.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

Capped (pensionable) pay was \$114,952 for fiscal year 2019 and increases at ½ the annual increase in the Consumer Price Index-U thereafter.

The annual increase in the Consumer Price Index-U is assumed to be 2.50 percent for all years.

Projection Methodology and Appropriation Requirements under P.A. 90-0655, P.A. 91-0357, P.A. 96-0889, P.A. 99-0521 and P.A. 100-0465

Employer Contributions under P.A. 96-0889

The following is an excerpt from the Illinois Compiled statutes 40 ILCS 5/17-129 (b)(iv)-(b)(vii):

(iv) For fiscal years 2014 through 2059, the minimum contribution to the Fund to be made by the Board of Education in each fiscal year shall be an amount determined by the Fund to be sufficient to bring the total assets of the Fund up to 90% of the total actuarial liabilities of the Fund by the end of fiscal year 2059. In making these determinations, the required Board of Education contribution shall be calculated each year as a level percentage of the applicable employee payrolls over the years remaining to and including fiscal year 2059 and shall be determined under the Projected Unit Credit actuarial cost method.

(v) Beginning in fiscal year 2060, the minimum Board of Education contribution for each fiscal year shall be the amount needed to maintain the total assets of the Fund at 90% of the total actuarial liabilities of the Fund.

(vi) Notwithstanding any other provision of this subsection (b), for any fiscal year, the contribution to the Fund from the Board of Education shall not be required to be in excess of the amount calculated as needed to maintain the assets (or cause the assets to be) at the 90% level by the end of the fiscal year.

(vii) Any contribution by the State to or for the benefit of the Fund, including, without limitation, as referred to under Section 17-127, shall be a credit against any contribution required to be made by the Board of Education under this subsection (b).

Additional State and Employer Contributions under P.A. 90-0655 and P.A. 91-0357

The following is an excerpt from the Illinois Compiled statutes 40 ILCS 5/17-127 (b):

(b) The General Assembly finds that for many years the State has contributed to the Fund an annual amount that is between 20% and 30% of the amount of the annual State contribution to the Article 16 retirement system, and the General Assembly declares that it is its goal and intention to continue this level of contribution to the Fund in the future. Beginning in State fiscal year 1999, the State shall include in its annual contribution to the Fund an additional amount equal to 0.544% of the Fund's total teacher payroll; except that this additional contribution need not be made in a fiscal year if the Board has certified in the previous fiscal year that the Fund is at least 90% funded, based on actuarial determinations. These additional State contributions are intended to offset a portion of the cost to the Fund of the increases in retirement benefits resulting from this amendatory Act of 1998.

The following is an excerpt from the Illinois Compiled statutes 40 ILCS 5/17-127.2 (1)-(2):

Sec. 17-127.2. Additional contributions by employer of teachers. Beginning July 1, 1998, the employer of a teacher shall pay to the Fund an employer contribution computed as follows:

(1) Beginning July 1, 1998 through June 30, 1999, the employer contribution shall be equal to 0.3% of each teacher's salary.

Projection Methodology and Appropriation Requirements under P.A. 90-0655, P.A. 91-0357, P.A. 96-0889, P.A. 99-0521 and P.A. 100-0465

(2) Beginning July 1, 1999 and thereafter, the employer contribution shall be equal to 0.58% of each teacher's salary. The employer may pay these employer contributions out of any source of funding available for that purpose and shall forward the contributions to the Fund on the schedule established for the payment of member contributions. These employer contributions need not be made in a fiscal year if the Board has certified in the previous fiscal year that the Fund is at least 90% funded, based on actuarial determinations. These employer contributions are intended to offset a portion of the cost to the Fund of the increases in retirement benefits resulting from Public Act 90-582.

Board of Education Dedicated Property Tax Levy under P.A. 99-0521 as Amended by P.A. 100-0465

The following is an excerpt from the Illinois Compiled statutes 105 ILCS 5/34-53:

Beginning on the effective date of this amendatory Act of the 99th General Assembly, for the purpose of making an employer contribution to the Public School Teachers' Pension and Retirement Fund of Chicago, the board may levy annually for taxable years prior to 2017, upon all taxable property located within the district, a tax at a rate not to exceed 0.383%. Beginning with the 2017 taxable year, for the purpose of making an employer contribution to the Public School Teachers' Pension and Retirement Fund of Chicago, the board may levy annually, upon all taxable property within the district, a tax at a rate of 0.567%. The proceeds from this additional tax shall be paid, as soon as possible after collection, directly to the Public School Teachers' Pension and Retirement Fund of Chicago and not to the Board of Education.

State Contributions under P.A. 100-0465

The following is an excerpt from the Illinois Compiled statutes 40 ILCS 5/17-127 (d)(1)-(d)(2):

(d) In addition to any other contribution required under this Article, including the contribution required under subsection (c), the State shall contribute to the Fund the following amounts:

(1) For State fiscal year 2018, the State shall contribute \$221,300,000 for the employer normal cost for fiscal year 2018 and the amount allowed under paragraph (3) of Section 17-142.1 of this Code to defray health insurance costs. Funds to this paragraph (1) shall come from funds appropriated for Evidence-Based Funding pursuant to Section 18-8.15 of the School Code.

(2) Beginning in State fiscal year 2019, the State shall contribute for each fiscal year an amount to be determined by the Fund, equal to the employer normal cost for that fiscal year, plus the amount allowed pursuant to paragraph (3) of Section 17-142.1 to defray health insurance costs.

We calculated the required contribution based on the above legislation; the results are shown in the summary section of this report.

SECTION H

SUMMARY OF PLAN PROVISIONS

Summary of Plan Provisions (as of June 30, 2019)

It should be noted that the purpose of this section is to describe the benefit structures of CTPF for which actuarial values have been generated. Many portions of the defined plans are described in a manner which may not be legally complete or precise.

It is not our intent to provide an exhaustive description of all benefits provided under CTPF or the policies and procedures utilized by CTPF staff. A more precise description of the provisions of CTPF can be found in Illinois Compiled Statutes (ILCS) Chapter 40, Articles 1, 17 and 20. In all situations, the plan provisions described in the Statutes govern.

Summary of Plan Provisions (as of June 30, 2019)

Purpose

The Public School Teachers' Pension and Retirement Fund of Chicago, established in 1895 by the Illinois state legislature, is a defined benefit public employee retirement fund that provides retirement, survivor and disability benefits to certain teachers and employees of the Chicago Public Schools.

Administration

Responsibility for the operation of the Fund and the direction of its policies is vested in a Board of Trustees of 12 members. The 12-member Board of Trustees is comprised of six members elected by the teacher contributors, three members elected by the annuitants, one member elected by the principal contributors and two members are appointed by the Board of Education. The administration of the detailed affairs of the Fund is the responsibility of the Executive Director who is appointed by the Board of Trustees. Administrative policies and procedures are designed to ensure an accurate accounting of funds of CTPF and prompt payment of claims for benefits within the applicable statute.

Membership

Any teacher and certain other employees of the Chicago Public Schools, approved charter schools and the Chicago Teachers' Pension Fund are participants of CTPF. Members hired prior to January 1, 2011, participate under the Tier 1 benefit structure. Members hired on and after January 1, 2011, participate under the Tier 2 benefit structure.

Membership Service

Membership service includes all service rendered while a member of the Fund for which credit is allowable. Contributors to the Fund cannot earn more than one year of service credit per fiscal year. Validated service within a fiscal year is determined on a schedule of 170 days.

Member Contributions

Members are required to contribute a percentage of salary as their share of meeting the cost of the various benefits. The total contribution rate of 9.0 percent of salary consists of 7.5 percent towards the retirement pension, 1.0 percent towards the survivor pension and 0.5 percent towards the post-retirement increase.

As of September 1981, the Board of Education has been paying 7.0 percent of the required teacher contributions for Chicago public school teachers. Charter school contributions may be contributed at various rates by the employers and teachers.

As a result of the collective bargaining agreement between the Board of Education of the City of Chicago and the Chicago Teachers Union, Local No. 1, American Federation of Teachers, AFL-CIO, which became effective December 7, 2016, teachers hired on and after January 1, 2017, will no longer receive the pension pick-up of 7.0 percent from the Board of Education.

Summary of Plan Provisions (as of June 30, 2019)

Retirement Pension

Qualification of Member

A member is eligible for a retirement pension after (1) completing 20 years of validated service, with the pension payable at age 55 or older, or (2) after completing five years of service with the pension payable at age 62 or older.

Amount of Pension

The pension is based on the member's final average salary and the number of years of service credit that has been established.

Final Average Salary is the average of the highest rates of salary for any four consecutive years of validated service within the last 10 years.

For service earned before July 1, 1998, the amount of the service retirement pension is 1.67 percent of final average salary for the first 10 years, 1.90 percent for each of the next 10 years, 2.10 percent for each of the following 10 years and 2.30 percent for each year above 30. For service earned after June 30, 1998, the amount of the service retirement pension is 2.2 percent of final average salary for each year of service.

Service earned before July 1, 1998, can be upgraded to the 2.2 percent formula through the payment of additional employee contributions of 1 percent of the teacher's highest salary within the last four years for each year of prior service, up to a maximum of 20 percent, which upgrades all service years. The number of years for which contributions are required is reduced by one for each three full years of service after June 30, 1998. No contribution is required if the member has at least 30 years of service.

The maximum pension payable is 75 percent of final average salary or \$1,500 per month, whichever is greater.

Annual Increases in Pension

Postretirement increases of 3.0 percent of the current pension (i.e., increases are compounded) are granted to members effective each January 1, occurring on or after the first anniversary of the pension or the 61st birthday, whichever is later.

Reductions

Except for retirement after 34 years of service, the retirement pension is reduced by $\frac{1}{2}$ of 1.0 percent for each month the member is under age 60.

Summary of Plan Provisions (as of June 30, 2019)

Survivors Annuity

Qualification of Survivor

A surviving spouse or unmarried minor children is entitled to a pension upon the death of a member while in service or in retirement. Survivor's pensions are conditioned upon marriage having been in effect at least one year prior to death.

Amount of Pension

The minimum survivor's pension upon death of an active or retired member is 50 percent of the deceased member's pension at the date of death. If the surviving spouse is under age 50, and no unmarried minor children under age 18 survive, payment of the survivor's pension is deferred until age 50.

Annual Increases in Pension

Survivor's pensions are subject to annual increases of 3.0 percent per year based on the current amount of pension starting the later of when the member would have attained age 61 and receipt of one year's pension payments.

Death Benefits

Amount and Duration of Payment

Upon the death of a member in service, a refund equal to the total contributions less contributions for survivor's pensions is payable without interest to a designated beneficiary or the estate of the member. The death benefit payable is the lesser of \$10,000 and salary earned for the most recent six months.

Upon death of a member after retirement, the death benefit consists of the excess, if any, of the total contributions over the total pension payments paid to the member or his/her beneficiary. Furthermore, the death benefit is the lesser of \$10,000 and the most recent salary earned for a six-month period less 20% of the death benefit for each year that the member has been on pension, to a minimum of \$5,000.

Non-Duty Disability Benefits

Qualification and Amount of Payment

A disability retirement pension is payable in the event of total or permanent disability with 10 or more years of service, irrespective of age. The benefit is the unreduced service retirement pension. However, if the participant has 20 or more and less than 25 years of service and is under age 55, the benefit is reduced by $\frac{1}{2}$ of 1.0 percent for each month that the age of the member is below age 55 down to a minimum age of 50. If total service is 20 years or more and the member has attained age 55, or after 25 years of service, regardless of age, the retirement pension is payable without reduction.

Summary of Plan Provisions (as of June 30, 2019)

Annual Increases in Annuity

Postretirement increases of 3.0 percent of the current pension (i.e., increases are compounded) are granted to members effective each January 1, occurring on or after the first anniversary of the pension or the 61st birthday, whichever is later.

Duty Disability Benefits

Qualification and Amount of Payment

A disability retirement pension is payable in the event of total or permanent disability from an injury that occurred while working. The disability benefit provided is 75 percent of final average salary until attainment of age 65. At age 65, the disabled retiree shall receive a service retirement pension, which includes service earned while disabled.

Annual Increases in Annuity

Postretirement increases of 3.0 percent of the current pension (i.e., increases are compounded) are granted to members effective each January 1, occurring on or after the first anniversary of the pension or the 61st birthday, whichever is later.

Refunds

Upon termination of employment, a member may obtain a refund of his/her total contributions and those contributions made on his/her behalf, without interest.

A member who is unmarried at the date of retirement is entitled to a refund of the full amount contributed for the survivor's pension, without interest.

Reversionary Pension

A member can provide a reversionary pension for a surviving beneficiary by having his/her current pension reduced. If the beneficiary survives the date of the member's retirement, but does not survive the retired member, the member's pension shall be restored to the full amount of pension in place prior to choosing the reversionary pension.

Health Insurance Subsidy

The board may pay each recipient of a retirement, disability or survivor's pension an amount to be determined by the board, which shall represent partial reimbursement for the cost of the recipient's health insurance coverage, with the total amount of payment not to exceed \$65,000,000, or 75% of the total cost of health insurance coverage in any year.

Summary of Plan Provisions (as of June 30, 2019)

Retirement Systems Reciprocal Act

The Fund complies with the Retirement Systems Reciprocal Act (Chapter 40 Act 5 Article 20 of the Illinois Compiled Statutes) to provide reciprocal benefits if a member has service credit for other public employment in Illinois.

Provisions Applicable to Members Hired on or after January 1, 2011, as a result of Public Act 96-0889

Final Average Compensation

Based on last eight years of service and may not exceed \$106,800, as automatically increased by the lesser of 3 percent or one-half of the annual increase in the consumer price index-u during the preceding 12-month calendar year.

Retirement Eligibility

Normal retirement – 67 years old with 10 years of service.

Early Retirement – 62 years old with 10 years of service with a 6.0 percent per year reduction in benefit for each year age is under 67.

Annual Increases in Annuity

Annual increases begin at the later of the first anniversary of retirement or age 67. The annual increases are equal to the lesser of 3.0 percent or one-half of the annual increase in the consumer price index-u during the preceding 12-month calendar year and are not compounded.

Survivor Benefits

Benefit equal to 66.67 percent of the earned retirement benefit at death. Survivor benefits are increased by the lesser of 3.0 percent or one-half of the annual increase in the consumer price index-u during the preceding 12-month calendar year and are not compounded.

Summary of Plan Provisions (as of June 30, 2019)

Salary and COLA Development for Members Hired on or After January 1, 2011

Year Ending	CPI-U	1/2 CPI-U	COLA	Maximum Annual Pensionable Earnings
2011			3.00%	\$106,800.00
2012	3.90%	1.95%	1.95%	\$108,882.60
2013	2.00%	1.00%	1.00%	\$109,971.43
2014	1.20%	0.60%	0.60%	\$110,631.26
2015	1.70%	0.85%	0.85%	\$111,571.63
2016	0.00%	0.00%	0.00%	\$111,571.63
2017	1.50%	0.75%	0.75%	\$112,408.42
2018	2.20%	1.10%	1.10%	\$113,644.91
2019	2.30%	1.15%	1.15%	\$114,951.83

SECTION I

GLOSSARY OF TERMS

Glossary of Terms

<i>Actuarial Accrued Liability (“AAL”)</i>	The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs.
<i>Actuarial Assumptions</i>	Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.
<i>Actuarial Cost Method</i>	A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of future Normal Costs and the Actuarial Accrued Liability.
<i>Actuarial Equivalent</i>	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
<i>Actuarial Present Value (“APV”)</i>	The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.
<i>Actuarial Present Value of Future Benefits (“APVFB”)</i>	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits and inactive, nonretired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
<i>Actuarial Valuation</i>	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for compliance with GASB No. 67, such as the Funded Ratio and the Actuarially Determined Contribution (“ADC”).
<i>Actuarial Value of Assets (“AVA”)</i>	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio or contribution requirement.

Glossary of Terms

<i>Actuarially Determined Contribution (“ADC”)</i>	The employer’s periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and Amortization Payment.
<i>Amortization Method</i>	A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.
<i>Amortization Payment</i>	That portion of the plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.
<i>Amortization Period</i>	The period used in calculating the Amortization Payment.
<i>Closed Amortization Period</i>	A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.
<i>Employer Normal Cost</i>	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
<i>Equivalent Single Amortization Period</i>	For plans that do not establish separate amortization bases (separate components of the UAAL), this is the same as the Amortization Period. For plans that do establish separate amortization bases, this is the period over which the UAAL would be amortized if all amortization bases were combined upon the current UAAL payment.
<i>Experience Gain/Loss</i>	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience; e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience; i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.

Glossary of Terms

<i>Funded Ratio</i>	The ratio of the Actuarial Value of Assets to the Actuarial Accrued Liability.
<i>GASB</i>	Governmental Accounting Standards Board.
<i>GASB Statement No. 67 and GASB Statement No. 68</i>	These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 68, which replaced Statement No. 27 effective with the fiscal year ending June 30, 2015, sets the accounting rules for the employers that sponsor or contribute to public retirement systems. Statement No. 67, which replaced Statement No. 25 effective with fiscal year ending June 30, 2014, sets the rules for the systems themselves.
<i>Normal Cost</i>	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
<i>Open Amortization Period</i>	An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. In other words, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year. In theory, if an Open Amortization Period is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never completely disappear, but will become smaller each year, either as a dollar amount or in relation to covered payroll.
<i>Unfunded Actuarial Accrued Liability</i>	The difference between the Actuarial Accrued Liability and Actuarial Value of Assets.
<i>Valuation Date</i>	The date as of which the Actuarial Present Value of Future Benefits are determined. The benefits expected to be paid in the future are discounted to this date.

SECTION J

ADDITIONAL PROJECTION DETAILS

Table 18

Additional Projection Details — Actuarial Accrued Liability (\$ in Millions)

Fiscal Year Ending	Current Inactives		Actives			Grand Totals		
	Retirees & Beneficiaries	Deferreds	Tier 1	Current Tier 2	Future Tier 2	Current Retirees, Beneficiaries & Deferreds	Actives	Total
2019	\$16,996.71	\$536.15	\$5,556.94	\$162.36	\$0.00	\$17,532.86	\$5,719.30	\$23,252.16
2020	16,650.69	558.89	6,254.11	197.97	0.00	17,209.58	6,452.07	23,661.65
2021	16,272.90	582.67	6,981.60	234.38	7.63	16,855.57	7,223.61	24,079.18
2022	15,864.29	607.32	7,739.00	274.24	21.73	16,471.61	8,034.97	24,506.58
2023	15,425.83	632.71	8,524.96	318.80	41.74	16,058.54	8,885.49	24,944.03
2024	14,958.59	658.85	9,336.53	368.71	67.22	15,617.45	9,772.47	25,389.91
2025	14,463.92	685.58	10,170.48	425.19	98.77	15,149.50	10,694.44	25,843.94
2026	13,943.43	712.77	11,023.40	488.83	136.37	14,656.20	11,648.60	26,304.80
2027	13,398.90	740.33	11,892.00	560.09	180.45	14,139.23	12,632.54	26,771.77
2028	12,832.37	768.17	12,771.85	639.47	232.15	13,600.54	13,643.48	27,244.02
2029	12,246.18	796.16	13,657.79	725.76	292.54	13,042.34	14,676.09	27,718.43
2030	11,642.90	836.32	14,544.32	818.73	364.63	12,479.22	15,727.67	28,206.89
2031	11,025.41	876.88	15,426.04	918.88	449.49	11,902.29	16,794.40	28,696.69
2032	10,396.88	917.85	16,297.13	1,026.58	548.28	11,314.72	17,871.99	29,186.71
2033	9,760.70	958.31	17,150.95	1,142.31	662.25	10,719.01	18,955.51	29,674.51
2034	9,120.56	998.28	17,980.59	1,266.52	792.77	10,118.83	20,039.88	30,158.71
2035	8,480.33	1,037.39	18,778.67	1,399.64	941.25	9,517.72	21,119.56	30,637.28
2036	7,844.06	1,075.58	19,537.97	1,542.10	1,109.23	8,919.65	22,189.30	31,108.94
2037	7,215.92	1,112.33	20,250.96	1,694.30	1,298.31	8,328.25	23,243.56	31,571.81
2038	6,600.08	1,147.58	20,909.61	1,856.61	1,510.22	7,747.66	24,276.43	32,024.09
2039	6,000.68	1,180.14	21,506.18	2,029.21	1,746.78	7,180.82	25,282.17	32,462.99
2040	5,421.70	1,209.57	22,033.11	2,212.30	2,009.93	6,631.26	26,255.34	32,886.60
2041	4,866.85	1,235.40	22,482.39	2,406.01	2,301.65	6,102.25	27,190.06	33,292.31
2042	4,339.50	1,257.24	22,846.60	2,610.08	2,624.07	5,596.74	28,080.76	33,677.50
2043	3,842.53	1,274.74	23,121.43	2,824.07	2,979.30	5,117.27	28,924.79	34,042.06
2044	3,378.29	1,287.65	23,304.24	3,047.03	3,369.50	4,665.94	29,720.77	34,386.71
2045	2,948.54	1,295.49	23,394.21	3,278.07	3,796.92	4,244.03	30,469.21	34,713.24
2046	2,554.43	1,298.68	23,393.54	3,515.20	4,263.75	3,853.11	31,172.49	35,025.60
2047	2,196.45	1,296.49	23,305.97	3,755.61	4,772.19	3,492.93	31,833.77	35,326.71
2048	1,874.47	1,289.74	23,136.68	3,996.74	5,324.38	3,164.21	32,457.80	35,622.01
2049	1,587.75	1,278.70	22,891.46	4,234.98	5,922.41	2,866.45	33,048.86	35,915.31
2050	1,335.01	1,263.83	22,576.55	4,465.20	6,568.33	2,598.84	33,610.08	36,208.92
2051	1,114.49	1,245.97	22,198.52	4,681.57	7,264.19	2,360.45	34,144.27	36,504.73
2052	924.03	1,225.57	21,762.68	4,878.01	8,011.78	2,149.60	34,652.47	36,802.07
2053	761.20	1,202.61	21,273.15	5,050.91	8,812.64	1,963.81	35,136.70	37,100.51
2054	623.39	1,177.10	20,733.51	5,197.28	9,667.79	1,800.49	35,598.58	37,399.07
2055	507.90	1,149.10	20,147.13	5,312.97	10,577.68	1,657.00	36,037.77	37,694.77
2056	412.04	1,118.63	19,517.31	5,394.94	11,542.17	1,530.68	36,454.42	37,985.10
2057	333.21	1,085.78	18,847.43	5,441.99	12,560.45	1,418.98	36,849.87	38,268.86
2058	268.93	1,050.62	18,140.93	5,455.51	13,630.94	1,319.55	37,227.38	38,546.93
2059	216.93	1,013.27	17,401.46	5,439.51	14,751.31	1,230.20	37,592.27	38,822.47

Table 19

Additional Projection Details — Present Value of Future Benefits (\$ in Millions)

Fiscal Year Ending	Current Inactives		Actives			Grand Totals		
	Retirees & Beneficiaries	Deferreds	Tier 1	Current Tier 2	Future Tier 2	Current Retirees, Beneficiaries & Deferreds	Actives	Total
2019	\$16,996.71	\$536.15	\$9,218.14	\$893.73	\$0.00	\$17,532.86	\$10,111.87	\$27,644.74
2020	16,650.69	558.89	9,826.31	929.64	98.21	17,209.58	10,854.16	28,063.74
2021	16,272.90	582.67	10,456.31	968.93	208.88	16,855.57	11,634.12	28,489.70
2022	15,864.29	607.32	11,107.37	1,013.12	328.66	16,471.61	12,449.16	28,920.77
2023	15,425.83	632.71	11,778.14	1,062.73	456.40	16,058.54	13,297.27	29,355.81
2024	14,958.59	658.85	12,465.99	1,117.85	593.78	15,617.45	14,177.61	29,795.05
2025	14,463.92	685.58	13,168.12	1,179.24	740.46	15,149.50	15,087.81	30,237.31
2026	13,943.43	712.77	13,881.67	1,247.09	897.09	14,656.20	16,025.85	30,682.06
2027	13,398.90	740.33	14,603.88	1,321.52	1,065.21	14,139.23	16,990.61	31,129.84
2028	12,832.37	768.17	15,331.13	1,402.80	1,246.59	13,600.54	17,980.52	31,581.06
2029	12,246.18	796.16	16,059.27	1,489.50	1,441.92	13,042.34	18,990.69	32,033.03
2030	11,642.90	836.32	16,783.84	1,581.16	1,653.92	12,479.22	20,018.92	32,498.14
2031	11,025.41	876.88	17,500.36	1,678.01	1,884.08	11,902.29	21,062.45	32,964.74
2032	10,396.88	917.85	18,203.93	1,780.26	2,133.79	11,314.72	22,117.99	33,432.71
2033	9,760.70	958.31	18,889.13	1,888.19	2,404.26	10,719.01	23,181.58	33,900.58
2034	9,120.56	998.28	19,550.41	2,002.05	2,696.72	10,118.83	24,249.18	34,368.02
2035	8,480.33	1,037.39	20,182.60	2,122.48	3,012.63	9,517.72	25,317.71	34,835.43
2036	7,844.06	1,075.58	20,779.99	2,249.77	3,352.92	8,919.65	26,382.68	35,302.33
2037	7,215.92	1,112.33	21,336.66	2,384.19	3,719.08	8,328.25	27,439.93	35,768.17
2038	6,600.08	1,147.58	21,846.24	2,526.00	4,112.60	7,747.66	28,484.84	36,232.50
2039	6,000.68	1,180.14	22,302.54	2,675.32	4,534.91	7,180.82	29,512.77	36,693.59
2040	5,421.70	1,209.57	22,699.30	2,832.30	4,987.10	6,631.26	30,518.70	37,149.97
2041	4,866.85	1,235.40	23,030.20	2,996.98	5,471.12	6,102.25	31,498.30	37,600.55
2042	4,339.50	1,257.24	23,289.29	3,169.17	5,987.34	5,596.74	32,445.80	38,042.54
2043	3,842.53	1,274.74	23,472.79	3,348.51	6,536.89	5,117.27	33,358.19	38,475.46
2044	3,378.29	1,287.65	23,578.26	3,534.25	7,121.69	4,665.94	34,234.20	38,900.14
2045	2,948.54	1,295.49	23,604.48	3,725.68	7,741.72	4,244.03	35,071.88	39,315.91
2046	2,554.43	1,298.68	23,552.39	3,921.24	8,398.85	3,853.11	35,872.48	39,725.59
2047	2,196.45	1,296.49	23,424.20	4,118.78	9,093.84	3,492.93	36,636.82	40,129.75
2048	1,874.47	1,289.74	23,223.38	4,316.30	9,827.61	3,164.21	37,367.30	40,531.50
2049	1,587.75	1,278.70	22,954.12	4,510.88	10,603.13	2,866.45	38,068.13	40,934.58
2050	1,335.01	1,263.83	22,621.12	4,698.55	11,423.38	2,598.84	38,743.06	41,341.89
2051	1,114.49	1,245.97	22,229.68	4,874.76	12,289.85	2,360.45	39,394.29	41,754.74
2052	924.03	1,225.57	21,784.06	5,034.56	13,204.59	2,149.60	40,023.22	42,172.82
2053	761.20	1,202.61	21,287.54	5,175.12	14,167.20	1,963.81	40,629.86	42,593.67
2054	623.39	1,177.10	20,742.98	5,293.71	15,178.37	1,800.49	41,215.06	43,015.56
2055	507.90	1,149.10	20,153.18	5,386.28	16,238.38	1,657.00	41,777.85	43,434.84
2056	412.04	1,118.63	19,521.06	5,449.68	17,346.80	1,530.68	42,317.54	43,848.22
2057	333.21	1,085.78	18,849.65	5,482.31	18,502.84	1,418.98	42,834.79	44,253.77
2058	268.93	1,050.62	18,142.18	5,485.00	19,705.31	1,319.55	43,332.49	44,652.03
2059	216.93	1,013.27	17,402.10	5,461.03	20,951.89	1,230.20	43,815.03	45,045.23

Table 20

Additional Projection Details — Benefit Payments Including Administrative Expenses and Health Insurance Subsidy (\$ in Millions)

Fiscal Year Ending	Current Inactives		Actives			Grand Totals		
	Retirees & Beneficiaries	Deferreds	Tier 1	Current Tier 2	Future Tier 2	Current Retirees, Beneficiaries & Deferreds	Actives	Total
2020	\$1,484.71	\$14.30	\$83.42	\$43.21	\$0.00	\$1,499.00	\$126.63	\$1,625.64
2021	1,492.01	14.83	101.31	40.85	7.19	1,506.83	149.35	1,656.19
2022	1,496.23	15.61	121.70	37.76	13.86	1,511.83	173.32	1,685.15
2023	1,497.44	16.55	144.90	34.74	20.68	1,513.99	200.32	1,714.32
2024	1,495.58	17.54	172.04	32.19	27.80	1,513.13	232.03	1,745.16
2025	1,490.49	18.75	203.03	29.41	34.67	1,509.24	267.11	1,776.34
2026	1,481.98	20.10	237.78	26.96	41.97	1,502.08	306.71	1,808.79
2027	1,469.99	21.59	275.97	24.93	49.41	1,491.59	350.31	1,841.89
2028	1,454.40	23.19	318.25	23.11	56.61	1,477.59	397.97	1,875.57
2029	1,435.08	24.92	364.86	23.16	63.92	1,460.00	451.94	1,911.94
2030	1,411.93	15.05	415.82	24.05	69.51	1,426.99	509.37	1,936.36
2031	1,384.84	17.39	470.86	25.07	75.37	1,402.23	571.30	1,973.53
2032	1,353.73	19.73	530.11	26.23	81.64	1,373.47	637.98	2,011.44
2033	1,318.59	23.00	593.73	27.47	88.42	1,341.59	709.62	2,051.21
2034	1,279.37	26.21	661.46	28.82	95.72	1,305.58	786.01	2,091.59
2035	1,236.14	29.75	732.59	29.94	102.47	1,265.88	865.00	2,130.88
2036	1,188.98	33.27	807.28	31.19	109.60	1,222.25	948.07	2,170.32
2037	1,138.07	37.26	885.36	32.64	117.06	1,175.34	1,035.06	2,210.40
2038	1,083.67	41.19	966.86	34.30	124.91	1,124.86	1,126.06	2,250.92
2039	1,026.10	46.18	1,051.19	36.33	133.15	1,072.28	1,220.67	2,292.95
2040	965.80	51.42	1,138.00	38.71	141.81	1,017.21	1,318.51	2,335.73
2041	903.28	56.88	1,226.96	41.55	150.86	960.16	1,419.37	2,379.53
2042	839.16	62.49	1,317.24	45.09	160.40	901.64	1,522.73	2,424.37
2043	774.10	68.16	1,406.40	49.47	170.36	842.26	1,626.23	2,468.49
2044	708.83	73.78	1,492.93	55.05	180.76	782.61	1,728.74	2,511.35
2045	644.06	79.56	1,575.47	61.71	191.69	723.63	1,828.87	2,552.50
2046	580.54	84.59	1,651.88	70.27	203.12	665.12	1,925.26	2,590.38
2047	518.94	90.00	1,721.03	81.13	215.20	608.94	2,017.36	2,626.29
2048	459.91	94.26	1,781.82	94.04	228.01	554.16	2,103.87	2,658.03
2049	404.03	97.95	1,833.79	109.75	241.67	501.98	2,185.22	2,687.20
2050	351.78	100.91	1,876.71	129.07	256.52	452.69	2,262.30	2,714.99
2051	303.53	102.79	1,910.30	152.27	272.84	406.32	2,335.41	2,741.73
2052	259.54	104.03	1,935.89	179.44	290.93	363.58	2,406.26	2,769.84
2053	219.94	105.14	1,954.73	208.22	311.15	325.08	2,474.10	2,799.18
2054	184.74	106.04	1,967.41	238.37	333.76	290.78	2,539.54	2,830.31
2055	153.83	106.73	1,974.16	271.01	359.24	260.56	2,604.41	2,864.97
2056	127.04	107.21	1,975.08	304.98	388.10	234.25	2,668.16	2,902.41
2057	104.10	107.46	1,970.22	338.60	420.80	211.56	2,729.61	2,941.17
2058	84.69	107.47	1,959.60	369.39	457.89	192.15	2,786.88	2,979.04
2059	68.46	107.21	1,943.21	395.07	499.92	175.67	2,838.20	3,013.87

Table 21

Additional Projection Details — Active Population, Covered Payroll, Employee Contributions and Normal Costs (\$ in Millions)

Fiscal Year Ending	Tier 1 Active Members				Current Tier 2 Active Members				Future Tier 2 Active Members			
	Population	Covered Payroll	Employee Contributions	Normal Cost	Population	Covered Payroll	Employee Contributions	Normal Cost	Population	Covered Payroll	Employee Contributions	Normal Cost
2019	18,632	\$1,611.92	\$145.07	\$381.35	10,805	\$591.13	\$53.20	\$66.64	0	\$0.00	\$0.00	\$0.00
2020	17,469	1,583.32	142.50	381.38	9,426	555.53	50.00	62.66	2,542	128.26	11.54	14.57
2021	16,473	1,557.27	140.15	381.45	8,494	533.68	48.03	60.44	4,469	235.55	21.20	26.97
2022	15,553	1,531.15	137.80	381.01	7,775	518.96	46.71	59.26	6,109	336.11	30.25	38.56
2023	14,688	1,503.76	135.34	379.72	7,219	510.41	45.94	58.88	7,530	432.18	38.90	49.61
2024	13,855	1,473.63	132.63	377.42	6,765	505.43	45.49	59.05	8,816	527.30	47.46	60.62
2025	13,062	1,440.46	129.64	374.08	6,393	503.61	45.33	59.71	9,982	621.87	55.97	71.63
2026	12,295	1,404.25	126.38	369.70	6,088	504.51	45.41	60.74	11,054	716.76	64.51	82.79
2027	11,552	1,365.09	122.86	364.09	5,821	506.45	45.58	61.96	12,064	813.73	73.24	94.37
2028	10,818	1,321.63	118.95	357.04	5,576	508.85	45.80	63.30	13,043	914.51	82.31	106.59
2029	10,102	1,274.84	114.74	348.62	5,349	512.07	46.09	64.81	13,986	1,019.07	91.72	119.40
2030	9,398	1,224.41	110.20	339.02	5,158	516.00	46.44	66.48	14,880	1,126.51	101.39	132.73
2031	8,717	1,171.80	105.46	328.32	4,979	519.19	46.73	68.17	15,741	1,237.92	111.41	146.73
2032	8,048	1,115.94	100.43	316.29	4,811	521.46	46.93	69.88	16,579	1,354.19	121.88	161.50
2033	7,392	1,057.05	95.13	302.88	4,651	522.49	47.02	71.60	17,394	1,475.27	132.77	177.09
2034	6,752	995.21	89.57	287.35	4,499	521.87	46.97	72.92	18,186	1,601.01	144.09	192.37
2035	6,129	930.60	83.75	270.54	4,355	519.80	46.78	74.20	18,954	1,731.34	155.82	208.29
2036	5,524	863.69	77.73	252.47	4,216	516.34	46.47	75.42	19,698	1,865.34	167.88	224.79
2037	4,937	794.60	71.51	233.18	4,078	511.63	46.05	76.55	20,422	2,003.39	180.30	241.91
2038	4,371	723.66	65.13	212.94	3,941	505.77	45.52	77.55	21,125	2,145.26	193.07	259.65
2039	3,831	652.22	58.70	192.04	3,802	498.53	44.87	78.39	21,804	2,290.66	206.16	277.99
2040	3,320	580.71	52.26	170.29	3,665	490.59	44.15	79.10	22,452	2,438.86	219.50	296.86
2041	2,831	507.82	45.70	147.92	3,525	481.37	43.32	79.55	23,082	2,590.23	233.12	316.34
2042	2,376	436.86	39.32	126.02	3,381	470.65	42.36	79.70	23,680	2,742.82	246.85	336.20
2043	1,964	369.63	33.27	105.00	3,234	458.74	41.29	79.49	24,240	2,896.08	260.65	356.36
2044	1,590	306.13	27.55	85.42	3,080	444.94	40.04	78.86	24,767	3,050.41	274.54	376.88
2045	1,266	249.38	22.44	68.11	2,925	429.96	38.70	77.68	25,247	3,203.28	288.30	397.47
2046	990	199.75	17.98	53.29	2,754	411.61	37.04	75.66	25,694	3,355.31	301.98	418.19
2047	763	157.77	14.20	41.00	2,571	390.65	35.16	73.00	26,102	3,505.14	315.46	438.90
2048	579	122.72	11.04	31.04	2,384	367.93	33.11	69.60	26,474	3,652.02	328.68	459.50
2049	433	94.28	8.49	23.18	2,178	341.46	30.73	65.04	26,826	3,797.84	341.81	480.17
2050	319	71.37	6.42	17.05	1,947	309.73	27.88	59.28	27,170	3,943.89	354.95	501.06
2051	232	53.28	4.79	12.34	1,703	274.65	24.72	52.54	27,502	4,089.59	368.06	522.07
2052	165	39.04	3.51	8.77	1,445	236.22	21.26	45.26	27,827	4,235.44	381.19	543.21
2053	115	28.14	2.53	6.13	1,202	199.11	17.92	38.07	28,119	4,378.66	394.08	564.09
2054	79	19.93	1.79	4.21	975	163.70	14.73	31.14	28,383	4,519.11	406.72	584.63
2055	53	13.74	1.24	2.83	768	130.87	11.78	24.70	28,616	4,656.31	419.07	604.70
2056	35	9.30	0.84	1.85	589	101.66	9.15	19.00	28,814	4,789.31	431.04	624.13
2057	22	6.07	0.55	1.17	439	76.94	6.92	14.19	28,976	4,917.57	442.58	642.79
2058	13	3.77	0.34	0.71	320	56.80	5.11	10.42	29,104	5,040.85	453.68	660.59
2059	8	2.23	0.20	0.40	236	42.47	3.82	7.70	29,194	5,158.15	464.23	677.33

Employee contributions and normal cost are for the following year.

Normal cost includes administrative expenses and the health insurance subsidy of \$65 million annually.

Covered payroll is capped for members hired after December 31, 2010, as defined by Public Act 96-0889.

Fiscal year ending June 30, 2019 includes 142 members expected to be hired to replace retirements and terminations that occurred in June 2019.