



NDTFFR Board Meeting AGENDA

Thursday, October 25, 2018 - 1:00 pm
Peace Garden Room - State Capitol
Bismarck, ND

1. **Call to Order and Approval of Agenda** – Pres. Lech (Board Action)
2. **Approval of Minutes of September September 24 and September 27, 2018 Board Meetings** – Pres. Lech (Board Action) 5 min.
3. **2018 Actuarial Valuation Report** – Kim Nicholl and Tanya Dybal, Segal (Board Action) 60 min.
4. **Actuarial Issues** – Kim Nicholl and Tanya Dybal, Segal (Information) 45 min.
 - Society of Actuaries (SOA) Public Sector Mortality Table Analysis
 - Actuarial Standard of Practice (ASOP 51 and ASOP 4) Implications
 - Pension Plan Risk Analysis and Stress Testing
5. **Board Education: DB/DC/Hybrid/Cash Balance Plans - Implications of 2018 Teacher Strikes on Public Pension Plans** – Kim Nicholl and Tanya Dybal, Segal (Information) 30 min.
6. **Actuarial Review of Proposed Legislation** – Kim Nicholl, Segal (Information) 10 min.
7. **TFFR Legislative Update** – Fay Kopp (Information) 10 min.
8. **2017-18 Retiree Re-employment Report** – Shelly Schumacher (Information) 15 min.
9. **Quarterly Audit Services Update** – Sara Sauter (Information) 10 min.
10. **Trustee Educational Conference Reports** – Board members (Information) 10 min.
11. **Executive Session - Attorney Consultation, Benefit Appeal # 2018-1A** – Anders Odegaard, AGO - 15 min.
 - *Executive Session required to discuss confidential member information and for attorney consultation pursuant to NDCC 15-39.1-30, NDCC 44-04-19.1 and NDCC 44-04-19.2.
12. **Other Business**
13. **Adjournment**

Next Board Meeting: January 24, 2019

Any individual requiring an auxiliary aid or service should contact the Retirement and Investment Office (RIO) at 701-328-9885 at least three (3) days prior to the scheduled meeting.

**NORTH DAKOTA TEACHERS' FUND FOR RETIREMENT
MINUTES OF THE
SEPTEMBER 24, 2018, SPECIAL BOARD MEETING**

BOARD MEMBERS PRESENT: Rob Lech, President (TLCF)
Mike Burton, Vice President (TLCF)
Mel Olson, Trustee (TLCF)
Cody Mickelson, Trustee (TLCF)
Kelly Schmidt, State Treasurer

BOARD MEMBERS ABSENT: Kirsten Baesler, State Supt. DPI
Toni Gumeringer, Trustee

STAFF PRESENT: Fay Kopp, Deputy ED/CRO
Missy Kopp, Retirement Assistant
Shelly Schumacher, Retirement Program Mgr
Dottie Thorsen, Internal Auditor

OTHERS PRESENT: Nici Meyer, Attorney General's Office
Anders Odegaard, Attorney General's Office
Brian Barnett, APT, Inc.

CALL TO ORDER:

Dr. Rob Lech, President of the Teachers' Fund for Retirement (TFFR) Board of Trustees, called the meeting to order at 10:31 a.m. on Monday, September 24, 2018, at the Retirement and Investment Office (RIO), Bismarck, ND.

THE FOLLOWING MEMBERS WERE PRESENT REPRESENTING A QUORUM: MR. BURTON, PRES. LECH, MR. MICKELSON, MR. OLSON, AND TREASURER SCHMIDT

AGENDA:

The Board considered the agenda for the September 24, 2018 special meeting.

IT WAS MOVED BY TREASURER SCHMIDT AND SECONDED BY MR. BURTON AND CARRIED BY A VOICE VOTE TO ACCEPT THE AGENDA AS DISTRIBUTED.

AYES: TREASURER SCHMIDT, MR. BURTON, MR. MICKELSON, MR. OLSON AND PRES. LECH

NAYS: NONE

MOTION CARRIED.

ABSENT: SUPT. BAESLER & MRS. GUMERINGER

Executive Session - Attorney Consultation and Discussion of Order, Benefit Appeal #2018-1A:

Pres. Lech explained that the only item on the agenda is Benefit Appeal #2018-1A. This item may be discussed in Executive Session. The legal authority for closing this portion of the meeting is NDCC 15-39.1-30, NDCC 44-04-19.1 and 44-04-19.2. The purpose of the Executive Session is attorney consultation and discussion of order regarding TFFR Benefit Appeal #2018-1A.

IT WAS MOVED BY TREASURER SCHMIDT AND SECONDED BY MR. OLSON AND CARRIED BY A ROLL CALL VOTE TO ENTER INTO EXECUTIVE SESSION.

AYES: MR. MICKELSON, MR. OLSON, TREASURER SCHMIDT, MR. BURTON AND PRES. LECH

NAYS: NONE

MOTION CARRIED.

ABSENT: SUPT. BAESLER & MRS. GUMERINGER

The open session of the TFFR Special Board meeting ended at 10:34 a.m. Members of the public were asked to leave the room.

EXECUTIVE SESSION

The executive session started at 10:34 a.m. Those in attendance at the executive session: Board members Pres. Lech, Mr. Burton, Mr. Mickelson, Mr. Olson, and Treasurer Schmidt; RIO staff Ms. Fay Kopp, Ms. Schumacher, Ms. Missy Kopp and Ms. Thorsen; and Attorney General's Office Ms. Meyer and Mr. Odegaard.

The executive session ended at 11:28 a.m.

OPEN SESSION

The meeting resumed in open session at 11:29 a.m. after members of the public were invited back into the meeting.

Board action will be taken on Benefit Appeal #2018-1A at the September 27, 2018 regular board meeting.

ADJOURNMENT:

With no further business to come before the Board, President Lech adjourned the meeting at 11:30 a.m.

Respectfully Submitted:

Dr. Rob Lech, President
Teachers' Fund for Retirement Board

Missy Kopp
Reporting Secretary

**NORTH DAKOTA TEACHERS' FUND FOR RETIREMENT
MINUTES OF THE
SEPTEMBER 27, 2018, BOARD MEETING**

BOARD MEMBERS PRESENT: Rob Lech, President
Mike Burton, Vice President
Kirsten Baesler, State Supt. DPI (Teleconf)
Toni Gumeringer, Trustee
Cody Mickelson, Trustee
Mel Olson, Trustee
Kelly Schmidt, State Treasurer

STAFF PRESENT: David Hunter, ED/CIO
Fay Kopp, Deputy ED/CRO
Missy Kopp, Retirement Assistant
Sara Sauter, Audit Services Supvr
Shelly Schumacher, Retirement Program Mgr
Rich Nagel, IT Supvr

OTHERS PRESENT: Nici Meyer, Attorney General's Office
Anders Odegaard, Attorney General's Office
Kathy Stowe Kindschi - ND United - Retired
Adam Tescher, Dept. of Public Instruction
Mari Riehl, Education Standards & Practices Board

CALL TO ORDER:

Dr. Rob Lech, President of the Teachers' Fund for Retirement (TFFR) Board of Trustees, called the meeting to order at 1:00 p.m. on Thursday, September 27, 2018, at the Retirement and Investment Office, Bismarck, ND.

THE FOLLOWING MEMBERS WERE PRESENT REPRESENTING A QUORUM: MR. BURTON, MRS. GUMERINGER, PRES. LECH, MR. MICKELSON AND MR. OLSON

AGENDA:

The Board considered the revised agenda for the September 27, 2018 meeting.

IT WAS MOVED BY MRS. GUMERINGER AND SECONDED BY MR. BURTON AND CARRIED BY A VOICE VOTE TO ACCEPT THE REVISED AGENDA.

AYES: MR. MICKELSON, MR. OLSON, MR. BURTON, MRS. GUMERINGER, PRES. LECH

NAYS: NONE

MOTION CARRIED.

ABSENT: SUPT. BAESLER & TREASURER SCHMIDT

MINUTES:

The Board considered the minutes of the July 26, 2018, meeting and the July 27, 2018, special meeting.

IT WAS MOVED BY MR. OLSON AND SECONDED BY MRS. GUMERINGER AND CARRIED BY A VOICE VOTE TO ACCEPT THE JULY 26, 2018, AND JULY 27, 2018, MINUTES AS DISTRIBUTED.

AYES: MR. MICKELSON, MR. OLSON, MR. BURTON, MRS. GUMERINGER, AND PRES. LECH

NAYS: NONE

MOTION CARRIED.

ABSENT: SUPT. BAESLER & TREASURER SCHMIDT

Supt. Baesler joined the meeting via teleconference at 1:03 p.m.

BENEFIT APPEAL #2018-1A - EXECUTIVE SESSION:

Pres. Lech explained that the next item on the agenda is Benefit Appeal #2018-1A. This item may be discussed in Executive Session. The legal authority for closing this portion of the meeting is NDCC 15-39.1-30, NDCC 44-04-19.1 and NDCC 44-04-19.2. The purpose of the Executive Session is attorney consultation and approval of final order and salary determination regarding TFFR Benefit Appeal #2018-1A.

IT WAS MOVED BY MR. OLSON AND SECONDED BY MRS. GUMERINGER AND CARRIED BY A ROLL CALL VOTE TO ENTER INTO EXECUTIVE SESSION.

AYES: SUPT. BAESLER, MRS. GUMERINGER, MR. OLSON, MR. BURTON, MR. MICKELSON, AND PRES. LECH.

NAYS: NONE

MOTION CARRIED.

ABSENT: TREASURER SCHMIDT

The open session of the meeting ended at 1:04 p.m. Members of the public were asked to leave the room.

EXECUTIVE SESSION

Executive session began at 1:04 p.m.

Those in attendance at the executive session were Board members: Pres. Lech, Mr. Burton, Mrs. Gumeringer, Mr. Mickelson, Mr. Olson, Supt. Baesler and Treasurer Schmidt (Treasurer Schmidt arrived at 1:07 p.m.); RIO staff: Ms. Fay Kopp, Mr. Hunter, Ms. Schumacher, Ms. Missy Kopp, Ms. Thorsen and Ms. Sauter; and Attorney General's Office: Ms. Meyer and Mr. Odegaard.

The executive session ended at 2:02 p.m.

OPEN SESSION

The meeting resumed in open session at 2:03 p.m. after members of the public were invited back into the meeting.

IT WAS MOVED BY TREASURER SCHMIDT AND SECONDED BY MR. BURTON AND CARRIED BY A ROLL CALL VOTE TO APPROVE THE DRAFT PROPOSED TFFR BOARD FINAL ORDER FOR BENEFIT APPEAL #2018-1A.

AYES: MRS. GUMERINGER, MR. BURTON, MR. MICKELSON, SUPT. BAESLER, MR. OLSON, TREASURER SCHMIDT AND PRES. LECH.

NAYS: NONE

MOTION CARRIED.

IT WAS MOVED BY MR. BURTON AND SECONDED BY MR. OLSON AND CARRIED BY A ROLL CALL VOTE TO APPROVE THE DRAFT PROPOSED TFFR BOARD FINAL ELIGIBLE PENSIONABLE SALARY DETERMINATION FOR BENEFIT APPEAL #2018-1A.

AYES: MR. OLSON, MR. MICKELSON, SUPT. BAESLER, MRS. GUMERINGER, TREASURER SCHMIDT, MR. BURTON AND PRES. LECH.

NAYS: NONE

MOTION CARRIED.

BOARD EDUCATION - ND EDUCATION DEMOGRAPHICS:

Mr. Adam Tescher, Director of School Finance and Organization for the Department of Public Instruction, presented information about the student population in ND and teacher data including salary. The number of students is projected to continue to grow over the next couple of school years. Over the past 10 years, the number of licensed administrators and teachers has increased as has their average salaries. However, from 2017 to 2018, the number of licensed administrators and teachers slightly decreased, and average salaries slightly increased. TFFR looks at these numbers to project how many active members there will be paying into the fund in the coming years.

Board discussion followed.

BOARD EDUCATION - EDUCATOR SHORTAGES:

Ms. Mari Riehl, Assistant Director at the ND Education Standards and Practices Board (ESPB), presented information about teacher licensure and shortages. From 2006 to 2015, ESPB determined all areas except Elementary and Physical Education as shortage areas, and in 2015 - 2018, all areas were shortage areas. In the 2018-19 year, all areas except Physical Education are considered shortage areas. These shortage areas can be filled by teachers with an Alternative Access License or a Retiree can return to teach while still receiving their retirement benefits under certain statutory guidelines.

Ms. Riehl shared information about the different types of licenses that are issued to teachers in ND. Ms. Riehl concluded that ND is experiencing

teacher shortages similar to the rest of the nation. There is a need to encourage more young people to go into education, especially special education.

Board discussion followed.

The Board recessed at 2:49 p.m. and reconvened at 2:57 p.m.

LEGISLATIVE REPORT

Ms. Kopp reviewed the technical comments made by Segal on the two bill drafts which impact the TFFR retirement program.

Bill Draft #126 makes technical corrections required by the Internal Revenue Service and will have no actuarial effect.

Bill Draft #20 changes the powers and duties of the Legislative Employee Benefits Programs Committee (LEBPC). Legislators and legislative committees would no longer be required to submit proposed bills or amendments to this committee for review to ensure an actuarial study is done. According to Segal, the bill itself has no actuarial cost impact, but could lead to a scenario that has a significant impact on the financial health of the TFFR and other ND retirement systems.

Board discussion followed. Board members expressed concerns about the proposed bill draft #20, however, no position was taken by the Board at this time.

ANNUAL INVESTMENT REPORT:

Mr. Hunter presented the annual TFFR investment report including investment performance, asset allocation, and investment returns for the fiscal year ending June 30, 2018. The net investment return for the one-year ended June 30, 2018 was 9.11% versus a policy benchmark of less than 8%. The 5-year average was 8.31% which exceeded the performance benchmark of 7.5% (and long-term actuarial assumption of 7.75%). Asset allocation is the primary driver of returns. During the last 5 years, TFFR earned nearly \$850 million of net investment income including \$795 million (or 94%) from asset allocation decisions and \$55 million (or 6%) from the prudent use of active management. TFFR investment returns were ranked in the 26th percentile for the 5 years ended June 30, 2018 (and 2017), based on Callan's Public Fund Sponsor Database.

After discussion,

IT WAS MOVED BY MR. OLSON AND SECONDED BY MR. BURTON AND CARRIED BY A VOICE VOTE TO ACCEPT THE ANNUAL TFFR INVESTMENT REPORT.

AYES: MR. BURTON, MRS. GUMERINGER, MR. OLSON, TREASURER SCHMIDT, MR. MICKELSON AND PRES. LECH.

NAYS: NONE

MOTION CARRIED

ABSENT: SUPT. BAESLER

ANNUAL TFFR EXPENSE REPORT:

Ms. Flanagan reviewed the annual RIO budget and expense report for the fiscal year ending June 30, 2018. She explained that about 93% of expenditures go to member claims. She also reviewed continuing appropriations and budgeted expenditures. With 50% of the biennium remaining, about 54% of the budget is currently available. Ms. Flanagan discussed the budget request that was submitted for the 2019-2021 biennium which includes the required 10% cut to the base budget. RIO has also submitted three optional budget requests to reinstate the 10% base budget cuts, upgrade or replace current pension administration software, and add one additional investment position.

IT WAS MOVED BY MRS. GUMERINGER AND SECONDED BY MR. MICKELSON AND CARRIED BY A VOICE VOTE TO ACCEPT THE ANNUAL TFFR EXPENSE REPORT.

AYES: MRS. GUMERINGER, MR. MICKELSON, TREASURER SCHMIDT, MR. BURTON, MR. OLSON AND PRES. LECH.

NAYS: NONE

MOTION CARRIED

ABSENT: SUPT. BAESLER

Supt. Baesler returned to the meeting via teleconference at 3:58 p.m.

ANNUAL INFORMATION TECHNOLOGY REPORT:

Mr. Nagel reviewed the annual Information Technology report. About 1,900 members have logged onto the TFFR Member Online Portal since it went into production on January 31, 2018. TFFR's current Pension Administration Software (PAS) has reached the end of its product release lifecycle. RIO staff have studied the potential risks, benefits and costs of upgrading or replacing the current application in order to improve and streamline TFFR pension administration processes, reporting capabilities, communications and services to members and employers. This project has been included in RIO's information technology plan and optional budget request for 2019-21. Mr. Nagel has been working with RIO's Audit Supervisor to review current policies and procedures to ensure a high level of security. IT recently upgraded all user workstations to Windows 10 with Microsoft Office 2016 and Skype for Business. Mr. Nagel also reviewed future information technology initiatives.

IT WAS MOVED BY TREASURER SCHMIDT AND SECONDED BY MR. BURTON AND CARRIED BY A VOICE VOTE TO ACCEPT THE ANNUAL TFFR INFORMATION TECHNOLOGY REPORT.

AYES: SUPT. BAESLER, MR. BURTON, MRS. GUMERINGER, MR. OLSON, TREASURER SCHMIDT, MR. MICKELSON AND PRES. LECH.

NAYS: NONE

MOTION CARRIED

ANNUAL SIB CUSTOMER SATISFACTION SURVEY:

Five surveys were completed and turned in which were compiled by Pres. Lech. Mr. Mickelson did not complete the survey because he is new to the Board and didn't have enough background to respond to the survey questions.

IT WAS MOVED BY MR. BURTON AND SECONDED BY MR. OLSON AND CARRIED BY A VOICE VOTE TO SUBMIT THE SIB CUSTOMER SATISFACTION SURVEY RESULTS.

AYES: TREASURER SCHMIDT, MR. OLSON, MR. BURTON, MR. MICKELSON, MRS. GUMERINGER, SUPT. BAESLER AND PRES. LECH.

NAYS: NONE

MOTION CARRIED

CONSENT AGENDA:

IT WAS MOVED BY MRS. GUMERINGER AND SECONDED BY MR. OLSON AND CARRIED BY A ROLL CALL VOTE TO APPROVE THE CONSENT AGENDA (QDRO 2018-03).

AYES: MR. BURTON, MR. MICKELSON, MRS. GUMERINGER, MR. OLSON, TREASURER SCHMIDT AND PRES. LECH

NAYS: NONE

MOTION CARRIED.

ABSENT: SUPT. BAESLER

ADJOURNMENT:

With no further business to come before the Board, Pres. Lech adjourned the meeting at 4:20 p.m.

Respectfully Submitted:

Dr. Rob Lech, President
Teachers' Fund for Retirement Board

Missy Kopp
Reporting Secretary

MEMORANDUM

TO: TFFR Board
FROM: Fay Kopp
DATE: October 18, 2018
SUBJ: 2018 Actuarial Valuation Report

Kim Nicholl and Tanya Dybal, Segal Consultants, will be at the October board meeting to present the recently completed 2018 actuarial valuation of the NDTFFR plan (attached).

A few highlights from the 2018 valuation report:

- **Funded ratio** (based on actuarial value of assets or AVA) increased from 63.7% to **65.4%** as of July 1, 2018.
- **Actuarially determined contribution rate (ADC)** decreased from 12.99% to **12.94%** this year. This rate is greater than the 12.75% statutory employer rate, so there is a **small contribution deficiency of (0.19)%** of payroll.
- **Unfunded actuarial accrued liability (UAAL)** decreased from \$1.35 billion to **\$1.34 billion**.

GASB 67 information at the plan level is also part of the 2018 valuation report:

- **GASB Funded Ratio or Plan Net Position** (market basis) increased from 63.2% to **65.5%** as of July 1, 2018.
- **Net Plan Liability (NPL)** (UAAL on a market basis) decreased from \$1.37 billion to **\$1.33 billion**.

A separate GASB 68 report is in the process of being completed which includes employer allocations and pension amounts. This report will be delivered to the Board at the January 2019 meeting.

Enclosure



**North Dakota Teachers'
Fund for Retirement
Actuarial Valuation and
Review as of July 1, 2018**

This report has been prepared at the request of the Board of Trustees to assist in administering the Fund. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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October 17, 2018

Board of Trustees
North Dakota Teachers' Fund for Retirement
3442 East Century Avenue
Bismarck, ND 58507-7100

Dear Trustees:

We certify that the information contained in this report is accurate and fairly presents the actuarial position of the North Dakota Teachers' Fund for Retirement (TFFR) as of July 1, 2018.

All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion the results presented also comply with the State Code, and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board (GASB). The undersigned are independent actuaries. Both are Fellows of the Society of Actuaries, Enrolled Actuaries, and Members of the American Academy of Actuaries, and both are experienced in performing valuations for large public retirement systems. They both meet the Qualification Standards of the American Academy of Actuaries.

ACTUARIAL VALUATION

The primary purposes of the valuation report are to determine the adequacy of the current employer contribution rate, to describe the current financial condition of TFFR, and to analyze changes in TFFR's financial condition. In addition, the report provides information required by TFFR in connection with the Governmental Accounting Standards Board Statement No. 67 (GASB 67) and it provides various summaries of the data. Valuations are prepared annually, as of July 1 of each year, the first day of TFFR's plan and fiscal year.

FINANCING OBJECTIVES

The member and employer contribution rates are established by statute. Member and employer rates are 11.75% and 12.75%, respectively. The 11.75% member contribution rate and 12.75% employer contribution rate will remain in effect until TFFR is 100% funded on an actuarial basis. At that point, the employer and member contribution rates will revert to 7.75%. The rates are intended to be sufficient to pay TFFR's normal cost and to amortize TFFR's unfunded actuarial accrued liability (UAAL) over a period of 25 years beginning July 1, 2018, although at any given time the statutory rates may be insufficient.

PROGRESS TOWARD REALIZATION OF FINANCING OBJECTIVES

In order to determine the adequacy of the 12.75% statutory employer contribution rate, it is compared to the actuarially determined contribution (ADC). The ADC is equal to the sum of (a) the employer normal cost rate and (b) the level percentage of pay required to amortize the UAAL over the 30-year closed period that began July 1, 2013 (25 years remaining as of July 1, 2018). For this calculation, payroll is assumed to increase 3.25% per year. As of July 1, 2018, the ADC is 12.94%, compared to 12.99% last year. This is greater than the 12.75% rate currently required by law. The decrease in ADC is primarily driven by an actuarial gain on assets and demographic experience emerging more favorably than assumed.

The funded ratio (the ratio of the actuarial value of assets to the actuarial accrued liability) increased from last year. The funded ratio at July 1, 2017, was 63.7%, while it is 65.4% as of July 1, 2018. Based on the market value of assets rather than the actuarial value of assets, the funded ratio increased to 65.5%, compared to 63.2% last year.

The Plan has a net investment gain of \$4.6 million from previous years that has not yet been recognized in the actuarial value of assets because of the five-year smoothing. This unrecognized asset gain is due to market losses during FY 2015 and FY 2016 offset by market gains in FY 2017 and FY 2018. As these gains are recognized over the next four years, the funded ratio is expected to slightly increase, assuming the plan earns 7.75% in the future.

REPORTING CONSEQUENCES

TFFR is required to disclose certain actuarial information in its Comprehensive Annual Financial Report (CAFR), including the Net Pension Liability (NPL), the sensitivity of the NPL to changes in the discount rate, a schedule of changes in NPL, and a comparison of actual contributions to the ADC. The State and the school districts need to comply with GASB 68, which also requires disclosure of certain actuarial information in their financial statements. This information will be provided in a separate report.

BENEFIT PROVISIONS

The actuarial valuation reflects the benefit and contribution provisions set forth in the North Dakota Century Code. These have not changed from the prior valuation.

ASSUMPTIONS AND METHODS

Actuarial assumptions and methods are set by the Board of Trustees, based upon recommendations made by the Plan's actuary. On April 30, 2015, the Board adopted new assumptions, effective for the July 1, 2015 valuation. In our opinion, the actuarial assumptions as approved by the Board are reasonable, taking into account the experience of the Plan and reasonable long-term expectations, and represent our best estimate of the anticipated long-term experience of the Plan. The actuarial assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice.

Effective with the July 1, 2013, actuarial valuation, the Trustees adopted an Actuarial Funding Policy, which provides direction on how to calculate an actuarially determined contribution. The actuarially determined contribution is compared to statutory contribution rates as a measure of funding adequacy.

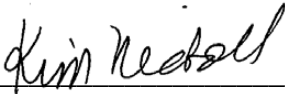
The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates, and funding periods.

DATA

Member data for retired, active, and inactive participants was supplied as of July 1, 2018, by the staff of the Retirement Office. We have not subjected this data to any auditing procedures, but have examined the data for reasonableness and consistency with the prior year's data. Asset information was also supplied by the staff. That assistance is gratefully acknowledged.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By: 
Kim Nicholl, FSA, MAAA, EA
Senior Vice President and Actuary

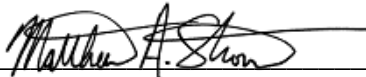

Matthew A. Strom, FSA, MAAA, EA
Vice President and Actuary

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Section 1: Actuarial Valuation Summary

Purpose and Basis

This report was prepared by Segal Consulting to present a valuation of the Plan as of July 1, 2018. The valuation was performed to determine whether the assets and contribution rates are sufficient to provide the prescribed benefits and to provide information for required disclosures under Governmental Accounting Standards Board (GASB) Statement No. 67. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligations. 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; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law.

Certain disclosure information required by GASB Statements 67 and 68 as of July 1, 2018 for TFFR is provided in a separate report.

The contribution requirements presented in this report are based on:

- The benefit provisions set forth in the North Dakota Century Code, as administered by the TFFR Board of Trustees;
- The characteristics of covered active members, inactive members, and retirees and beneficiaries as of July 1, 2018, provided by the North Dakota Retirement and Investment Office;
- The assets of the Plan as of June 30, 2018, provided by the North Dakota Retirement and Investment Office;
- Economic assumptions regarding future salary increases and investment earnings;
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc.; and
- The funding policy adopted by the TFFR Board of Trustees.

Valuation Highlights

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and a portion of the principal balance. The funding policy adopted by the TFFR meets this standard.
2. The employer statutory contribution rate for the fiscal year beginning July 1, 2018, under the North Dakota Century Code is equal to 12.75% of payroll for employers. Compared to the actuarially determined contribution of 12.94% of payroll, there is a contribution deficiency of 0.19% of payroll as of July 1, 2018. The actuarially determined contribution rate defined by the Plan's funding policy is based on a 25-year, level percent of payroll amortization of the unfunded actuarial accrued liability. The employer statutory contribution rate of 12.75% results in an effective amortization period of 26 years; one year longer than the Plan's funding policy amortization period.
3. Actual employer contributions made during the fiscal year ending June 30, 2018, were \$86,675,715, which is 98.2% of the actuarially determined contribution. In the prior fiscal year, actual contributions were \$86,058,868, which is 97.7% of the prior year actuarially determined contribution.
4. The funded ratio based on the actuarial value of assets over the actuarial accrued liability as of July 1, 2018 is 65.4%, compared to 63.7% as of July 1, 2017. This ratio is a measure of funding status and its history is a measure of funded progress. These measurements are not necessarily appropriate for assessing the sufficiency of the Plan's assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.
5. For the year ended June 30, 2018, Segal has determined that the asset return on a market value basis was 9.0%. After gradual recognition of investment gains and losses under the actuarial smoothing method, the actuarial rate of return was 7.9%. This represents an experience gain when compared to the assumed rate of 7.75%. As of June 30, 2018, the actuarial value of assets (\$2.526 billion) represented 99.8% of the market value (\$2.531 billion).
6. The portion of deferred investment gains and losses recognized during the calculation of the July 1, 2018, actuarial value of assets contributed to a gain of \$4.6 million. The demographic and liability experience resulted in a \$28.6 million gain.
7. As mentioned above, the current method used to determine the actuarial value of assets yields an amount that is 99.8% of the market value of assets as of June 30, 2018. 99.8% falls within the 20% corridor, so no further adjustment to the actuarial value of assets is necessary. Guidelines in Actuarial Standard of Practice No. 44 (Selection and Use of Asset Valuation Methods for Pension Valuations) recommend that asset values fall within a reasonable range around the corresponding market value. The actuarial asset method complies with these guidelines.

8. When measuring pension liability for GASB purposes, the same actuarial cost method (Entry Age Normal) is used to determine the funded status of the Plan, the actuarially determined contribution rate, and the effective amortization period. In addition, the GASB blended discount rate calculation results in the same discount rate (expected return on assets) as used for funding purposes (7.75%). This means that the Total Pension Liability (TPL) measure for financial reporting shown in this report is determined on the same basis as the Actuarial Accrued Liability (AAL) measure for funding. We note that the same is true for the Normal Cost component of the annual plan cost for funding and financial reporting.
9. The Net Pension Liability (NPL) is equal to the difference between the TPL and the Plan Fiduciary Net Position. The Plan Fiduciary Net Position is equal to the market value of assets and therefore, the NPL measure is the same as the Unfunded Actuarial Accrued Liability on a market value basis. The NPL decreased from \$1,373,525,753 as of June 30, 2017, to \$1,332,858,315 as of June 30, 2018.
10. The Fund's cash flow (contributions minus benefit payments, refunds, and expenses) as a percentage of the market value of assets is -1.6% as of June 30, 2018, compared to -1.3% as of June 30, 2017. The decrease in net cash flow is primarily due to the growth of benefit payments and expenses. It is not unusual for a mature pension system to operate with minor negative cash flow as returns on investments generally exceed the net cash outflow and assets continue to rise. However, as the degree of negative cash flow increases, the plan's vulnerability to investment market volatility increases.
11. This actuarial report as of July 1, 2018 is based on financial and demographic data as of that date. Changes subsequent to that date are not reflected and will affect future actuarial costs of the plan.
12. Since the actuarial valuation results are dependent on a given set of assumptions, there is a risk that emerging results may differ significantly as actual experience proves to be different from the assumptions. We have included a discussion of various risks that may affect the plan in Section 2.

Summary of Key Valuation Results

		2018	2017
Demographic data for plan year beginning July 1	• Number of retirees and beneficiaries	8,743	8,501
	• Number of inactive vested members	1,623	1,600
	• Number of inactive non-vested members contributions	971	878
	• Number of active members	10,881	10,874
	• Total payroll supplied by System, annualized	\$653,456,893	\$650,052,674
	• Average payroll supplied by System, annualized	\$60,055	\$59,780
Statutory contributions for fiscal year beginning July 1:	• Member rate	11.75%	11.75%
	• Employer rate	12.75%	12.75%
	• Actuarially determined contribution rate	12.94%	12.99%
	• Margin/(deficit)	-0.19%	-0.24%
Actuarial accrued liability for plan year beginning July 1:	• Retirees and beneficiaries	\$2,222,021,190	\$2,092,923,830
	• Inactive vested members	95,439,788	89,410,993
	• Inactive non-vested members	8,416,461	6,560,485
	• Active members	<u>1,537,638,287</u>	<u>1,545,121,520</u>
	• Total	\$3,863,515,726	\$3,734,016,828
	• Normal cost including administrative expenses for plan year beginning July 1	\$82,888,334	\$83,230,495
Assets for plan year beginning July 1:	• Market value of assets (MVA)	\$2,530,657,411	\$2,360,491,075
	• Actuarial value of assets (AVA)	2,526,058,269	2,379,811,205
	• Actuarial value of assets as a percentage of market value of assets	99.8%	100.8%
Funded status for plan year beginning July 1:	• Unfunded/(overfunded) actuarial accrued liability on market value of assets	\$1,332,858,315	\$1,373,525,753
	• Funded percentage on MVA basis	65.5%	63.2%
	• Unfunded/(overfunded) actuarial accrued liability on actuarial value of assets	\$1,337,457,457	\$1,354,205,623
	• Funded percentage on AVA basis	65.4%	63.7%
	• Effective amortization period	26 years	27 years
GASB information:	• Discount rate	7.75%	7.75%
	• Total pension liability	\$3,863,515,726	\$3,734,016,828
	• Plan fiduciary net position	2,530,657,411	2,360,491,075
	• Net pension liability	\$1,332,858,315	\$1,373,525,753
	• Plan fiduciary net position as a percentage of total pension liability	65.5%	63.2%
Gains/(losses):	• Asset experience	\$4,586,416	\$9,464,023
	• Liability experience	28,564,402	11,371,394
	• Administrative expenses	115,624	-275,066
	• Assumption/method changes	<u>0</u>	<u>0</u>
	• Total gain/(loss)	\$33,266,442	\$20,560,351

Important Information About Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal Consulting (“Segal”) relies on a number of input items. These include:

Plan of benefits	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
Participant data	An actuarial valuation for a plan is based on data provided to the actuary by TFFR. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets	The valuation is based on the market value of assets as of the valuation date, as provided by TFFR. TFFR uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
Actuarial assumptions	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The actuarial valuation is prepared at the request of the TFFR. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the Plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the Plan.
- Actuarial results in this report are not rounded, but that does not imply precision.
- If the TFFR is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. TFFR should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of the Plan, it is not a fiduciary in its capacity as actuaries and consultants with respect to the Plan.

Section 2: Actuarial Valuation Results

A. Member Data

The Actuarial Valuation and Review considers the number and demographic characteristics of covered members, including active members, inactive members, retirees and beneficiaries.

This section presents a summary of significant statistical data on these member groups.

More detailed information for this valuation year and the preceding valuation can be found in *Section 3, Exhibits A, B, C, D and E.*

MEMBER POPULATION: 2009 –2018

As of July 1	Active Members	Inactive Vested Members	Inactive Non-vested Members	Retirees and Beneficiaries	Ratio of Non-Actives to Actives
2009	9,707	1,490	292	6,466	0.82
2010	9,907	1,472	331	6,672	0.82
2011	10,004	1,463	407	6,933	0.84
2012	10,014	1,483	468	7,151	0.86
2013	10,138	1,500	563	7,489	0.89
2014	10,305	1,509	661	7,747	0.90
2015	10,514	1,607	660	8,025	0.92
2016	10,813	1,601	779	8,249	0.91
2017	10,874	1,600	878	8,501	0.93
2018	10,881	1,623	971	8,743	0.95

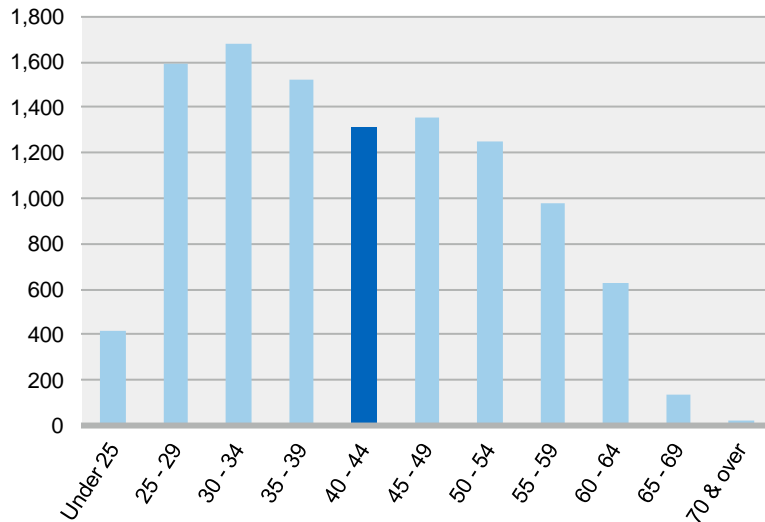
*Excluding inactive non-vested members

Active Members

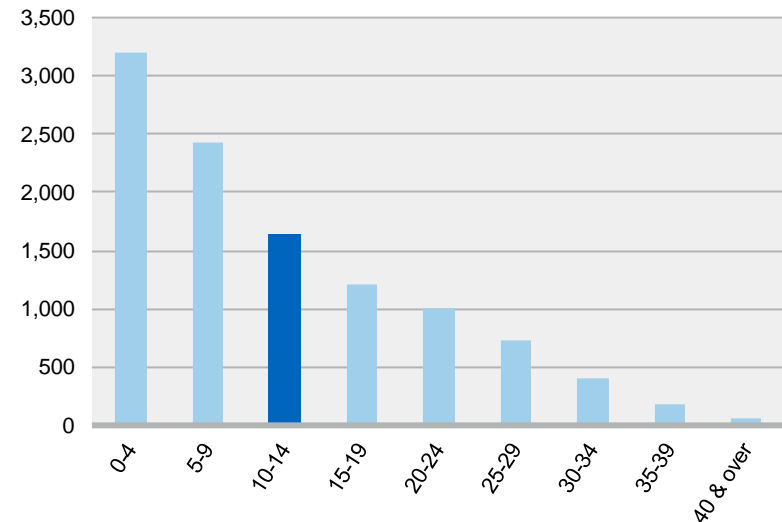
Plan costs are affected by the age, years of service and compensation of active members. In this year's valuation, there were 10,881 active members with an average age of 41.9 and average years of service of 11.8 years. The 10,874 active members in the prior valuation had an average age of 42.1 and average service of 11.9 years.

Distribution of Active Participants as of July 1, 2018

ACTIVES BY AGE



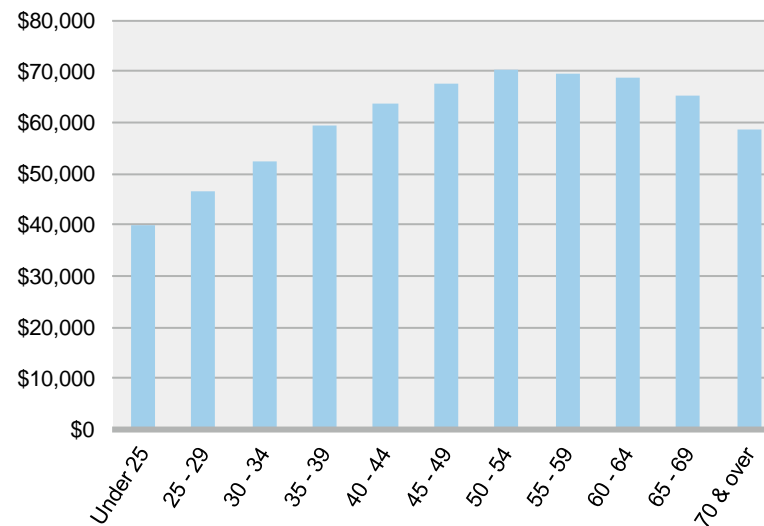
ACTIVES BY YEARS OF SERVICE



In this year's valuation, there were 10,881 active members with an average compensation of \$60,055. The 10,874 active members in the prior valuation had an average compensation of \$59,780.

Distribution of Active Participants as of July 1, 2018

AVERAGE COMPENSATION OF ACTIVES BY AGE



Inactive Members

In this year's valuation, there were 1,623 members with a vested right to a deferred or immediate vested benefit.

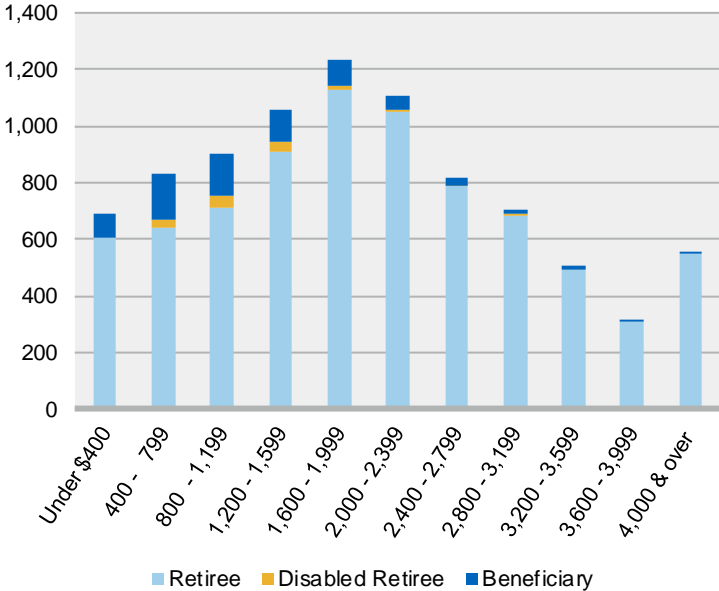
In addition, there were 971 non-vested members entitled to a return of their employee contributions.

Retirees and Beneficiaries

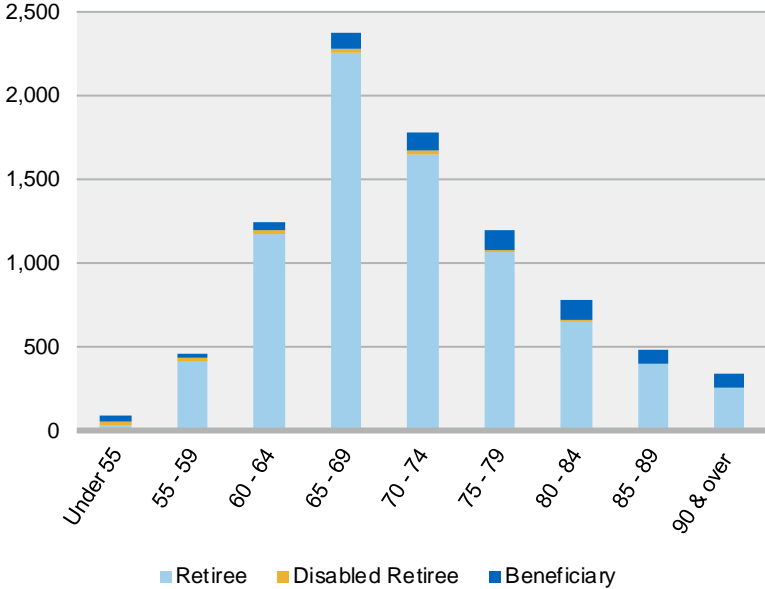
As of July 1, 2018, 8,002 retirees and 741 beneficiaries were receiving total monthly benefits of \$17,617,313. For comparison, in the previous valuation, there were 7,792 retirees and 709 beneficiaries receiving monthly benefits of \$16,576,096.

Distribution of Retirees and Beneficiaries as of July 1, 2018

RETIRES AND BENEFICIARIES BY TYPE AND MONTHLY AMOUNT



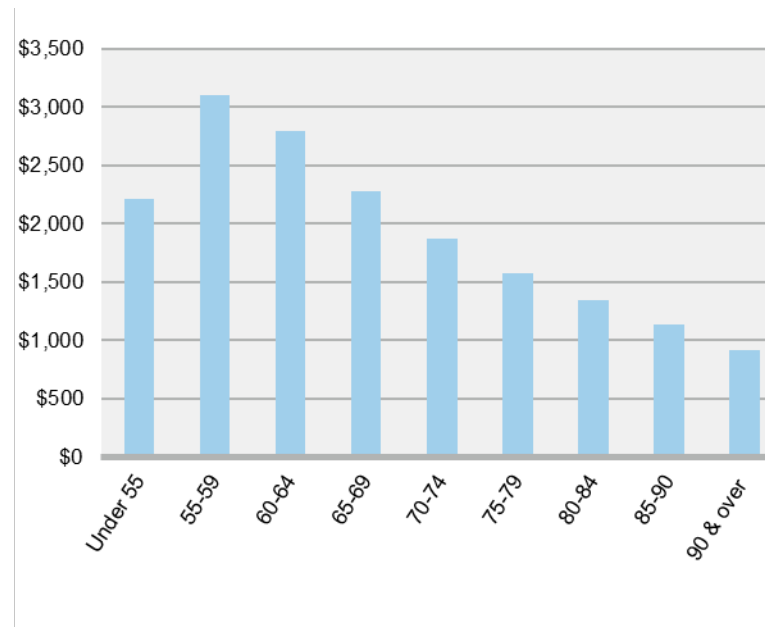
RETIRES AND BENEFICIARIES BY TYPE AND BY AGE



As of July 1, 2018, the average monthly benefit for retirees and beneficiaries is \$2,015, compared to \$1,950 in the previous valuation. The average age for retirees and beneficiaries is 71.8 in the current valuation, compared with 71.7 in the prior valuation.

Distribution of Retirees and Beneficiaries as of July 1, 2018

AVERAGE MONTHLY AMOUNT OF RETIREES AND BENEFICIARIES BY AGE



Historical Plan Population

The chart below demonstrates the progression of the active population over the last 20 years.

ACTIVE MEMBER DATA STATISTICS: 1999 – 2018

As of July 1	Active Members		Total Payroll Supplied by System, Annualized		Average Salary		Average Age	Average Service
	Number	Percent Change	Amount in \$ Millions	Percent Change	\$ Amount	Percent Change		
1999	10,046	1.5%	\$314.6	5.4%	\$31,318	3.9%	44.0	14.4
2000	10,025	-0.2%	323.0	2.7%	32,223	2.9%	43.9	14.1
2001	10,239	2.1%	342.2	5.9%	33,421	3.7%	44.4	14.4
2002	9,931	-3.0%	348.1	1.7%	35,052	4.9%	44.5	14.4
2003	9,916	-0.2%	367.9	5.7%	37,105	5.9%	44.8	14.6
2004	9,826	-0.9%	376.5	2.3%	38,321	3.3%	44.9	14.7
2005	9,801	-0.3%	386.6	2.7%	39,447	2.9%	44.9	14.7
2006	9,585	-2.2%	390.1	0.9%	40,703	3.2%	44.8	14.6
2007	9,599	0.1%	401.3	2.9%	41,810	2.7%	44.7	14.5
2008	9,561	-0.4%	417.7	4.1%	43,684	4.5%	44.6	14.4
2009	9,707	1.5%	440.0	5.3%	45,327	3.8%	44.5	14.3
2010	9,907	2.1%	465.0	5.7%	46,937	3.6%	44.2	14.0
2011	10,004	1.0%	488.8	5.1%	48,857	4.1%	43.9	13.8
2012	10,014	0.1%	505.3	3.4%	50,458	3.3%	43.7	13.7
2013	10,138	1.2%	526.7	4.2%	51,953	3.0%	43.2	13.2
2014	10,305	1.6%	557.2	5.8%	54,073	4.1%	42.9	12.8
2015	10,514	2.0%	589.8	5.8%	56,095	3.7%	42.5	12.4
2016	10,813	2.8%	627.0	6.3%	57,986	3.4%	42.3	12.1
2017	10,874	0.6%	650.1	3.7%	59,780	3.1%	42.1	11.9
2018	10,881	0.1%	653.5	0.5%	60,055	0.5%	41.9	11.8

The chart below shows the growth among the retired population over the last 10 years.

SERVICE RETIREES DATA STATISTICS: 2009 – 2018

As of July 1	Service Retirees		Average Annual Amount		
	Number	Percent Change	\$ Amount	Percent Change	Average Age
2009	5,833	2.4%	\$18,806	2.4%	70.8
2010	6,029	3.4%	19,445	3.4%	70.7
2011	6,252	3.7%	19,990	2.8%	70.7
2012	6,448	3.1%	20,739	3.7%	70.8
2013	6,754	4.7%	21,462	3.5%	70.8
2014	6,991	3.5%	22,230	3.6%	70.9
2015	7,250	3.7%	22,976	3.4%	71.0
2016	7,435	2.6%	23,593	2.7%	71.3
2017	7,664	3.1%	24,352	3.2%	71.5
2018	7,877	2.8%	25,187	3.4%	71.7

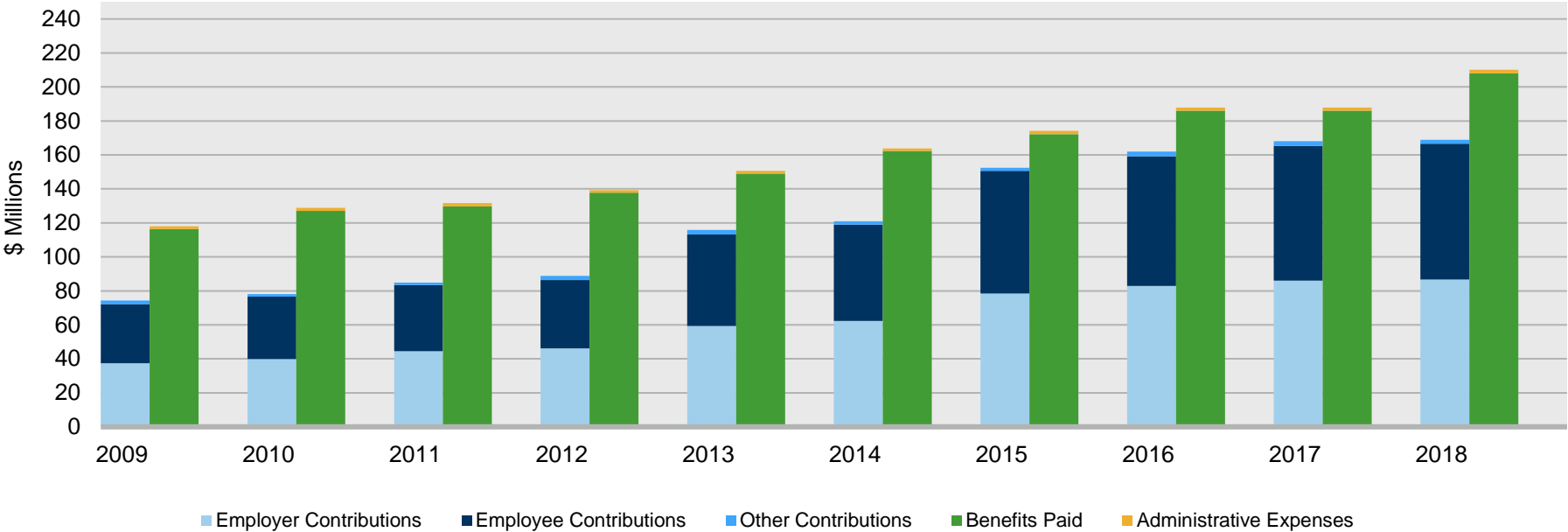
This table does not include disability retirees or beneficiaries.

B. Financial Information

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components.

Additional financial information, including a summary of these transactions for the valuation year, is presented in *Section 3, Exhibits E, F and G*.

COMPARISON OF CONTRIBUTIONS WITH BENEFITS PAID FOR YEARS ENDED JUNE 30, 2009 – 2018



It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

DETERMINATION OF ACTUARIAL VALUE OF ASSETS FOR YEAR ENDED JUNE 30, 2018, AND JUNE 30, 2017

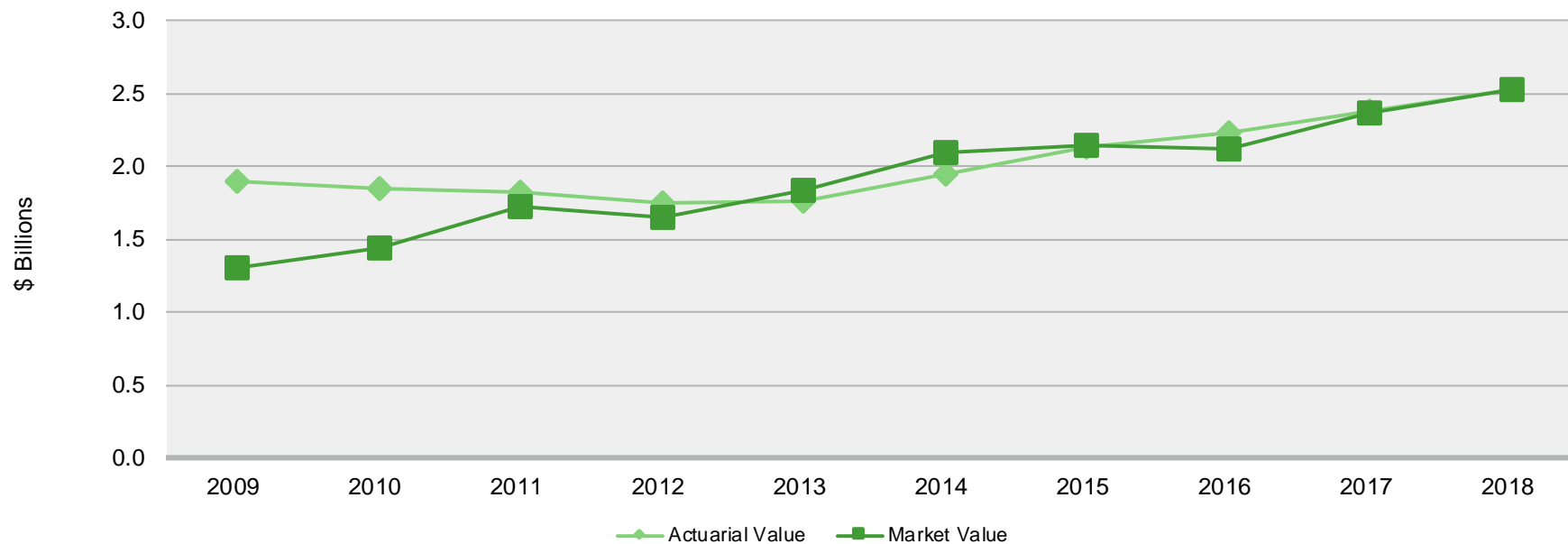
		2018		2017	
1.	Market value of assets available for benefits		\$2,530,657,411		\$2,360,491,075
2.	Calculation of unrecognized return*	Original Amount**	% Not Recognized	% Not Recognized	
a.	Year ended June 30, 2018	\$30,002,998	80%	\$24,002,398	
b.	Year ended June 30, 2017	103,235,815	60%	61,941,489	\$82,588,652
c.	Year ended June 30, 2016	-156,759,166	40%	-62,703,666	-94,055,500
d.	Year ended June 30, 2015	-93,205,396	20%	-18,641,079	-37,282,158
e.	Year ended June 30, 2014	147,144,380		0	<u>29,428,876</u>
f.	Total unrecognized return			\$4,599,142	-\$19,320,130
3.	Actuarial value of assets (Current Assets): 1 – 2f			<u>\$2,526,058,269</u>	<u>\$2,379,811,205</u>
4.	Actuarial value as a percent of market value: 3 ÷ 1			<u>99.8%</u>	<u>100.8%</u>

* Recognition at 20% per year over five years

** Total return minus expected return on a market value basis

Both the actuarial value and market value of assets are representations of TFFR’s financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the Plan’s liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

ACTUARIAL VALUE OF ASSETS VS. MARKET VALUE OF ASSETS AS OF JUNE 30, 2009 – 2018



C. Actuarial Experience

To calculate any actuarially determined contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), any contribution requirement will decrease from the previous year. On the other hand, any contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single years' experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The total gain is \$33,266,442, which includes \$4,586,416 from investment gains and \$28,680,026 in net gains from all other sources. The net experience variation from individual sources other than investments was 0.7% of the actuarial accrued liability. A discussion of the major components of the actuarial experience is on the following pages.

ACTUARIAL EXPERIENCE FOR YEAR ENDED JUNE 30, 2018

1.	Net gain/(loss) from investments*	\$4,586,416
2.	Net gain/(loss) from administrative expenses	115,624
3.	Net gain/(loss) from liability and other experience	28,564,402
4.	Net experience gain/(loss): 1 + 2 + 3	\$33,266,442

* Details on next page.

Investment Experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the Plan's investment policy. The rate of return on the market value of assets was 9.03% for the year ended June 30, 2018.

For valuation purposes, the assumed rate of return on the actuarial value of assets is 7.75%. The actual rate of return on an actuarial basis for the 2018 plan year was 7.94%. Since the actual return for the year was greater than the assumed return, the Plan experienced an actuarial gain during the year ended June 30, 2018 with regard to its investments.

INVESTMENT EXPERIENCE

	Year Ended June 30, 2018		Year Ended June 30, 2017	
	Market Value	Actuarial Value	Market Value	Actuarial Value
1. Value assets at the beginning of year	\$2,360,491,075	\$2,379,811,205	\$2,124,335,288	\$2,229,292,988
2. Contributions during the fiscal year	168,928,460	168,928,460	168,157,111	168,157,111
3. Benefits and expense during the fiscal year	210,107,493	210,107,493	198,689,975	198,689,975
4. Value of assets at end of year	2,530,657,411	2,526,058,269	2,360,491,075	2,379,811,205
5. Net investment income: $4 - 1 - 2 + 3$	\$211,345,369	\$187,426,097	\$266,688,651	\$181,051,081
6. Average value of assets: $1 + [2 - 3] \times \frac{1}{2}$	\$2,339,901,559	\$2,359,221,689	\$2,109,068,856	\$2,214,026,556
7. Rate of return: $5 \div 6$	9.03%	7.94%	12.64%	8.18%
8. Assumed rate of return	7.75%	7.75%	7.75%	7.75%
9. Expected investment income: 6×8	\$181,342,371	\$182,839,681	\$163,452,836	\$171,587,058
10. Actuarial gain/(loss): $5 - 9$	<u>\$30,002,998</u>	<u>\$4,586,416</u>	<u>\$103,235,815</u>	<u>\$9,464,023</u>

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last 20 years, including averages over select time periods.

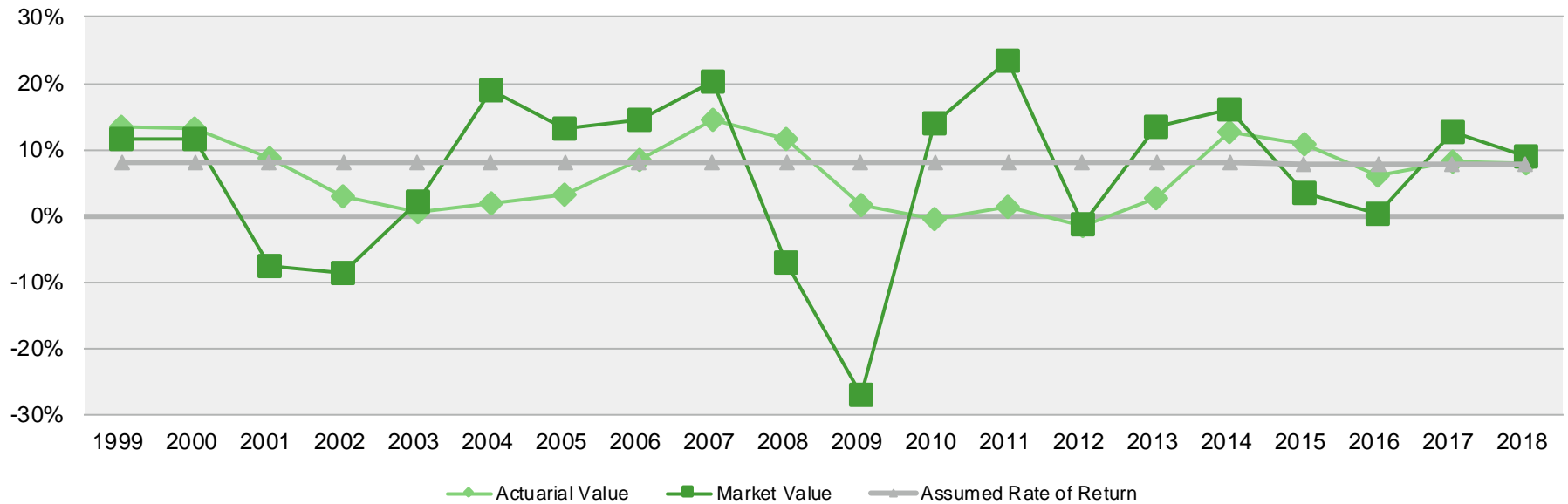
INVESTMENT RETURN – MARKET VALUE VS. ACTUARIAL VALUE: 1989 - 2018

Year Ended June 30	Market Value	Actuarial Value	Year Ended June 30	Market Value	Actuarial Value	Year Ended June 30	Market Value	Actuarial Value	
1989	14.3%	8.6%	1999	11.5%	13.5%	2009	-27.0%	1.7%	
1990	6.7	7.7	2000	11.6	13.3	2010	13.9	-0.5	
1991	7.5	5.8	2001	-7.6	8.6	2011	23.5	1.4	
1992	12.4	6.5	2002	-8.6	3.0	2012	-1.4	-1.4	
1993	14.7	8.1	2003	2.1	0.6	2013	13.4	2.7	
1994	1.2	7.0	2004	18.9	1.9	2014	16.1	12.6	
1995	13.6	9.1	2005	13.3	3.3	2015	3.5	10.7	
1996	15.6	11.3	2006	14.6	8.5	2016	0.4	6.2	
1997	18.5	12.6	2007	20.4	14.4	2017	12.6	8.2	
1998	13.2	12.6	2008	-7.0	11.6	2018	9.0	7.9	
							Most recent five-year average return	8.2%	9.1%
							Most recent ten-year average return	5.5%	4.8%
							Most recent 15-year average return	7.5%	5.8%
							Most recent 20-year average return	5.9%	6.3%
							Most recent 30-year average return	7.8%	7.2%

Note: For 2011-2018, investment returns on market basis were determined by Segal.

Subsection B described the actuarial asset valuation method that gradually recognizes fluctuations in the market value rate of return. The goal of this is to stabilize the actuarial rate of return and to produce more level pension plan costs.

MARKET AND ACTUARIAL RATES OF RETURN FOR YEARS ENDED JUNE 30, 1999 - 2018



Administrative Expenses

Administrative expenses for the year ended June 30, 2018 totaled \$2,128,794 compared to the assumption of \$2,233,200. This resulted in a gain of \$115,624 for the year, when adjusted for timing.

Other Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among participants,
- retirement experience (earlier or later than projected),
- mortality (more or fewer deaths than projected),
- the number of disability retirements (more or fewer than projected), and
- salary increases (greater or smaller than projected).

The net gain from this other experience for the year ended June 30, 2018 amounted to \$28,564,402, which is 0.7% of the actuarial accrued liability.

EXPERIENCE DUE TO CHANGES IN DEMOGRAPHICS FOR YEAR ENDED JUNE 30, 2018

Turnover	-\$1,695,530
Retirement	-3,038,289
Deaths among retired members and beneficiaries	6,945,479
Salary/service increase for continuing actives	29,231,339
New entrants	-4,462,845
Miscellaneous	<u>1,584,248</u>
Total gain/ (loss)	\$28,564,402

D. Changes in the Actuarial Accrued Liability

The actuarial accrued liability as of July 1, 2018 is \$3,863,515,726, an increase of \$129,498,898, or 3.5%, from the actuarial accrued liability as of the prior valuation date. The change in liability is due to interest, accumulation and payment of benefits, and actuarial experience (as discussed in the previous subsection).

Actuarial Assumptions

- There are no assumption changes reflected in this report.
- Details on actuarial assumptions and methods are in *Section 4, Exhibit I*.

Plan Provisions

- There were no changes in plan provisions since the prior valuation.
- A summary of plan provisions is in *Section 4, Exhibit II*.

E. Cash Flow

Cash flow is the difference between contributions and benefit payments, refunds, and expenses. Negative cash flow indicates that the payments made from the Fund exceed contributions made to the Fund.

HISTORY OF CASH FLOW: 2009 - 2018

Year Ended June 30	Disbursements or Expenditures					Net Cash Flow for the Year ²	Market Value of Assets	Net Cash Flow as Percent of Market Value
	Contributions ¹	Benefit Payments	Refunds	Administrative Expenses	Total Disbursements			
2009	\$74,380,980	(\$113,966,079)	(\$2,362,251)	(\$1,707,506)	(\$118,035,836)	(\$43,654,856)	\$1,309,716,730	-3.3%
2010	78,105,830	(124,472,154)	(2,557,240)	(1,902,796)	(128,932,190)	(50,826,360)	1,437,949,843	-3.5%
2011	84,923,250	(127,435,564)	(2,210,738)	(2,003,705)	(131,650,007)	(46,726,757)	1,726,179,317	-2.7%
2012	88,808,604	(135,250,568)	(2,479,194)	(1,596,976)	(139,326,738)	(50,518,134)	1,654,149,659	-3.1%
2013	115,849,348	(145,943,323)	(3,053,395)	(1,623,638)	(150,620,356)	(34,771,008)	1,839,583,960	-1.9%
2014	120,991,968	(158,350,355)	(3,908,921)	(1,586,045)	(163,845,321)	(42,853,353)	2,090,977,056	-2.0%
2015	152,463,762	(168,349,762)	(3,889,671)	(1,923,392)	(174,162,825)	(21,699,063)	2,141,920,800	-1.0%
2016	161,995,828	(180,617,784)	(5,350,896)	(1,851,656)	(187,820,336)	(25,824,508)	2,124,335,288	-1.2%
2017	168,157,111	(191,104,694)	(5,411,850)	(2,173,431)	(198,689,975)	(30,532,864)	2,360,491,075	-1.3%
2018	168,928,460	(202,417,031)	(5,561,668)	(2,128,794)	(210,107,493)	(41,179,033)	2,530,657,411	-1.6%

¹ Includes employee and employer contributions, as well as any purchased service credits during the year

² Equal to Contributions + Total Disbursements

F. Development of Unfunded/(Overfunded) Actuarial Accrued Liability

DEVELOPMENT OF UNFUNDED/(OVERFUNDED) ACTUARIAL ACCRUED LIABILITY FOR YEAR ENDED JUNE 30, 2018, AND JUNE 30, 2017

	2018	2017
1. Unfunded/(overfunded) actuarial accrued liability at beginning of year	\$1,354,205,623	\$1,360,100,863
2. Normal cost at beginning of year	80,199,924	77,315,074
3. Total contributions	-168,928,460	-168,157,111
4. Interest on:		
a. Unfunded actuarial accrued liability and normal cost	\$111,166,430	\$111,399,735
b. Total contributions	<u>-5,919,617</u>	<u>-5,892,587</u>
c. Total interest: 4a + 4b	<u>105,246,813</u>	<u>105,507,148</u>
5. Expected unfunded/(overfunded) actuarial accrued liability	\$1,370,723,899	\$1,374,765,974
6. Changes due to (gain)/loss:		
a. Investments	-\$4,586,416	-\$9,464,023
b. Demographics	<u>-28,680,026</u>	<u>-11,096,328</u>
c. Total changes due to (gain)/loss: 6a + 6b	-33,266,442	-20,560,351
7. Changes due to plan amendments	0	0
8. Changes in actuarial cost method	0	0
9. Changes in actuarial assumptions	0	0
10. Changes due to actuarial audit	<u>0</u>	<u>0</u>
11. Unfunded/(overfunded) actuarial accrued liability at end of year: 5 + 6c + 7 + 8 + 9 + 10	<u>\$1,337,457,457</u>	<u>\$1,354,205,623</u>

G. Actuarially Determined Contribution

The amount of the actuarially determined contribution is comprised of an employer normal cost payment and a payment on the unfunded/(overfunded) actuarial accrued liability. This total amount is divided by the projected payroll for active members to determine the actuarially determined contribution of 12.94% of payroll.

TFFR sets the methodology used to calculate the actuarially determined contribution based on a closed amortization period of 30 years, established as of July 1, 2013. As of July 1, 2018, there are 25 years remaining on this schedule. The employer contribution rate set by the TFFR is currently 12.75% of payroll. Since the actuarially determined contribution is 12.94% of payroll, there is a deficit of 0.19% of payroll. The calculated employer normal cost (including expenses) is 0.20% of payroll. The remaining 12.74% of payroll will amortize the unfunded actuarial accrued liability over a period of 25 years.

The contribution requirement as of July 1, 2018 is based on the data previously described, the actuarial assumptions and Plan provisions described in *Section 4*, including all changes affecting future costs adopted at the time of the actuarial valuation, actuarial gains and losses, and changes in the actuarial assumptions.

ACTUARIALLY DETERMINED CONTRIBUTION*

	Year Beginning July 1			
	2018		2017	
	Amount	% of Payroll	Amount	% of Payroll
1. Total normal cost, adjusted for timing*	\$82,888,334	11.95%	\$83,230,495	12.06%
2. Expected employee contributions	<u>81,514,258</u>	<u>11.75%</u>	<u>81,117,159</u>	<u>11.75%</u>
3. Employer normal cost, adjusted for timing*: 1 - 2	\$1,374,076	0.20%	\$2,113,336	0.31%
4. Actuarial accrued liability	3,863,515,726		3,734,016,828	
5. Actuarial value of assets	2,526,058,269		2,379,811,205	
6. Unfunded/(overfunded) actuarial accrued liability: 4 - 5	1,337,457,457		1,354,205,623	
7. Payment on unfunded actuarial accrued liability, adjusted for timing*	88,392,796	12.74%	87,579,901	12.69%
8. Total recommended contribution: 3 + 7	<u>\$89,766,872</u>	<u>12.94%</u>	<u>\$89,693,237</u>	<u>12.99%</u>
9. Total payroll supplied by System, annualized	\$653,456,893		\$650,052,674	
10. Projected annual payroll for fiscal year beginning July 1	\$693,738,366		\$690,358,799	

* Normal cost includes administrative expenses and contributions are assumed to be paid at the middle of every month

Reconciliation of Actuarially Determined Contribution

The chart below details the changes in the actuarially determined contribution from the prior valuation to the current year's valuation.

RECONCILIATION OF ACTUARIALLY DETERMINED CONTRIBUTION

	July 1, 2018	July 1, 2017
1. Prior valuation	12.99%	13.22%
2. Increases/(decreases) due to:		
• Effect of change in amortization period (decrease from 27 years to 26 years remaining as of July 1, 2017 and decrease from 26 years to 25 years remaining as of July 1, 2018)	0.00%	0.00%
• Effect of change in covered payroll and normal cost	0.25%	-0.03%
• Effect of contributions (more)/less than actuarially determined contribution: 12.75% rather than 13.22% for FY2017 and 12.75% rather than 12.99% for FY2018	0.02%	-0.01%
• Effect of gains and losses on accrued liability and administrative expenses	-0.28%	-0.10%
• Effect of investment (gain)/loss	-0.04%	-0.09%
• Effect of legislative changes	0.00%	0.00%
• Effect of change in actuarial assumptions	0.00%	0.00%
• Net effect of other changes	0.00%	0.00%
Total change	<u>-0.05%</u>	<u>-0.23%</u>
3. Current valuation: 1 + 2	12.94%	12.99%
4. Statutory employer contribution rate	12.75%	12.75%
5. Margin available [contribution sufficiency/(deficiency)]: 4 - 3	<u>-0.19%</u>	<u>-0.24%</u>

H. History of Employer Contributions

Critical information to assess the funding progress is the historical comparison of the actuarially determined contribution (annual required contribution prior to July 1, 2014) to the actual contributions. A history of the most recent years of contributions is shown below.

HISTORY OF EMPLOYER CONTRIBUTIONS: 2009 – 2018

Fiscal Year Ended June 30	Actuarially Determined Employer Contribution (ADC) ¹		Actual Employer Contribution ²		Percent Contributed
	Amount ³	Percentage of Payroll ⁴	Amount	Percentage of Payroll	
2009	\$41,986,174	9.24%	\$37,487,655	8.25%	89.3%
2010	52,053,217	10.78%	39,836,646	8.25%	76.5%
2011	65,112,696	12.79%	44,545,433	8.75%	68.4%
2012	69,373,794	13.16%	46,126,193	8.75%	66.5%
2013	52,396,153	9.49% ⁵	59,352,860	10.75%	113.3%
2014	59,513,485	10.26%	62,355,146	10.75%	104.8%
2015	71,167,632	11.57%	78,422,098	12.75%	110.2%
2016	84,724,122	13.04%	82,839,932	12.75%	97.8%
2017	89,231,211	13.22%	86,058,868	12.75%	97.7%
2018	88,307,239	12.99%	86,675,715	12.75%	98.2%

¹ Prior to FY 2014, the ADC is the same as the GASB ARC determined under GASB 25.

² Prior to FY 2014, these amounts include prior year corrections.

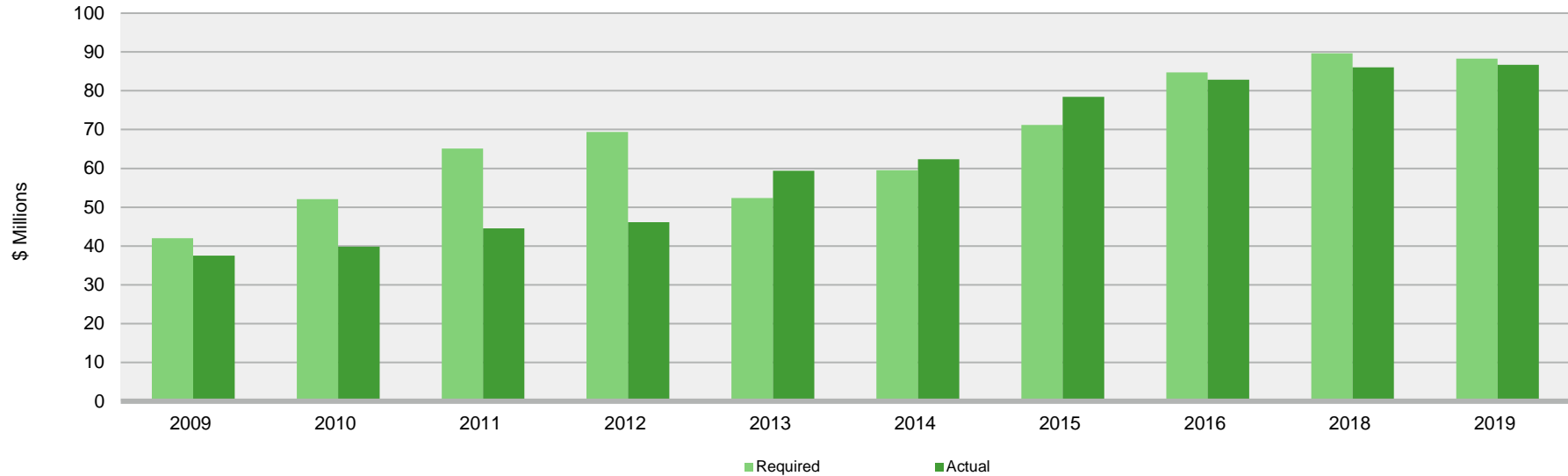
³ The dollar amount of the ADC for FY 2014 through FY 2017 is based on actual payroll for the year and differs from the estimated dollar amount shown in the prior year's actuarial valuation report because of differences between estimated and actual payroll.

⁴ The ADC for each fiscal year is based on the actuarial valuation as of the beginning of the year. Therefore, the FY 2018 ADC is based on the July 1, 2017 valuation. The ADC is defined as the contribution rate required to pay the employer normal cost and to amortize the unfunded actuarial accrued liability over the closed 30-year period that began July 1, 2013 as a level percentage of payroll.

⁵ The FY 2013 ADC reflects the actuarial present value of the increased statutory contributions scheduled to occur July 1, 2014.

The chart below presents a graphical representation of the historical comparison of the actuarially determined contribution to the actual contributions for TFFR.

ACTUARILLY DETERMINED VERSUS ACTUAL EMPLOYER CONTRIBUTIONS, YEARS ENDED JUNE 30



I. Additional Information

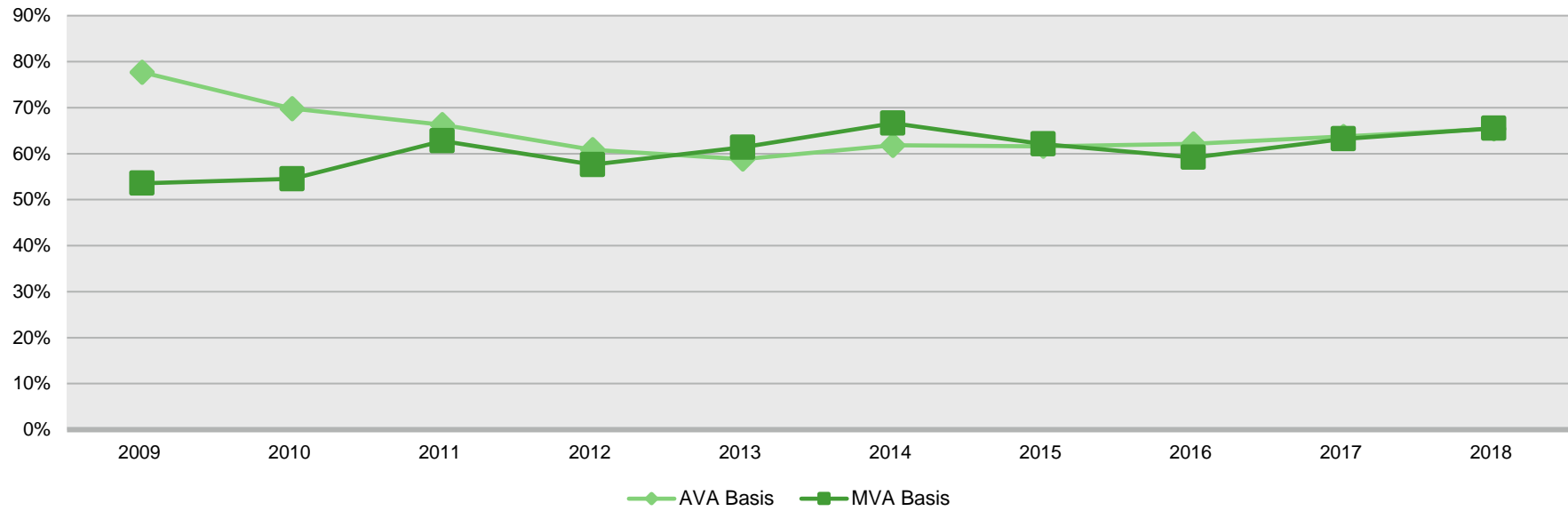
The other critical piece of information regarding TFFR's financial status is the funded ratio. This ratio compares the actuarial value of assets to the actuarial accrued liabilities of the Plan. High ratios indicate a well-funded plan with assets sufficient to cover the plan's actuarial accrued liabilities. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors. The chart below shows the funded ratio calculated using the actuarial value of assets.

SCHEDULE OF FUNDING PROGRESS

As of July 1	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded/ Accrued Liability (UAAL)	Funded Ratio	Total Payroll Supplied by System, Annualized	UAAL as a % of Compensation
2009	\$1,900,327,834	\$2,445,896,710	\$545,568,876	77.7%	\$439,986,705	124.0%
2010	1,841,960,220	2,637,165,045	795,204,825	69.8%	465,007,110	171.0%
2011	1,822,598,871	2,749,751,755	927,152,884	66.3%	488,764,292	189.7%
2012	1,748,080,771	2,871,870,286	1,123,789,515	60.9%	505,285,069	222.4%
2013	1,762,321,644	2,997,139,087	1,234,817,443	58.8%	526,698,342	234.4%
2014	1,940,473,504	3,138,799,773	1,198,326,269	61.8%	557,222,917	215.1%
2015	2,125,017,451	3,449,775,982	1,324,758,531	61.6%	589,783,780	224.6%
2016	2,229,292,988	3,589,393,851	1,360,100,863	62.1%	627,002,353	216.9%
2017	2,379,811,205	3,734,016,828	1,354,205,623	63.7%	650,052,674	208.3%
2018	2,526,058,269	3,863,515,726	1,337,457,457	65.4%	653,456,893	204.7%

The chart below shows the funded ratio calculated using both the actuarial value of assets and the market value of assets.

FUNDED RATIO, AS OF JULY 1



J. GFOA Solvency Test

The Actuarial Accrued Liability represents the present value of benefits earned, calculated using the Plan's actuarial cost method. The Actuarial Value of Assets reflects the financial resources available to liquidate the liability. The portion of the liability covered by assets reflects the extent to which accumulated plan assets are sufficient to pay future benefits, and is shown for liabilities associated with employee contributions, pensioner liabilities, and other liabilities. The Government Finance Officers Association (GFOA) recommends that the funding policy aim to achieve a funded ratio of 100 percent.

GFOA SOLVENCY TEST AS OF JULY 1

	2018	2017
Actuarial accrued liability (AAL)		
• Active member contributions	\$881,392,433	\$839,076,681
• Retirees and beneficiaries	2,222,021,190	2,092,923,830
• Active and inactive members (employer financed)	<u>760,102,103</u>	<u>802,016,317</u>
Total	\$3,863,515,726	\$3,734,016,828
Actuarial value of assets	\$2,526,058,269	\$2,379,811,205
Cumulative portion of AAL covered		
• Active member contributions	100.0%	100.0%
• Retirees and beneficiaries	74.0%	73.6%
• Active and inactive members (employer financed)	0.0%	0.0%

K. Summary of Actuarial Valuation Results

	July 1, 2018	July 1, 2017
A. Determination of Actuarial Accrued Liability		
1. Active members		
a. Retirement benefits	\$2,161,868,443	\$2,168,649,742
b. Disability benefits	35,619,428	34,821,841
c. Death benefits	37,705,085	37,339,571
d. Withdrawal benefits	<u>159,411,742</u>	<u>152,460,825</u>
e. Total	\$2,394,604,698	\$2,393,271,979
2. Inactive vested members	95,439,788	89,410,993
3. Inactive non-vested members	8,416,461	6,560,485
4. Retirees and beneficiaries	<u>2,222,021,190</u>	<u>2,092,923,830</u>
5. Actuarial Present Value of Projected Benefits: 1e + 2 + 3 + 4	\$4,720,482,137	\$4,582,167,287
6. Actuarial Present Value of Future Normal Costs, Active Members		
a. Retirement benefits	\$668,561,346	\$666,419,486
b. Disability benefits	15,997,612	15,828,831
c. Death benefits	16,351,408	16,296,393
d. Withdrawal benefits	<u>156,056,045</u>	<u>149,605,749</u>
e. Total	\$856,966,411	\$848,150,459
7. Actuarial Accrued Liability: 5 - 6e	<u>\$3,863,515,726</u>	<u>\$3,734,016,828</u>
B. Determination of Unfunded Actuarial Accrued Liability		
1. Actuarial accrued liability	\$3,863,515,726	\$3,734,016,828
2. Actuarial value of assets	<u>\$2,526,058,269</u>	<u>2,379,811,205</u>
3. Unfunded actuarial accrued liability: 1 - 2	\$1,337,457,457	\$1,354,205,623

L. Actuarial Balance Sheet

An overview of the Plan’s funding is given by an Actuarial Balance Sheet. In this approach, first the amount and timing of all future payments that will be made by the Plan for current participants is determined. Then these payments are discounted at the valuation interest rate to the date of the valuation, thereby determining the present value, referred to as the “liability” of the Plan.

Second, this liability is compared to the assets. The “assets” for this purpose include the net amount of assets already accumulated by the Plan, the present value of future member contributions, the present value of future employer normal cost contributions, and the present value of future employer amortization payments for the unfunded actuarial accrued liability.

ACTUARIAL BALANCE SHEET

	As of	
	July 1, 2018	July 1, 2017
Liabilities		
• Present value of benefits for retirees and beneficiaries	\$2,222,021,190	\$2,092,923,830
• Present value of benefits for inactive members	103,856,249	95,971,478
• Present value of benefits for active members	<u>2,394,604,698</u>	<u>2,393,271,979</u>
Total liabilities	\$4,720,482,137	\$4,582,167,287
Assets		
• Total valuation value of assets	\$2,526,058,269	\$2,379,811,205
• Present value of future contributions by members	922,733,395	906,244,234
• Present value of future employer contributions for:		
» Entry age normal costs	-65,766,984	-58,093,775
» Unfunded actuarial accrued liability	<u>1,337,457,457</u>	<u>1,354,205,623</u>
Total of current and future assets	<u>\$4,720,482,137</u>	<u>\$4,582,167,287</u>

M. Determination of Contribution Sufficiency

A. Statutory Contributions	July 1, 2018		July 1, 2017	
	% Payroll	\$ Amount	% Payroll	\$ Amount
1. Member contributions	11.75%	\$81,514,258	11.75%	\$81,117,159
2. Employer contributions	12.75%	<u>88,451,642</u>	12.75%	<u>88,020,747</u>
3. Total	24.50%	<u>\$169,965,900</u>	24.50%	<u>\$169,137,906</u>
B. Actuarially Determined Contribution	% Payroll	\$ Amount	% Payroll	\$ Amount
1. Normal cost				
a. Retirement	8.87%	\$61,494,846	8.99%	\$62,129,851
b. Disability	0.20%	1,391,024	0.20%	1,389,983
c. Death	0.21%	1,481,355	0.22%	1,491,791
d. Deferred termination benefit and refunds	<u>1.93%</u>	<u>13,388,740</u>	<u>1.89%</u>	<u>13,029,709</u>
e. Total	<u>11.21%</u>	<u>\$77,755,965</u>	<u>11.30%</u>	<u>\$78,041,335</u>
f. Normal cost, adjusted for timing	11.63%	80,694,185	11.73%	80,990,337
2. Administrative expenses, adjusted for timing	0.32%	2,194,149	0.32%	2,240,158
3. Gross normal cost including administrative expenses, adjusted for timing: 1f + 2	11.95%	\$82,888,334	12.05%	\$83,230,495
4. Less member contribution rate	11.75%	81,514,258	11.75%	81,117,159
5. Employer normal cost rate: 3- 4	0.20%	1,374,076	0.30%	2,113,336
6. Unfunded actuarial accrued liability rate, adjusted for timing	12.74%	88,392,796	12.69%	87,579,901
7. Total: 5 + 6	<u>12.94%</u>	<u>89,766,872</u>	<u>12.99%</u>	<u>89,693,237</u>
C. Contribution Sufficiency / (Deficiency): A2 – B7	-0.19%	-\$1,315,230	-0.24%	-\$1,672,490
Projected annual payroll for fiscal year beginning on the valuation date		\$693,738,366		\$690,358,799

N. Risk

The actuarial valuation results depend on a single set of assumptions; however, there is a risk that emerging results may differ significantly as actual experience proves to be different than projected from the current assumptions.

We have not been engaged to perform a detailed analysis of the potential range of the impact of risks relative to the Plan's future financial condition, but have included a brief discussion of some of the risks that may affect the Plan. This discussion is focused on funding-related risks, but similar concerns may apply to risks regarding the level of expense and liabilities reported for Plan accounting purposes as well.

A more detailed assessment of the risks could provide a better understanding of the risks inherent in the Plan. This assessment may include scenario testing, sensitivity testing, stress testing, and stochastic modeling.

A detailed risk assessment could be important for TFFR because:

- The negative cash flow position of the Plan could be exacerbated by relatively small deviations from assumed future experience.
- Retired and inactive participants account for more than half of the Plan's liabilities limiting options for reducing plan liabilities in the event of adverse experience.
- The employer contribution rate has been less than the actuarially determined contribution rate for several years, which may indicate additional funding challenges in the future.
- We are unaware of any detailed risk assessment having been performed for the Plan.
- The risks identified below show significant potential for variability.

The following risks could significantly affect the Plan's future condition:

a. Investment Risk (the risk that returns will be different than expected)

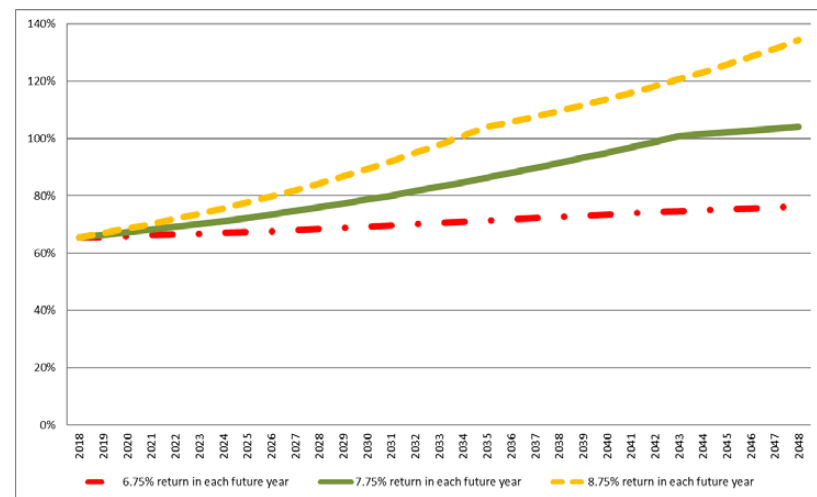
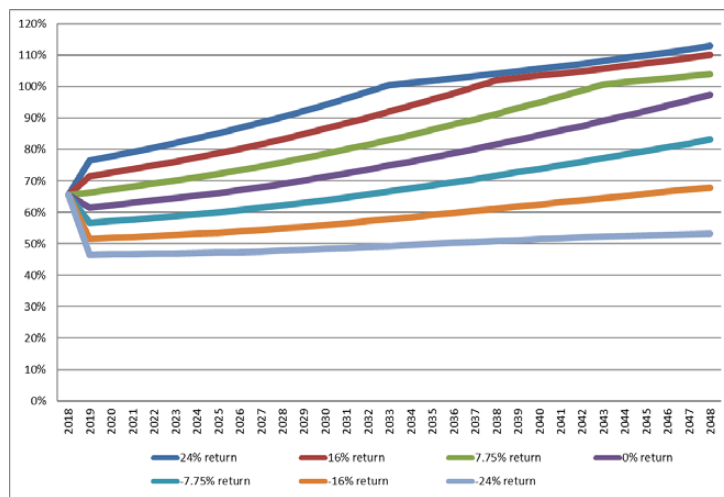
If the actual market value return for the Plan Year were 1% different from the assumed (either higher or lower), the projected unfunded actuarial liability would change by about 2%, or about \$20 million.

If the prior year's investment performance resulted in a market value of assets that is 10% different than the current value, it would result in a change of \$253.1 million in the asset value. A 10% increase in assets would cause the unfunded liability (market value basis) to decrease from \$1,332.9 million to \$1,079.8 million. Likewise, a 10% decrease in the asset value, would cause the unfunded liability to increase from \$1,332.9 million to \$1,586.0 million.

Since the Plan’s assets are much larger than contributions, investment performance may create volatility in the actuarially determined contribution requirements. For example, for each 1% difference in actual return, the actuarially determined contribution would increase or decrease by 0.04% of payroll. Ignoring the effects of the five-year phase-in of investment gains and losses, the actuarially determined contribution would change by 0.2% of payroll.

The market value rate of return over the last ten years has ranged from a low of -27.0% to a high of 23.5%.

The following graphs illustrate the impact on projected funded ratios (market value basis) under two scenarios: 1) market value returns for the next Plan year vary between -24% and +24%, and 2) market value returns in each future Plan year are +1% or -1% of the 7.75% assumptions.



b. Longevity Risk (the risk that mortality experience will be different than expected)

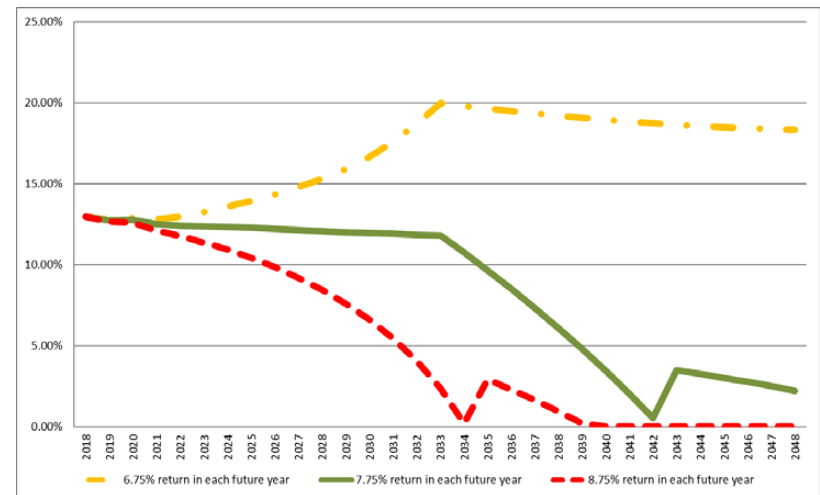
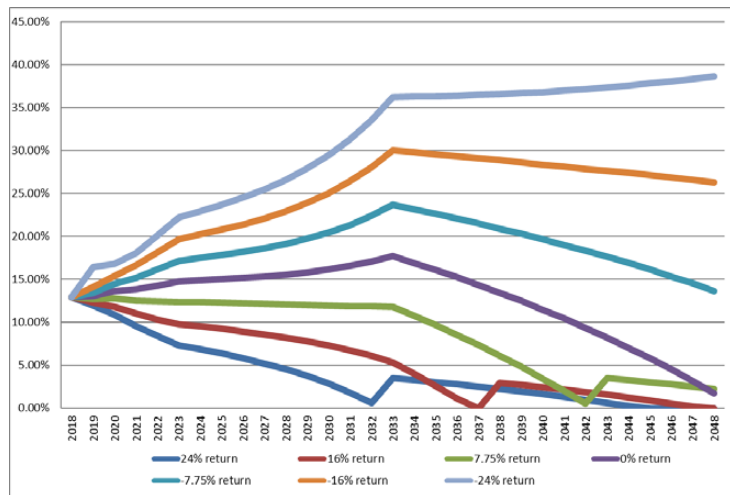
The actuarial valuation includes an expectation of future improvement in life expectancy. Emerging plan experience that does not match these expectations will result in either an increase or decrease in the actuarially determined contribution.

A 10% reduction in the assumed mortality rates results in an increase in the liabilities of roughly 3% for most plans. For TFFR, a 3% liability increase would result in an increase in the unfunded accrued liability of \$115.9 million. The unfunded accrued liability (market value of assets basis) would increase from \$1,332.9 million to \$1,448.8 million.

c. **Contribution Risk** (the risk that actual contributions will be different from actuarially determined contribution)

Plan contributions are set by statute. If contributions remain at current level and future experience matches the current assumptions, we project the unfunded actuarial accrued liability (market value basis) will be paid off in 2043 (in 25 years).

The following graphs illustrate the impact on projected actuarially determined contribution rates under two scenarios: 1) market value returns for the next Plan year vary between -24% and +24%, and 2) market value returns in each future Plan year are +1% or -1% of the 7.75% assumption.



d. **Demographic Risk** (the risk that participant experience will be different than assumed)

Examples of this risk include:

- Actual retirements occurring earlier or later than assumed. The value of retirement plan benefits is sensitive to the rate of benefit accruals and any early retirement subsidies that apply.
- More or less active participant turnover than assumed.
- Salary increases more or less than assumed.

e. Actual Experience

- Past experience can help demonstrate the sensitivity of key results to the Plan's actual experience. Over the past eight years:
 - » The investment gain/loss for a year has ranged from a loss of \$159 million to a gain of \$220 million.
 - » The non-investment gain/loss for a year has ranged from a gain of \$8.9 million to a gain of \$28.7 million.
- The funded percentage on the actuarial value of assets has ranged from a low of 59% to a high of 102% since 2000.

f. Maturity Measures

The risk associated with a pension plan increases as it becomes more mature, meaning that the actives represent a smaller portion of the liabilities of the plan. When this happens, there is a greater risk that fluctuations in the experience of the non-active participants or of the assets of the plan can result in large swings in the contribution requirements.

- Over the past ten years, the ratio of non-active participants (excluding inactive non-vested members) to active participants has increased from a low of 0.82 to a high of 0.95. Currently the Plan has a non-active to active participant ratio of 0.95. For the prior year, benefits paid were \$41.2 million more than contributions received. As the Plan matures, more cash will be needed from the investment portfolio to meet benefit payments.
- As of July 1, 2018, the retired life actuarial accrued liability represents 58% of the total actuarial accrued liability. In addition, the actuarial accrued liability for inactive vested participants represents 3% of the total. The higher the non-active actuarial accrued liability is as a percent of the total liability, the greater the danger of volatility in results.
- Benefits and administrative expenses less contributions totaled \$41.2 million for the year ending June 30, 2018, 1.6% of the market value of assets. The Plan is dependent upon investment returns in order to pay benefits.

Section 3: Supplemental Information

MEMBERSHIP DATA

Membership data was provided on electronic files sent by the RIO staff. Data for active members includes sex, birth date, service, salary for the prior fiscal year, and accumulated contributions. Data for inactive members was similar, but also includes the members' unreduced benefit. For retired members, data includes status (service retiree, disabled retiree or beneficiary), sex, birth date, pension amount, date of retirement, form of payment, and beneficiary sex and birth date if applicable.

While not verifying the correctness of the data at the source, we performed various tests to ensure the internal consistency of the data and its overall reasonableness.

Membership statistics are summarized in Exhibit A. Exhibit B shows the age/service distribution of active members. Exhibit C-1 and Exhibit C-2 show the distribution of retirees by option and by benefit amount. Exhibit D shows a reconciliation of the member data from last year's valuation to this year's valuation.

The number of active members increased by 0.1% since last year, from 10,874 to 10,881. Note that normally the actual number of members employed during the year will be somewhat higher than the valuation count, since the July 1 count excludes most June and July retirees but does not include new teachers joining the system for the next school year.

Total payroll increased 0.5% since last year. For all comparative purposes, payroll is the amount supplied by the RIO staff (i.e., the 2017-2018 member pay), annualized. However, this figure is increased by one year's assumed pay increase to determine the member's rate of pay (and thus, total projected payroll) at July 1, 2018. Pay is assumed to change only at the beginning of a school/fiscal year.

Average pay increased by 0.5%, from \$59,780 to \$60,055. This includes the impact of replacing more highly paid members who retire with new teachers. The average increase in salary for the 9,999 continuing members (members active in both this valuation and the preceding valuation) was 2.9%.

The average age of active members decreased from 42.1 years to 41.9 years, and their average service decreased from 11.9 years to 11.8 years.

The table below shows additional information about the active membership this year and last year. Tier 1 Grandfathered members are those who had 65 points as of June 30, 2013, or were at least age 55 and vested. Members who joined prior to June 30, 2008, and did not meet these criteria are considered Tier 1 Non-grandfathered members. Tier 2 members are those hired or rehired after June 30, 2008. All new members in future years will enter as Tier 2 members, so the number will increase over time. The Tier 1 Grandfathered and Non-grandfathered population will decrease each year as members leave due to retirement, termination, death, and disability.

ACTIVE STATISTICS

Category	July 1, 2018	July 1, 2017
Plan Eligibility:		
• Tier 1 Grandfathered	1,889	2,221
• Tier 1 Non-grandfathered	3,180	3,237
• Tier 2	<u>5,812</u>	<u>5,416</u>
• Total	10,881	10,874
Benefit Eligibility:		
• Non-Vested	3,185	3,331
• Vested	6,019	5,789
• Early Retirement	812	859
• Normal Retirement	<u>865</u>	<u>895</u>
• Total	10,881	10,874

In addition, this table shows the number of members who are non-vested, those who are vested but not eligible for retirement, those who are eligible only for an early retirement (reduced) benefit, and those eligible for a normal (unreduced) benefit. As of the valuation date, 1,677 members were eligible for either reduced or unreduced retirement, a decrease over last year's figure of 1,754.

Exhibit A – Member Data

Category	July 1, 2018	July 1, 2017	Change From Prior Year
Active members:			
• Males	2,717	2,731	-0.51%
• Females	8,164	8,143	0.26%
• Total number	10,881	10,874	0.06%
• Total payroll supplied by System, annualized	\$653,456,893	\$650,052,674	0.52%
• Average salary	\$60,055	\$59,780	0.46%
• Average age	41.9	42.1	-0.2
• Average service	11.8	11.9	-0.1
• Total contributions with interest	\$881,392,433	\$839,076,681	5.04%
• Average contribution with interest	\$81,003	\$77,164	4.98%
Vested inactive members:			
• Number	1,623	1,600	1.44%
• Total annual deferred benefits	\$12,348,432	\$11,604,535	6.41%
• Average annual deferred benefit	\$7,608	\$7,253	4.89%
• Average age	49.0	49.1	-0.1
Non-vested inactive members:			
• Number	971	878	10.59%
• Employee contributions with interest due	\$6,365,397	\$5,040,170	26.29%
• Average refund due	\$6,556	\$5,741	14.20%
• Average age	37.5	37.0	0.5
Service retirees:			
• Number	7,877	7,664	2.78%
• Total annual benefit	\$198,399,020	\$186,635,145	6.30%
• Average annual benefit	\$25,187	\$24,352	3.43%
• Average age	71.7	71.5	0.2
Disabled retirees:			
• Number	125	128	-2.34%
• Total annual benefit	\$1,861,025	\$1,877,679	-0.89%
• Average annual benefit	\$14,888	\$14,669	1.49%
• Average age	64.0	63.4	0.6
Beneficiaries:			
• Number	741	709	4.51%
• Total annual benefit	\$11,147,709	\$10,400,322	7.19%
• Average annual benefit	\$15,044	\$14,669	2.56%
• Average age	75.7	75.4	0.3

Exhibit B - Members in Active Service as of July 1, 2018
By Age, Years of Credited Service, and Average Compensation

Age	Total	Years of Credited Service									
		0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over	
Under 25	415	415	0	0	0	0	0	0	0	0	0
	\$39,890	\$39,890	0	0	0	0	0	0	0	0	0
25 - 29	1,593	1,201	392	0	0	0	0	0	0	0	0
	\$46,722	\$45,436	\$50,661	0	0	0	0	0	0	0	0
30 - 34	1,680	496	949	233	2	0	0	0	0	0	0
	\$52,511	\$46,782	\$54,111	\$58,171	\$54,759	0	0	0	0	0	0
35 - 39	1,524	312	402	639	169	2	0	0	0	0	0
	\$59,310	\$49,649	\$56,981	\$63,435	\$67,188	\$50,971	0	0	0	0	0
40 - 44	1,310	215	248	293	422	132	0	0	0	0	0
	\$63,732	\$50,985	\$58,705	\$64,941	\$69,337	\$73,336	0	0	0	0	0
45 - 49	1,353	209	169	175	237	441	119	3	0	0	0
	\$67,529	\$51,469	\$61,102	\$64,945	\$70,449	\$74,506	\$76,576	\$83,931	0	0	0
50 - 54	1,248	141	107	124	159	221	371	124	1	0	0
	\$70,547	\$55,565	\$60,227	\$64,816	\$66,629	\$74,894	\$77,198	\$79,618	\$68,379	0	0
55 - 59	974	118	88	90	122	118	173	186	79	0	0
	\$69,491	\$54,485	\$61,650	\$64,665	\$66,656	\$71,699	\$74,591	\$78,016	\$75,975	0	0
60 - 64	624	63	56	61	82	81	63	82	95	41	0
	\$68,876	\$50,155	\$60,192	\$62,591	\$67,669	\$72,359	\$75,614	\$73,812	\$75,443	\$78,940	0
65 - 69	135	25	21	18	20	11	7	7	8	18	0
	\$65,467	\$60,040	\$61,077	\$56,443	\$62,888	\$71,880	\$57,642	\$75,197	\$66,731	\$84,798	0
70 & over	25	10	4	0	2	2	0	2	2	3	0
	\$57,730	\$50,983	\$53,054	\$0	\$71,662	\$76,065	\$0	\$71,758	\$68,386	\$56,817	0
Total	10,881	3,205	2,436	1,633	1,215	1,008	733	404	185	62	0
	\$60,055	\$47,105	\$55,721	\$63,180	\$68,392	\$73,836	\$76,159	\$77,619	\$75,179	\$79,570	0

Exhibit C-1 – Schedule of Annuitants by Type of Benefit as of July 1, 2018

Type of Benefits/Form of Payment	Number	Annual Benefits Amount	Average Monthly Benefits
Service:			
• Straight Life	2,988	\$65,824,793	\$1,836
• 100% J&S	3,358	96,258,424	2,389
• 50% J&S	680	18,808,979	2,305
• 5 Years C&L	18	267,235	1,237
• 10 Years C&L	173	3,667,434	1,767
• 20 Years C&L	130	3,258,632	2,089
• Level	<u>530</u>	<u>10,313,523</u>	<u>1,622</u>
Subtotal:	7,877	\$198,399,020	\$2,099
Disability:			
• Straight Life	97	\$1,481,051	\$1,272
• 100% J&S	20	274,965	1,146
• 50% J&S	5	70,842	1,181
• 5 Years C&L	1	6,254	521
• 10 Years C&L	0	0	0
• 20 Years C&L	2	27,913	1,163
• Level	<u>0</u>	<u>0</u>	<u>0</u>
Subtotal:	125	\$1,861,025	\$1,241
Beneficiaries:			
• Straight Life	698	\$10,779,537	\$1,287
• 10 Years Certain	4	28,080	585
• 20 Years Certain	12	124,389	864
• QDRO Alternate Payee	<u>27</u>	<u>215,703</u>	<u>666</u>
Subtotal:	741	\$11,147,709	\$1,254
Total:	8,743	\$211,407,754	\$2,015

Exhibit C-2 – Schedule of Annuitants by Monthly Benefit as of July 1, 2018

Monthly Benefit Amount	Number of Members	Female	Male	Average Service
Under \$200	253	187	66	6.12
200 - 399	448	336	112	11.50
400 - 599	434	338	96	15.75
600 - 799	403	289	114	19.52
800 - 999	400	292	108	21.94
1,000 - 1,199	500	378	122	25.28
1,200 - 1,399	504	346	158	26.89
1,400 - 1,599	555	367	188	28.66
1,600 - 1,799	620	418	202	28.85
1,800 - 1,999	611	413	198	29.64
2,000 - 2,199	570	400	170	29.84
2,200 - 2,399	538	356	182	30.34
2,400 - 2,599	436	295	141	31.40
2,600 - 2,799	384	262	122	31.93
2,800 - 2,999	378	241	137	32.58
3,000 - 3,199	329	231	98	32.92
3,200 - 3,399	288	189	99	33.85
3,400 - 3,599	220	136	84	33.74
3,600 - 3,799	186	115	71	34.78
3,800 - 3,999	131	87	44	35.06
4,000 & over	<u>555</u>	<u>287</u>	<u>268</u>	36.41
Total:	8,743	5,963	2,780	27.35

Exhibit D – Reconciliation of Member Data by Status

	Active Members	Vested Terminated Members	Non-Vested Terminated Members	Service Retirees	Disabled Retirees	Beneficiaries	Total
Number as of July 1, 2017	10,874	1,600	878	7,664	128	709	21,853
• Additions and new members	779	0	1	0	0	0	780
• Retirements	-330	-68	0	398	0	0	0
• Disability	-3	0	0	0	3	0	0
• Died with beneficiary	-5	-1	0	-48	-1	55	0
• Died without beneficiary	-5	-1	-1	-136	-4	-25	-172
• Terminated vested	-169	169	0	0	0	0	0
• Terminated non-vested	-182	0	182	0	0	0	0
• Refunds	-181	-27	-37	0	0	0	-245
• Rehired as active	103	-49	-52	-1	-1	0	0
• Expired benefits	0	0	0	0	0	0	0
• New alternate payee	0	0	0	0	0	2	2
• Data adjustments	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Number as of July 1, 2018	10,881	1,623	971	7,877	125	741	22,218

Exhibit E – Summary Statement of Income and Expenses on a Market Value Basis

	Year Ended June 30 , 2018	Year Ended June 30 , 2017
Net assets at market value at the beginning of the year	\$2,360,491,075	\$2,124,335,288
Contribution:		
• Employee contributions	\$79,877,611	\$79,309,153
• Employer contributions	86,675,715	86,058,868
• Purchased service credit	2,181,106	2,553,200
• Interest, penalties and other	<u>194,028</u>	<u>235,890</u>
<i>Total contribution income</i>	<i>\$168,928,460</i>	<i>\$168,157,111</i>
Investment income:		
• Interest, dividends and other income	\$54,486,768	\$50,718,890
• Securities lending income	231,448	229,936
• Investment expenses	-5,352,945	-6,011,791
• Securities lending income	<u>-46,271</u>	<u>-45,973</u>
<i>Net investment income</i>	<i>\$49,319,000</i>	<i>\$44,891,062</i>
Net realized and unrealized gains/(losses)	<u>162,026,369</u>	<u>221,797,589</u>
Total income available for benefits	\$380,273,829	\$434,845,762
Less benefit payments and expenses:		
• Regular annuity benefits	\$201,648,202	\$190,029,141
• Partial lump-sum benefits paid	768,829	1,075,553
• Refunds	<u>5,561,668</u>	<u>5,411,850</u>
Total benefits and refunds	\$207,978,699	\$196,516,544
• Administrative and miscellaneous expenses	2,128,794	2,173,431
<i>Total benefit payments and expenses</i>	<i>\$210,107,493</i>	<i>\$198,689,975</i>
Change in reserve for future benefits	\$170,166,336	\$236,155,787
Net assets at market value at the end of the year	\$2,530,657,411	\$2,360,491,075

Exhibit F – Summary Statement of Plan Assets

	June 30 , 2018	June 30 , 2017
Cash and cash equivalents (operating cash)	\$20,493,198	\$19,082,062
Invested securities lending collateral	7,413,200	12,839,759
Total accounts receivable	36,322,393	35,281,492
Investments:		
• Equities	\$1,352,977,909	\$1,275,571,112
• Fixed Income	589,368,951	521,927,872
• Short-term	28,631,157	27,243,767
• Real assets	416,937,112	407,547,460
• Private equity	<u>88,154,554</u>	76,976,255
Total investments at market value	<u>\$2,476,069,683</u>	<u>\$2,309,266,466</u>
Total assets	\$2,540,298,474	\$2,376,469,779
Deferred outflows of resources related to pensions	813,903	384,391
Total accounts payable	-10,406,447	-16,307,753
Deferred inflows related to pensions	<u>-48,519</u>	<u>-55,342</u>
Net assets at market value	\$2,530,657,411	\$2,360,491,075
Net assets at actuarial value	\$2,526,058,269	\$2,379,811,205

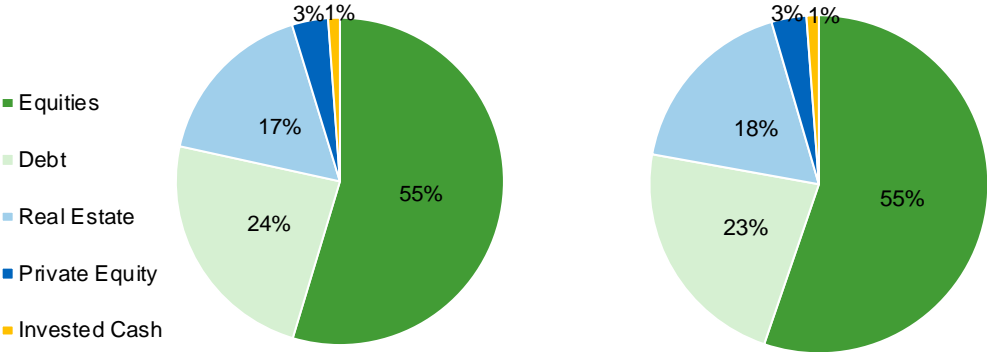


Exhibit G – Development of the Fund Through June 30, 2018

Year Ended June 30	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return*	Admin. Expenses	Benefit Payments	Market Value of Assets at Year-End**	Actuarial Value of Assets at Year-End	Actuarial Value as a Percent of Market Value
2009	\$37,487,655	\$34,712,846	\$2,180,479	(\$492,741,825)	(\$1,707,506)	(\$116,328,330)	\$1,309,716,730	\$1,900,327,834	145.1%
2010	39,836,646	36,848,481	1,420,703	179,059,473	(1,902,796)	(127,029,394)	1,437,949,843	1,841,960,220	128.1%
2011	44,545,433	38,869,260	1,508,557	332,952,526	(2,003,705)	(129,646,302)	1,726,179,317	1,822,598,871	105.6%
2012	46,126,193	40,254,562	2,427,849	(23,108,500)	(1,596,976)	(137,729,762)	1,654,149,659	1,748,080,771	105.7%
2013	59,352,860	53,824,557	2,671,931	218,581,671	(1,623,638)	(148,996,718)	1,839,583,960	1,762,321,644	95.8%
2014	62,355,146	56,554,767	2,082,055	292,660,404	(1,586,045)	(162,259,276)	2,090,977,056	1,940,473,504	92.8%
2015	78,422,098	72,268,451	1,773,213	73,204,806	(1,923,392)	(172,239,433)	2,141,920,800	2,125,017,451	99.2%
2016	82,839,932	76,342,685	2,813,211	8,238,996	(1,851,656)	(185,968,680)	2,124,335,288	2,229,292,988	104.9%
2017	86,058,868	79,309,153	2,789,090	266,688,651	(2,173,431)	(196,516,544)	2,360,491,075	2,379,811,205	100.8%
2018	86,675,715	79,877,611	2,375,134	211,345,369	(2,128,794)	(207,978,699)	2,530,657,411	2,526,058,269	99.8%

* On a market basis, net of investment fees; for 2009-2010 and 2015-2018, net of investment fees and administrative expenses

** The market value of assets as of June 30, 2014 was restated by (\$561,999) due to GASB 68 implementation. The restated amount is \$2,090,415,057.

Exhibit H – Definition of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Actuarial Accrued Liability for Actives:	The value of all projected benefit payments for current members less the portion that will be paid by future normal costs.
Actuarial Accrued Liability for Pensioners:	The single-sum value of lifetime benefits to existing pensioners. This sum takes into account life expectancies appropriate to the ages of the pensioners and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial Cost Method:	A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the Actuarially Determined Contribution (ADC).
Actuarial Gain or Loss:	A measure of the difference between actual experience and expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge that may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., assets earn more than projected, salary increases are less than 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, actuarial losses are the result of unfavorable experience, i.e., actual results yield actuarial liabilities that are larger than projected. Actuarial gains will shorten the time required for funding the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.
Actuarially Equivalent:	Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV):	The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. Each such amount or series of amounts is: <ul style="list-style-type: none">a. Adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)b. Multiplied by the probability of the occurrence of an event (such as survival, death, disability, withdrawal, etc.) on which the payment is conditioned, andc. Discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Actuarial Present Value of Future Plan Benefits:	The Actuarial Present Value of benefit amounts expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age, anticipated future compensation, and future service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive 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.
Actuarial Valuation:	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, such as the Actuarially Determined Contribution (ADC) and the Net Pension Liability (NPL).
Actuarial Value of Assets (AVA):	The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.
Actuarially Determined:	Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.
Actuarially Determined Contribution (ADC):	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under the Plan's funding policy. The ADC consists of the Employer Normal Cost and the Amortization Payment.
Amortization Method:	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 assumed rate at which total covered payroll of all active members will increase.
Amortization Payment:	The portion of the pension plan contribution, or ADC, that is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.
Assumptions or Actuarial Assumptions:	The estimates upon which the cost of the Fund is calculated, including: <ul style="list-style-type: none"> a. <u>Investment return</u> - the rate of investment yield that the Fund will earn over the long-term future;

	<ul style="list-style-type: none"> b. <u>Mortality rates</u> - the death rates of employees and pensioners; life expectancy is based on these rates; c. <u>Retirement rates</u> - the rate or probability of retirement at a given age; d. <u>Withdrawal rates</u> - the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement; e. <u>Salary increase rates</u> - the rates of salary increase due to inflation and productivity growth.
Closed Amortization Period:	A specific number of years that is counted down by one each year and therefore 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. See Open Amortization Period.
Decrements:	Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.
Defined Benefit Plan:	A retirement plan in which benefits are defined by a formula applied to the member's compensation and/or years of service.
Defined Contribution Plan:	A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.
Employer Normal Cost:	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Experience Study:	A periodic review and analysis of the actual experience of the Fund that may lead to a revision of one or more Actuarial Assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.
Funded Ratio:	The ratio of the Actuarial Value of Assets (AVA) to the Actuarial Accrued Liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.
Funding Period or Amortization Period:	The term "Funding Period" is used in two ways. First, it is the period used in calculating the Amortization Payment as a component of the ADC. Second, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on the statutory employer contribution rate, and assuming no future actuarial gains or losses.
GASB:	Governmental Accounting Standards Board.

GASB 67 and GASB 68:	Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68. 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 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves.
Investment Return:	The rate of earnings of the Fund from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.
Margin:	The difference, whether positive or negative, between the statutory employer contribution rate and the Actuarially Determined Contribution (ADC).
Net Pension Liability (NPL):	The Net Pension Liability is equal to the Total Pension Liability minus the Plan Fiduciary Net Position.
Normal Cost:	That portion of the Actuarial Present Value of pension plan benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment with respect to an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability, or retirement.
Open Amortization Period:	An open amortization period is one that is used to determine the Amortization Payment, but which does not change over time. 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 with level percentage of payroll is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never decrease, but will become smaller each year, in relation to covered payroll, if the Actuarial Assumptions are realized.
Plan Fiduciary Net Position:	Market value of assets.
Real Rate of Return:	Nominal rate of return on investments, adjusted for inflation.
Total Pension Liability (TPL):	The actuarial accrued liability under the entry age normal cost method and based on the blended discount rate as described in GASB 67 and 68.
Unfunded Actuarial Accrued Liability (UAAL):	The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

Valuation Date or Actuarial Valuation Date:

The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Section 4: Actuarial Valuation Basis

Exhibit I – Actuarial Assumptions and Actuarial Cost Method

Investment Return Rate:	7.75% per annum, compounded annually, equal to an assumed 2.75% inflation rate plus a 5.50% real rate of return, less 0.50% for expected investment expenses. (Adopted effective July 1, 2015).																																				
Mortality Rates:	The mortality rates were based on historical and current demographic data, as used in the experience study dated April 30, 2015. The underlying tables reasonably reflect the mortality experience of the Fund as of the measurement date.																																				
Post-Retirement Non-Disabled:	RP-2014 Healthy Annuitant Mortality Table set back one year, multiplied by 50% for ages under 75 and grading up to 100% by age 80, projected generationally using Scale MP-2014. (Adopted effective July 1, 2015). Sample 2014 mortality rates are as follows:																																				
	<table border="1"> <thead> <tr> <th>Age</th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>0.20%</td> <td>0.14%</td> </tr> <tr> <td>55</td> <td>0.27%</td> <td>0.17%</td> </tr> <tr> <td>60</td> <td>0.37%</td> <td>0.24%</td> </tr> <tr> <td>65</td> <td>0.51%</td> <td>0.37%</td> </tr> <tr> <td>70</td> <td>0.77%</td> <td>0.58%</td> </tr> <tr> <td>75</td> <td>1.22%</td> <td>0.95%</td> </tr> <tr> <td>80</td> <td>3.62%</td> <td>2.82%</td> </tr> <tr> <td>85</td> <td>6.93%</td> <td>5.40%</td> </tr> <tr> <td>90</td> <td>12.15%</td> <td>9.56%</td> </tr> <tr> <td>95</td> <td>20.11%</td> <td>16.30%</td> </tr> <tr> <td>100</td> <td>29.38%</td> <td>25.11%</td> </tr> </tbody> </table>	Age	Male	Female	50	0.20%	0.14%	55	0.27%	0.17%	60	0.37%	0.24%	65	0.51%	0.37%	70	0.77%	0.58%	75	1.22%	0.95%	80	3.62%	2.82%	85	6.93%	5.40%	90	12.15%	9.56%	95	20.11%	16.30%	100	29.38%	25.11%
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	The mortality tables are adjusted forward from 2014 using a generational projection to reflect future mortality improvement.																																				
Post-Retirement Disabled:	RP-2014 Disabled Mortality Table set forward 4 years. (Adopted effective July 1, 2015).																																				
Pre-Retirement Non-Disabled:	RP-2014 Employee Mortality Table, projected generationally using Scale MP-2014. (Adopted effective July 1, 2015).																																				

Retirement Rates:

The following rates of retirement are assumed for members eligible to retire. (Adopted effective July 1, 2015).

Age	Unreduced Retirement*		Reduced Retirement
	Male	Female	Male/Female
50-54	15.00%	15.00%	
55-57	15.00%	15.00%	2.00%
58	15.00%	15.00%	3.00%
59	15.00%	15.00%	3.50%
60	15.00%	15.00%	4.00%
61	25.00%	25.00%	6.50%
62	35.00%	35.00%	9.00%
63	25.00%	30.00%	12.00%
64	35.00%	40.00%	12.00%
65	40.00%	50.00%	
66	30.00%	40.00%	
67	30.00%	30.00%	
68	25.00%	30.00%	
69	25.00%	30.00%	
70-74	25.00%	25.00%	
75	100.00%	100.00%	

*If a member reaches eligibility for unreduced retirement before age 65 under the rule of 85 (Grandfathered Tier 1) or the Rule of 90/Age 60 (Non-grandfathered Tier 1 and Tier 2), 10% is added to the rate at the age (and only this age) the member becomes first eligible for an unreduced retirement benefit.

Disability Rates:

Shown below for selected ages. (Adopted effective July 1, 2010).

Age	Rates
20	0.011%
25	0.011%
30	0.011%
35	0.011%
40	0.033%
45	0.055%
50	0.088%
55	0.154%
60	0.297%

Termination Rates:

Termination rates based on years of service, for causes other than death, disability, or retirement. (Adopted effective July 1, 2015).

Years from Hire	Male	Female	Years from Hire	Male	Female
0	20.00%	20.00%	10	2.50%	2.50%
1	14.00%	12.00%	11	2.00%	2.50%
2	11.00%	9.00%	12	2.00%	2.50%
3	8.00%	7.00%	13	2.00%	2.50%
4	6.50%	6.00%	14	2.00%	2.50%
5	5.00%	5.00%	15-18	1.50%	2.00%
6	4.00%	4.00%	19	0.75%	2.00%
7	3.50%	3.50%	20-24	0.75%	1.50%
8	3.00%	3.00%	25 & over	0.75%	0.75%
9	2.50%	2.50%			

Termination rates eliminated at first retirement eligibility

Salary Increase Rates:

Inflation rate of 2.75% plus productivity increase rate of 1.50%, plus step-rate/promotional increase as shown below. (Adopted effective July 1, 2015).

Years from Hire	Annual Step-Rate Promotional Component	Annual Total Salary Increase
0	10.25%	14.50%
1	3.50	7.75
2	3.25	7.50
3	3.00	7.25
4	2.75	7.00
5	2.50	6.75
6	2.25	6.50
7	2.00	6.25
8-9	1.75	6.00
10-11	1.50	5.75
12-13	1.25	5.50
14-15	1.00	5.25
16-18	0.75	5.00
19-22	0.50	4.75
23-24	0.25	4.50
25 & over	0.00	4.25

Payroll Growth Rate:

3.25% per annum. This assumption does not include any allowance for future increase in the number of members. (Adopted effective July 1, 2010).

Percent Married:

For valuation purposes, 75% of members are assumed to be married. Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses. (Adopted effective July 1, 1992).

Percent Electing a Deferred Termination Benefit:

Terminating members are assumed to elect the most valuable benefit at the time of termination. Termination benefits are assumed to commence at the first age at which unreduced benefits are available. (Adopted effective July 1, 1990).

Loading Factor for New Retirees:	The liability includes a 3% load for members who retired during the year ended June 30, 2018, to reflect that their benefits are not finalized as of the valuation date.
Annual Administrative Expenses:	Administrative expenses of \$2,187,336 (actual expenses for the previous year, increased with inflation) are expected to be paid monthly for the year beginning July 1, 2018.
Asset Valuation Method:	The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (or less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The actual investment return for this purpose is determined net of all investment expenses. The actuarial value is further adjusted, if necessary, to be within 20% of the market value.
Actuarial Cost Method:	Normal cost and actuarial accrued liability are calculated on an individual basis and are allocated by salary. Entry age is determined as the age at member's enrollment in TFFR. The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability (UAAL) is the excess of the actuarial accrued liability over the actuarial value of assets.
Amortization Period and Method:	The actuarially determined contribution (ADC) is determined as the sum of (a) the employer normal cost rate, and (b) a level percentage of payroll required to amortize the unfunded actuarial accrued liability over the 30-year closed period that began July 1, 2013.

Exhibit II – Summary of Plan Provisions

This exhibit summarizes the major provisions of the Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

Effective Date:	July 1, 1971															
Plan Year:	July 1 through June 30															
Administration:	The Teachers’ Fund for Retirement (TFFR) is administrated by a Board of Trustees. A separate State Investment Board is responsible for the investment of the trust assets, although TFFR’s Board establishes the asset allocation policy. The Retirement and Investment Office is the administrative agency for TFFR.															
Type of Plan:	TFFR is a qualified governmental defined benefit retirement plan. For Governmental Accounting Standards Board purposes, it is a cost-sharing multiple-employer public employee retirement system.															
Eligibility:	All certified teachers of any public school in the State participate in TFFR. This includes teachers, supervisors, principals, administrators, etc. Non-certified employees such as teacher’s aides, janitors, secretaries, drivers, etc. are not allowed to participate in TFFR. Eligible employees become members at their date of employment.															
Member Contributions:	All active members contribute 11.75% of their salary per year. The employer may “pick up” the member’s contribution under the provisions of Internal Revenue Code Section 414(h). The member contribution rate was increased from 7.75% to 9.75% effective July 1, 2012, and was increased to 11.75% effective July 1, 2014. The total addition of 4.00% to the member contribution rate will remain in effect until TFFR is 100% funded on an actuarial basis. At that point, the member contribution rate will revert to 7.75%.															
Salary:	A member’s total earnings are used for salary purposes, including overtime, etc., and including nontaxable wages under a Section 125 plan, but excluding certain extraordinary compensation, such as fringe benefits or unused sick and vacation leave.															
Employer Contributions:	The district or other employer that employs a member contributes a percentage of the member’s salary. This percentage consists of a base percentage of 7.75%, plus, since July 1, 2008, additions as shown below. <table border="1" data-bbox="632 1089 1728 1320"> <thead> <tr> <th>Effective Date</th> <th>Addition to 7.75% Base Rate</th> <th>Employer Contribution Rate</th> </tr> </thead> <tbody> <tr> <td>July 1, 2008</td> <td>0.50%</td> <td>8.25%</td> </tr> <tr> <td>July 1, 2010</td> <td>1.00%</td> <td>8.75%</td> </tr> <tr> <td>July 1, 2012</td> <td>3.00%</td> <td>10.75%</td> </tr> <tr> <td>July 1, 2014</td> <td>5.00%</td> <td>12.75%</td> </tr> </tbody> </table> <p>However, the additions are subject to a “sunset” provision, so the contribution rate will revert to 7.75% once the funded ratio reaches 100%, measured using the actuarial value of assets. The contribution rate will not automatically increase if the funded ratio later falls back below 100%.</p>	Effective Date	Addition to 7.75% Base Rate	Employer Contribution Rate	July 1, 2008	0.50%	8.25%	July 1, 2010	1.00%	8.75%	July 1, 2012	3.00%	10.75%	July 1, 2014	5.00%	12.75%
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Service:	Employees receive credit for service while a member. A member may also purchase credit for certain periods, such as time spent teaching at a public school in another state, by paying the actuarially determined cost of the additional service. Special rules and limits govern the purchase of additional service.
Tiers:	Members who join TFFR by June 30, 2008 are in Tier 1, while members who join later are in Tier 2. If a Tier 1 member terminates, takes a refund, and later rejoins TFFR after June 30, 2008, that member will be in Tier 2. As of June 30, 2013, Tier 1 members who are at least age 55 and vested (3 years of service) as of the effective date, or the sum of the member's age and service is at least 65, are considered Grandfathered, and previous plan provisions will not change. Tier 1 members who do not fit these criteria as of June 30, 2013, are considered Non-grandfathered. These members, along with Tier 2, have new plan provisions, as described below.
Final Average Compensation (FAC):	The average of the member's highest three (Tier 1 members) or five (Tier 2 members) plan year salaries. Monthly benefits are based on one-twelfth of this amount.
Normal Retirement:	<p>a. Eligibility:</p> <ul style="list-style-type: none"> • Tier 1 members may retire upon Normal Retirement on or after age 65 with credit for 3 years of service, or if earlier, when the sum of the member's age and service is at least 85. Effective as of June 30, 2013, Tier 1 members who are at least age 55 and vested (3 years of service) as of the effective date, or the sum of the member's age and service is at least 65, normal retirement eligibility will not change (participants are Grandfathered). For those who did not meet these criteria as of June 30, 2013 (Non-grandfathered), members may retire upon Normal Retirement on or after age 65 with credit for 3 years of service, or if earlier, when the sum of the member's age and service is at least 90, with a minimum age of 60. • Tier 2 members may retire upon Normal Retirement on or after age 65 with credit for 5 years of service, or, if earlier, when the sum of the member's age and service is at least 90. Effective July 1, 2013, Tier 2 members may retire upon Normal Retirement on or after age 65 with credit for 5 years of service, or if earlier, when the sum of the member's age and service is at least 90, with a minimum age of 60. <p>b. Monthly Benefit: 2.00% of FAC (monthly) times years of service.</p> <p>c. Payment Form: Benefits are paid as a monthly life annuity, with a guarantee that if the payments made do not exceed the member's contributions plus interest, determined as of the date of retirement, the balance will be paid in a lump-sum to the member's beneficiary. Optional forms of payment are available; see below.</p>
Early Retirement:	<p>a. Eligibility: Tier 1 members may retire early after reaching age 55 with credit for three years of service, while Tier 2 members may retire early after reaching age 55 with credit for five years of service.</p> <p>b. Monthly Benefit: 2.00% of FAC (monthly) times years of service, multiplied by a factor that reduces the benefit 6% for each year from the earlier of (i) age 65, or (ii) the age at which current service plus age equals 85 (Tier 1 members) or 90 (Tier 2 members). Effective July 1, 2013 for members who are either</p>

	<p>Non-grandfathered Tier 1 or Tier 2: 2.00% of FAC (monthly) times years of service, multiplied by a factor that reduces the benefit 8% for each year from the earlier of (i) age 65, or (ii) the age at which current service plus age equals 90 with a minimum age of 60.</p> <p>c. Payment Form: Same as for Normal Retirement above.</p>
Disability Retirement:	<p>a. Eligibility: A member is eligible provided he/she has credit for at least one year of service. Effective July 1, 2013, a member is eligible provided he/she has credit for at least five years of service.</p> <p>b. Monthly Benefit: 2.00% of FAC (monthly) times years of service with a minimum 20 years of service. Effective July 1, 2013, 2.00% of FAC (monthly) times years of service.</p> <p>c. Payment Form: The disability benefit commences immediately upon the member's retirement. Benefits cease upon recovery or reemployment. Disability benefits are payable as a monthly life annuity with a guarantee that, at the member's death, the sum of the member's contributions plus interest as of the date of retirement that is in excess of the sum of payments already received will be paid in a lump sum to the member's beneficiary.</p> <p>d. All alternative forms of payment other than level income and the partial lump-sum option are also permitted in the case of disability retirement. For basis recovery only, disability benefits are converted to normal retirement benefits when the member reaches normal retirement age or age 65, whichever is earlier.</p>
Deferred Termination Benefit:	<p>a. Eligibility: A Tier 1 member with at least three years of service, or a Tier 2 member with at least five years of service, who does not withdraw his/her contributions from the fund, is eligible for a deferred termination benefit.</p> <p>b. Monthly Benefit: 2.00% of FAC (monthly) times years of service. Both FAC and service are determined at the time the member leaves active employment. Benefits may commence unreduced at age 65 or when the sum of the member's age and service is 85 (Grandfathered Tier 1 members) or 90 with a minimum age of 60 (Non-grandfathered Tier 1 and Tier 2 members). Reduced benefits may commence at or after age 55 if the member is not eligible for an unreduced benefit. Reductions are the same as for Early Retirement.</p> <p>c. Payment Form: The form of payment is the same as for Normal Retirement above.</p> <p>d. Death Benefit: A member who dies after leaving active service but before retiring is entitled to receive a benefit as described below.</p>
Withdrawal (Refund) Benefit:	<p>a. Eligibility: Tier 1 members leaving covered employment with less than three years of service, and Tier 2 members leaving covered employment with less than five years of service, are eligible. Optionally, vested members may withdraw their contributions plus interest in lieu of the deferred benefits otherwise due.</p> <p>b. Benefit: The member who withdraws receives a lump-sum payment of his/her employee contributions, plus the interest credited on these contributions. Interest is credited at 6% per year (0.5% per month).</p>

Death Benefit:	<p>a. Eligibility: Death must have occurred while an active or an inactive, non-retired member.</p> <p>b. Benefit: Upon the death of a nonvested member, a refund of the member's contributions and interest is paid. Upon the death of a vested member, the beneficiary may elect (i) the refund benefit above, or (ii) a life annuity of the normal retirement benefit, determined under Option One below, based on FAC and service as of the date of death, but without applying any reduction for the member's age at death. In determining the reduction for Option One, members not eligible for normal retirement benefits use the Fund's option tables for disabled members.</p>
Optional Forms of Payment:	<p>There are optional forms of payment available on an actuarially equivalent basis, as follows:</p> <p>Option 1 - A life annuity payable while either the participant or his beneficiary is alive, "popping-up" to the original life annuity if the beneficiary predeceases the member.</p> <p>Option 2 - A life annuity payable to the member while both the member and beneficiary are alive, reducing to 50% of this amount if the member predeceases the beneficiary, and "popping-up" to the original life annuity if the beneficiary predeceases the member.</p> <p>Option 3a - A life annuity payable to the member, with a guarantee that, should the member die prior to receiving 60 payments (five years), the payments will be continued to a beneficiary for the balance of the five-year period. (This option has been replaced by Option 3b. It is not available to employees who retire on or after August 1, 2003. Retirees who elected this option prior to that date are unaffected.)</p> <p>Option 3b - A life annuity payable to the member, with a guarantee that, should the member die prior to receiving 240 payments (twenty years), the payments will be continued to a beneficiary for the balance of the twenty-year period. (This option replaced Option 3a effective August 1, 2003.)</p> <p>Option 4 - A life annuity payable to the member, with a guarantee that, should the member die prior to receiving 120 payments (10 years), the payments will be continued to a beneficiary for the balance of the ten-year period.</p> <p>Option 5 - A non-level annuity payable to the member, designed to provide a level total income when combined with the member's Social Security benefit. This option is not available to disabled retirees.</p> <p>In addition, members may elect a partial lump-sum option (PLSO) at retirement. Under this option, a member receives an immediate lump sum equal to 12 times the monthly life annuity benefit and a reduced annuity. The reduction is determined actuarially. The member can then elect to receive the annuity benefit in one of the other optional forms, except that members who receive a PLSO may not elect Option 5 – the level income option. The PLSO is not available to disabled retirees or retirees who are not eligible for an unreduced retirement benefit.</p> <p>Actuarial equivalence is based on tables adopted by the Board of Trustees.</p>
Cost-of-living Increase:	<p>From time to time, TFFR has been amended to grant certain post-retirement benefit increases. However, TFFR has no automatic cost-of-living increase features.</p>

Exhibit III – Summary of Plan Changes

1991 Legislative Sessions:

1. Benefit multiplier increased from 1.275% to 1.39% for all future retirees.
2. Provide a post retirement benefit increases for all annuitants receiving a monthly benefit on June 30, 1991. The monthly increase is the greater of a 10% increase or a level increase based on years of service and retirement date:
 - a. \$3 per year of service for retirements before 1980
 - b. \$2 per year of service for retirements between 1980 and 1983
 - c. \$1 per year of service for retirements from 1984 through June 30, 1991

Minimum increase is \$5 per month. Maximum increase is \$75 per month

1993 Legislative Session:

1. Benefit multiplier increased from 1.39% to 1.55% for all future retirees.
2. Provide a post-retirement benefit increase for all annuitants receiving a monthly benefit on June 30, 1993. The monthly increase is the greater of a 10% increase or a level increase based on years of service and retirement date:
 - a. \$3 per year of service for retirements before 1980
 - b. \$2.50 per year of service for retirements between 1980 and 1983
 - c. \$1 per year of service for retirements from 1984 through June 30, 1993

Minimum increase is \$5 per month. Maximum increase is \$100 per month.

3. Minimum retirement benefit increased to \$10 times years of service up to 25, plus \$15 times years of service greater than 25. (Previously was \$6 up to 25 years of service plus \$7.50 over 25 years of service.)
4. Disability benefit changed to 1.55% of FAC times years of service using a minimum of 20 years of service.

1995 Legislative Session:

There were no material changes made during the 1995 legislative session.

1997 Legislative Session:

1. Benefit multiplier increased from 1.55% to 1.75% for all future retirees.
2. Member contribution rate and employer contribution rate increased from 6.75% to 7.75%.
3. A \$30.00/month benefit improvement was granted to all retirees and beneficiaries.

1999 Legislative Session:

1. Active members will now be fully vested after three years (rather than five years) of service.
2. Early retirement benefits will be reduced 6% per year from the earlier of (i) age 65, or (ii) the date as of which age plus service equals 85 (rather than from age 65 in all cases).
3. An ad hoc COLA was provided for all retirees and beneficiaries. This increase is equal to an additional \$2.00 per month for each year of service plus \$1.00 per month for each year since the member's retirement.
4. The formula multiplier was increased from 1.75% to 1.88% effective July 1, 1999.

2001 Legislative Session:

1. An ad hoc COLA was provided for all retirees and beneficiaries. The ad hoc COLA increase is equal to an additional \$2.00 per month for each year of service plus \$1.00 per month for each year since the member's retirement. Retirees and beneficiaries will also receive two additional increases equal to 0.75% times the monthly benefit, payable July 1, 2001 and July 1, 2002. The two 0.75% increases are conditional. If the actuarial margin is a shortfall, i.e., is negative, by 60 basis points or more, or if the margin has been negative by 30 or more basis points for two years, the Board could elect to suspend the increase.
2. The formula multiplier was increased from 1.88% to 2.00% effective July 1, 2001.

2003 Legislative Session:

1. Partial lump-sum option adopted, equal to twelve times the monthly life annuity benefit. Not available if level-income option is elected. Not available for reduced retirement or disability retirement.
2. Five-year certain and life option replaced with 20-year certain and life. This does not impact retirees who retired under the five-years certain and life option.
3. Employer service purchase authorized.
4. Active members of the Department of Public Instruction are permitted to make a one-time irrevocable election to transfer to the State Public Employees Retirement System in FY 2004. Both assets and liabilities for all TFFR service will be transferred for electing employees. Transferred assets will be based on the actuarial present value of the member's accrued TFFR benefit, or the member's contribution account balance if larger.

2005 Legislative Session:

There were no material changes made during the 2005 legislative sessions.

2007 Legislative Session:

1. For active members hired on or after July 1, 2008 (called Tier 2 members):
 - a. Members will be eligible for an unreduced retirement benefit when they reach age 65 with at least five years of service (rather than three years of service); or if earlier, when the sum of the member's age and service is at least 90 (rather than 85).
 - b. Members will be eligible for a reduced (early) retirement benefit when they reach age 55 with five years of service, rather than three years of service.
 - c. Members will be fully vested after five years of service (rather than three year of service).
 - d. The Final Average Compensation for Tier 2 members is the average of the member's highest five plan year salaries, rather than the average of the three highest salaries.
2. The employer contribution rate increases from 7.75% to 8.25% effective July 1, 2008, but this rate will be reset to 7.75% once the Fund reaches a 90% funded ratio, measured using the actuarial value of assets. (If the funded ratio later falls below 90% again, the contribution rate will not automatically return to 8.25%.)
3. Employer contributions are required on the salary of reemployed retirees.
4. Active members of the Department of Career and Technical Education are permitted to make a one-time irrevocable election to transfer to the State Public Employees Retirement System in FY 2008. Both assets and liabilities for all TFFR service will be transferred for electing employees. Transferred assets will be the actuarial present value of the member's accrued TFFR benefit, or the member's contribution account balance, if larger.

2009 Legislative Session:

1. An individual who retired before January 1, 2009, and is receiving monthly benefits is entitled to receive a supplemental payment from the fund. The supplemental payment is equal to an amount determined by taking twenty dollars multiplied by the member's number of years of service credit plus fifteen dollars multiplied by the number of years since the member's retirement as of January 1, 2009. The supplemental payment may not exceed the greater of 10% of the member's annual annuity or \$750.00. TFFR will make the supplemental payment in December 2009.
2. The employer contribution rate increases from 8.25% to 8.75% effective July 1, 2010, but this rate will be reset to 7.75% once the Fund reaches a 90% funded ratio, measured using the actuarial value of assets. (If the funded ratio later falls below 90% again, the contribution rate will not automatically return to 8.75%.)

2011 Legislative Session:

1. The employer contribution rate increases from 8.75% to 10.75% effective July 1, 2012, and increases thereafter to 12.75% effective July 1, 2014. The member contribution rate increases from 7.75% to 9.75% effective July 1, 2012, and increases thereafter to 11.75% effective July 1, 2014. Employer and member contributions will be reset to 7.75% once the Fund reaches a 90% funded ratio, measured using the actuarial value of assets.
2. For current Tier 1 members who, as of June 30, 2013, are vested (at least 3 years of service), and at least age 55, OR the sum of the member's age and service is at least 65, are considered a Tier 1 Grandfathered member. Current Tier 1 members, who will not meet this criteria as of June 30, 2013, are considered a Tier 1 Non-grandfathered member.
3. Eligibility for normal/ unreduced retirement benefits do not change for Tier 1 Grandfathered members. For Tier 1 Non-grandfathered and Tier 2 members, effective after June 30, 2013, unreduced retirement benefits start when the member reaches age 65 and is vested (3 years for Tier 1 Non-grandfathered, 5 years for Tier 2); or if earlier, when the sum of the member's age and service is at least 90, with a minimum age of 60.
4. Early retirement benefits do not change for Tier 1 Grandfathered members. For Tier 1 Non-grandfathered and Tier 2 members, effective after June 30, 2013, the normal retirement benefit will be reduced by 8% per year from the earlier of age 65 OR the age at which the sum of the member's age and service is at least 90, with a minimum age of 60.
5. Effective after June 30, 2013, all members may retire on disability after a period of at least five years of service (rather one year of service). The amount of the benefit is based on a 2% multiplier and actual service (rather than a minimum of twenty years of service in the current calculation).
6. Effective July 1, 2012, re-employed retirees are required to pay member contributions.
7. Effective August 1, 2011, beneficiary and death benefit provisions were updated, and the 60-month death payment benefit was removed.

2013 Legislative Session:

1. Employer and member contribution rates will be reset to 7.75% once the Fund reaches a 100% funded ratio (rather than the 90% funded ratio enacted with the 2011 Legislation), measured using the actuarial value of assets.
2. Various technical and administrative changes that do not have an actuarial effect on the Plan were enacted.

2015 Legislative Session:

1. Various technical and administrative changes that do not have an actuarial effect on the Plan were enacted.

2017 Legislative Session:

There were no material changes made during the 2017 legislative sessions.

Section 5: GASB Information

Exhibit 1 – Net Pension Liability

The components of the net pension liability at were as follows:

	July 1, 2018	July 1, 2017
Total pension liability	\$3,863,515,726	\$3,734,016,828
Plan fiduciary net position	<u>(2,530,657,411)</u>	<u>(2,360,491,075)</u>
Net pension liability	\$1,332,858,315	\$1,373,525,753
Plan fiduciary net position as a percentage of the total pension liability	65.5%	63.2%

The net pension liability was measured as of June 30, 2018, and is determined based on the total pension liability from the July 1, 2018, actuarial valuation.

Plan provisions. The plan provisions used in the measurement of the net pension liability are the same as those used in the actuarial valuation as of July 1, 2018.

Actuarial assumptions. The total pension liability was determined by an actuarial valuation as of July 1, 2018, using the following actuarial assumptions, applied to all periods included in the measurement:

Inflation	2.75%
Salary increases	4.25% to 14.50%, varying by service, including inflation and productivity
Investment rate of return	7.75%, net of pension plan investment expense, including inflation
Cost-of-living adjustments	None

For active and inactive members, mortality rates were based on the RP-2014 Employee Mortality Table, projected generationally using Scale MP-2014. For healthy retirees, mortality rates were based on the RP-2014 Healthy Annuitant Mortality Table set back one year, multiplied by 50% for ages under 75 and grading up to 100% by age 80, projected generationally using Scale MP-2014. For disabled retirees, mortality rates were based on the RP-2014 Disabled Mortality Table set forward four years.

The actuarial assumptions used were based on the results of an experience study dated April 30, 2015. They are the same as the assumptions used in the July 1, 2018 funding actuarial valuation.

The long-term expected rate of return on pension plan investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of arithmetic real rates of return for each major asset class included in the pension plan’s target asset allocation as of July 1, 2018 are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return*
Global Equities	58%	6.7%
Global Fixed Income	23%	1.5%
Global Real Assets	18%	5.1%
Cash Equivalents	<u>1%</u>	0.0%
Total	100%	

*As reported by the North Dakota Retirement and Investment Office.

Discount rate: The long-term expected rate of return on pension plan investments is 7.75%. The high quality tax-exempt general obligation municipal bond rate (20-Bond GO Index) as of the closest date prior to the valuation date of June 30, 2018, is 3.87%, as published by the Board of Governors of the Federal Reserve System.

The discount rate used to measure the total pension liability was 7.75% as of June 30, 2018. The projection of cash flows used to determine the discount rate assumed plan member and employer contributions will be made at rates equal to those based on this July 1, 2018, Actuarial Valuation Report. For this purpose, only employer contributions that are intended to fund benefits of current plan members and their beneficiaries are included. Projected employer contributions that are intended to fund the service costs of future plan members and their beneficiaries, as well as projected contributions from future plan members, are not included. Based on those assumptions, the pension plan’s fiduciary net position was projected to be available to make all projected future benefit payments of current plan members as of June 30, 2018. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability as of June 30, 2018.

Sensitivity of the net pension liability to changes in the discount rate. The following presents the net pension liability, calculated using the discount rate of 7.75%, as well as what the net pension liability would be if it were calculated using a discount rate that is one-percentage-point lower (6.75%) or one-percentage-point higher (8.75%) than the current rate:

	1% Decrease (6.75%)	Current Discount (7.75%)	1% Increase (8.75%)
Net pension liability as of June 30, 2015	\$1,728,392,470	\$1,307,855,182	\$957,135,967
Net pension liability as of June 30, 2016	\$1,900,291,033	\$1,465,058,563	\$1,102,551,032
Net pension liability as of June 30, 2017	\$1,826,126,843	\$1,373,525,753	\$996,748,988
Net pension liability as of June 30, 2018	\$1,799,744,383	\$1,332,858,315	\$944,554,161

Exhibit 2 – Schedules of Changes in Net Pension Liability

	2018	2017
Total pension liability		
• Service cost	\$78,041,335	\$75,476,063
• Interest	287,375,333	276,412,402
• Change of benefit terms	0	0
• Differences between expected and actual experience	(27,939,071)	(10,748,944)
• Changes of assumptions	0	0
• Benefit payments, including refunds of employee contributions	(207,978,699)	(196,516,544)
Net change in total pension liability	\$129,498,898	\$144,622,977
Total pension liability – beginning	<u>3,734,016,828</u>	<u>3,589,393,851</u>
Total pension liability – ending (a)	<u>\$3,863,515,726</u>	<u>\$3,734,016,828</u>
Plan fiduciary net position		
• Contributions – employer	\$86,675,715	\$86,058,868
• Contributions – employee	79,877,611	79,309,153
• Contributions – purchased service credit	2,181,106	2,553,200
• Contributions – other	194,028	235,890
• Net investment income	211,345,369	266,688,651
• Benefit payments, including refunds of employee contributions	(207,978,699)	(196,516,544)
• Administrative expense	(2,128,794)	(2,173,431)
• Other	0	0
Net change in plan fiduciary net position	170,166,336	236,155,787
Plan fiduciary net position – beginning	<u>2,360,491,075</u>	<u>2,124,335,288</u>
Plan fiduciary net position – ending (b)	<u>\$2,530,657,411</u>	<u>\$2,360,491,075</u>
Net pension liability – ending (a) – (b)	<u>\$1,332,858,315</u>	<u>\$1,373,525,753</u>
Plan fiduciary net position as a percentage of the total pension liability	65.5%	63.2%
Covered employee payroll	\$679,809,385	\$674,971,342
Net pension liability as percentage of covered employee payroll	196.1%	203.5%

Exhibit 3 – Schedule of Employer Contributions

Fiscal Year Ended June 30	Actuarially Determined Contributions	Contributions in Relation to the Actuarially Determined Contributions	Contribution Deficiency (Excess)	Covered-Employee Payroll	Contributions as a Percentage of Covered Employee Payroll
2013	\$52,396,153	\$59,300,720	\$(6,904,567)	\$551,655,590	10.75%
2014	59,513,485	62,355,146	(2,841,661)	580,053,235	10.75%
2015	71,167,632	78,422,098	(7,254,466)	615,104,860	12.75%
2016	84,724,122	82,839,932	1,884,190	649,724,868	12.75%
2017	89,231,211	86,058,868	3,172,343	674,971,342	12.75%
2018	88,307,239	86,675,715	1,631,524	679,809,385	12.75%

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North Dakota Teachers' Fund for Retirement

Actuarial Valuation as of July 1, 2018

October 25, 2018

Presented By:

*Kim Nicholl, FSA, MAAA, EA
Senior Vice President and Actuary*

*Tanya Dybal, FSA, MAAA, EA
Actuary*

This document has been prepared by Segal Consulting for the benefit of the Board of Trustees of the North Dakota Teachers' Fund for Retirement and is not complete without the presentation provided at the October 25, 2018 meeting of the Board of Trustees.

Discussion Topics – Valuation and Projections



**Segal
Consulting**

- **Overview of Valuation Process**
- **Valuation Results and Projections**
- **Actuarial Issues and Board Education**
- **Bill Drafts #20 and #126**

Purposes of the Actuarial Valuation

- Report the Fund's actuarial assets
- Calculate the Fund's liabilities
- Determine the funding policy Actuarially Determined Contribution (ADC) for fiscal year 2019 and compare to the statutory employer contribution
- Determine the effective amortization period
- Explore the reasons why the current valuation differs from the prior valuation
- Provide information for annual financial statements

The Valuation Process

Input

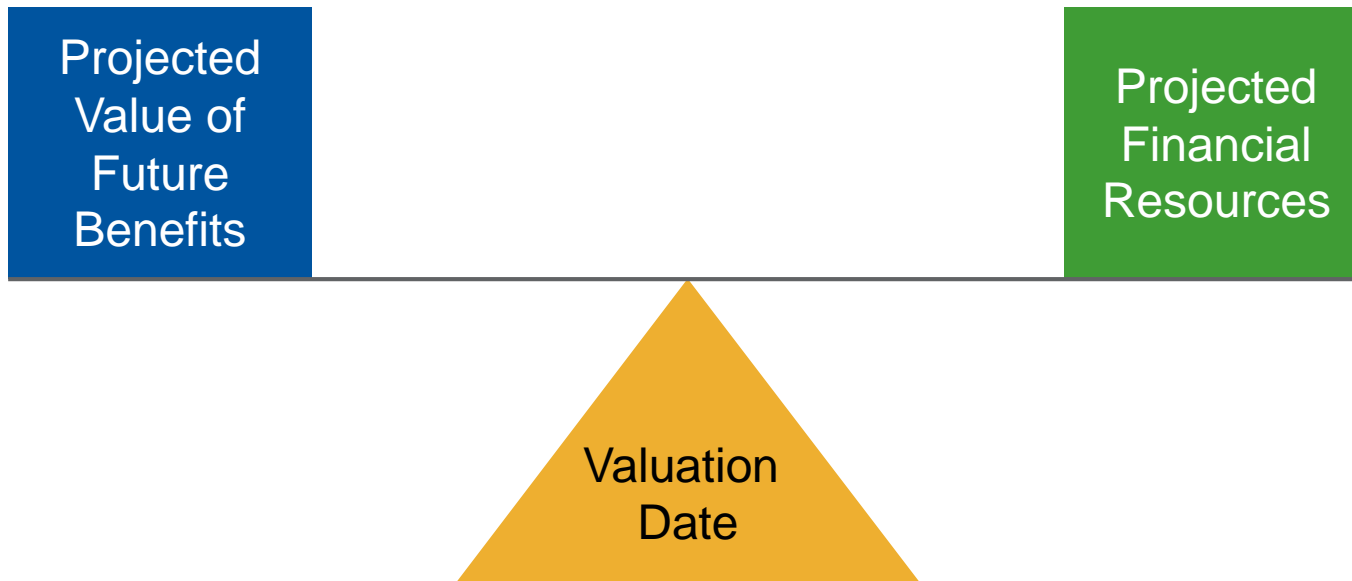
Member Data
Asset Information
Benefit Provisions
Actuarial Assumptions
Funding Methodology



Results

Actuarial Value of Assets
Normal Cost and Actuarial Liability
Unfunded Liability and Funded Ratio
Funding Period
Actuarially Determined Employer
Contribution
Accounting Results

Actuarial Balance



Over the life of a pension system,

$\text{Benefits} + \text{Expenses} = \text{Contributions} + \text{Investment Return}$

$\text{Contributions} = \text{Benefits} + \text{Expenses} - \text{Investment Return}$

Actuarially Determined Contribution vs. Funding Period

Actuarially Determined Contribution (ADC)

- Equal to the normal cost plus amortization of the unfunded actuarial accrued liability (UAAL)
- The funding policy components:
 - Asset valuation method
 - Cost method
 - Amortization period

Funding Period

- Number of years that the UAAL is expected to be amortized based upon the fixed member and employer contribution rates
- Funding period is compared to the ADC's amortization period to assess the progress toward amortizing the unfunded accrued liability

The employer contribution rate is compared to the ADC as a measure of the adequacy of the employer (and member) contribution rates.

Actuarial Assumptions

Two types:

Demographic

- Retirement
- Disability
- Death in active service
- Withdrawal
- Death after retirement

Economic

- Inflation – 2.75%
- Investment return – 7.75%
- Salary increases – 14.50% for new members to 4.25% for members with 25+ years
- Payroll growth – 3.25%

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

Actuarial Methods

Asset Valuation Method (Actuarial Assets)

- Investment gains and losses recognized over a number of years
- TFFR uses a five-year smoothing method
- A 20% market value corridor is applied – actuarial value of assets must fall within 80% to 120% of market value

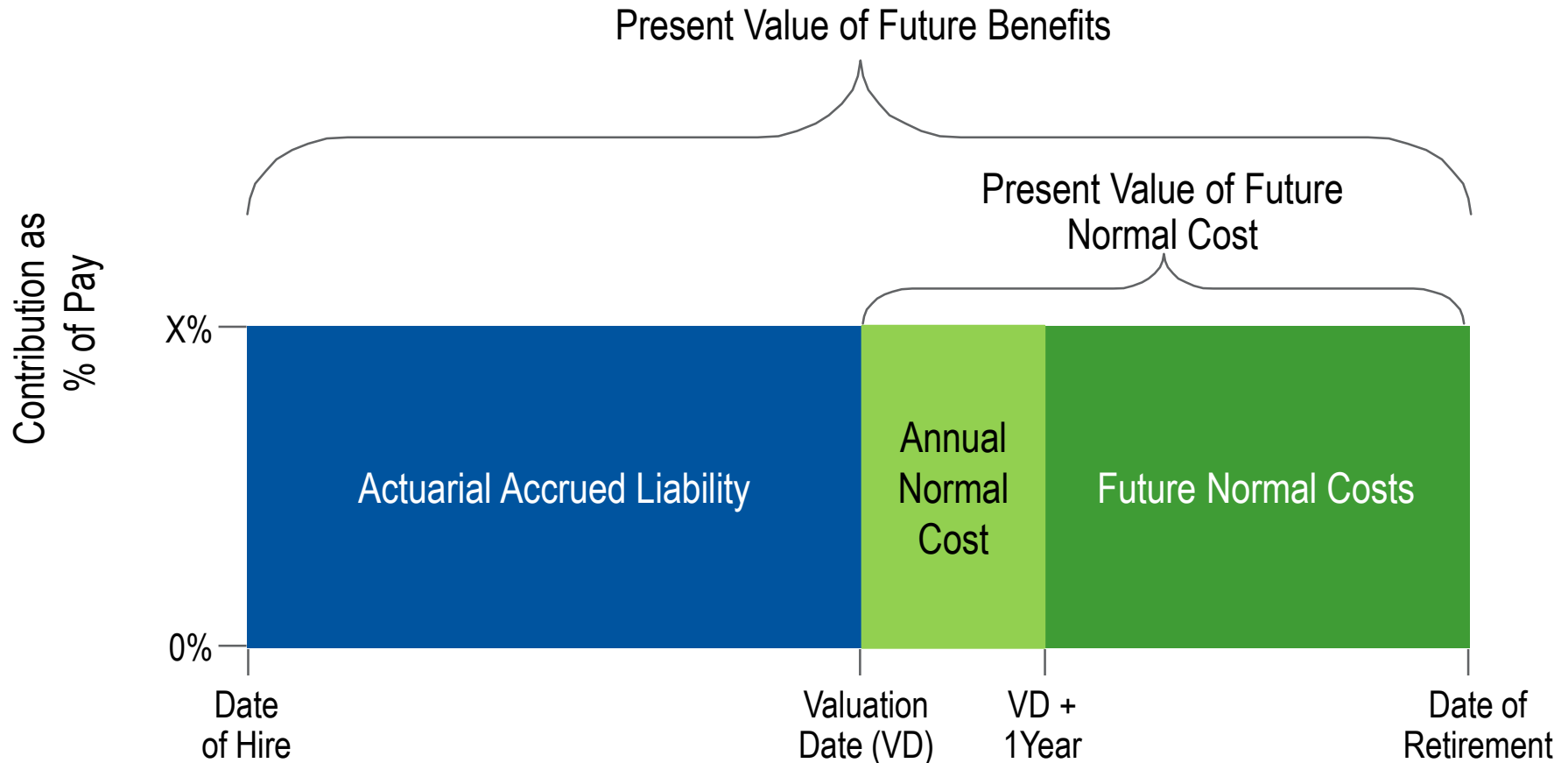
Cost Method

- Allocation of liability to past and future service
- TFFR uses the entry age normal cost method
 - Allocates cost of member's retirement benefit over expected career as a level % of salary
 - Most common cost method among public sector retirement systems
 - Required by GASB for financial statement reporting purposes

Amortization Method

- Relies on two inputs:
 - Number of years to amortize the UAL
 - Level dollar or level percentage of payroll approach
- TFFR's amortization method:
 - 30-year closed period that began July 1, 2013
 - 25 years remaining
 - Level percentage of payroll

Funding Process



$$\text{Actuarial Accrued Liability} - \text{Assets} = \text{Unfunded Actuarial Accrued Liability}$$

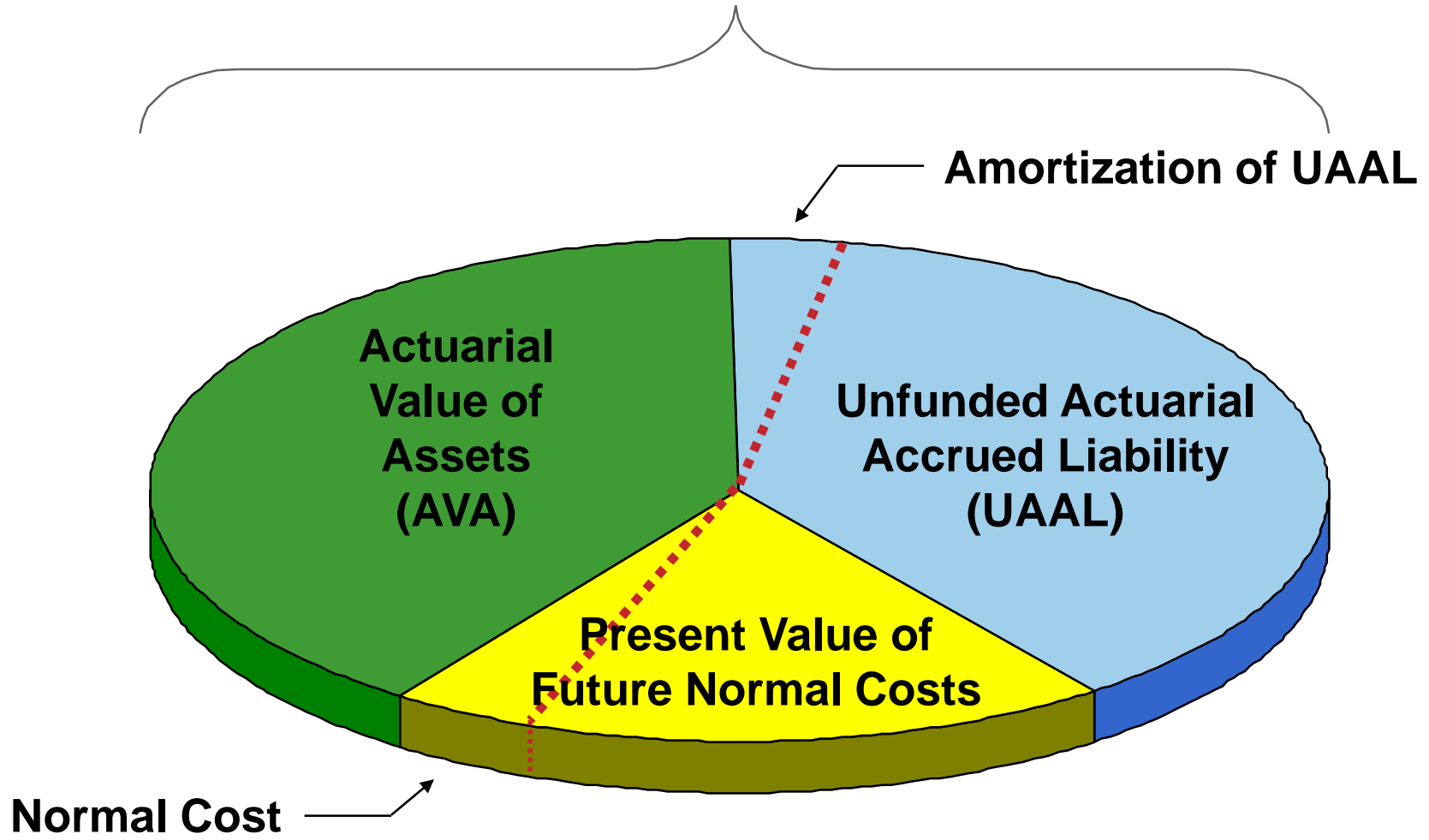
Entry Age Normal Cost Method

Allocates cost between past and future service

- **Normal Cost:** Cost of annual benefit accrual as a level percent of salary
- **Actuarial Accrued Liability:** Represents accumulated value of past normal costs (or difference between total cost and future normal costs)
- **Unfunded Actuarial Accrued Liability:** Actuarial accrued liability minus actuarial value of assets

Actuarially Determined Contribution

Present Value of Future Benefits



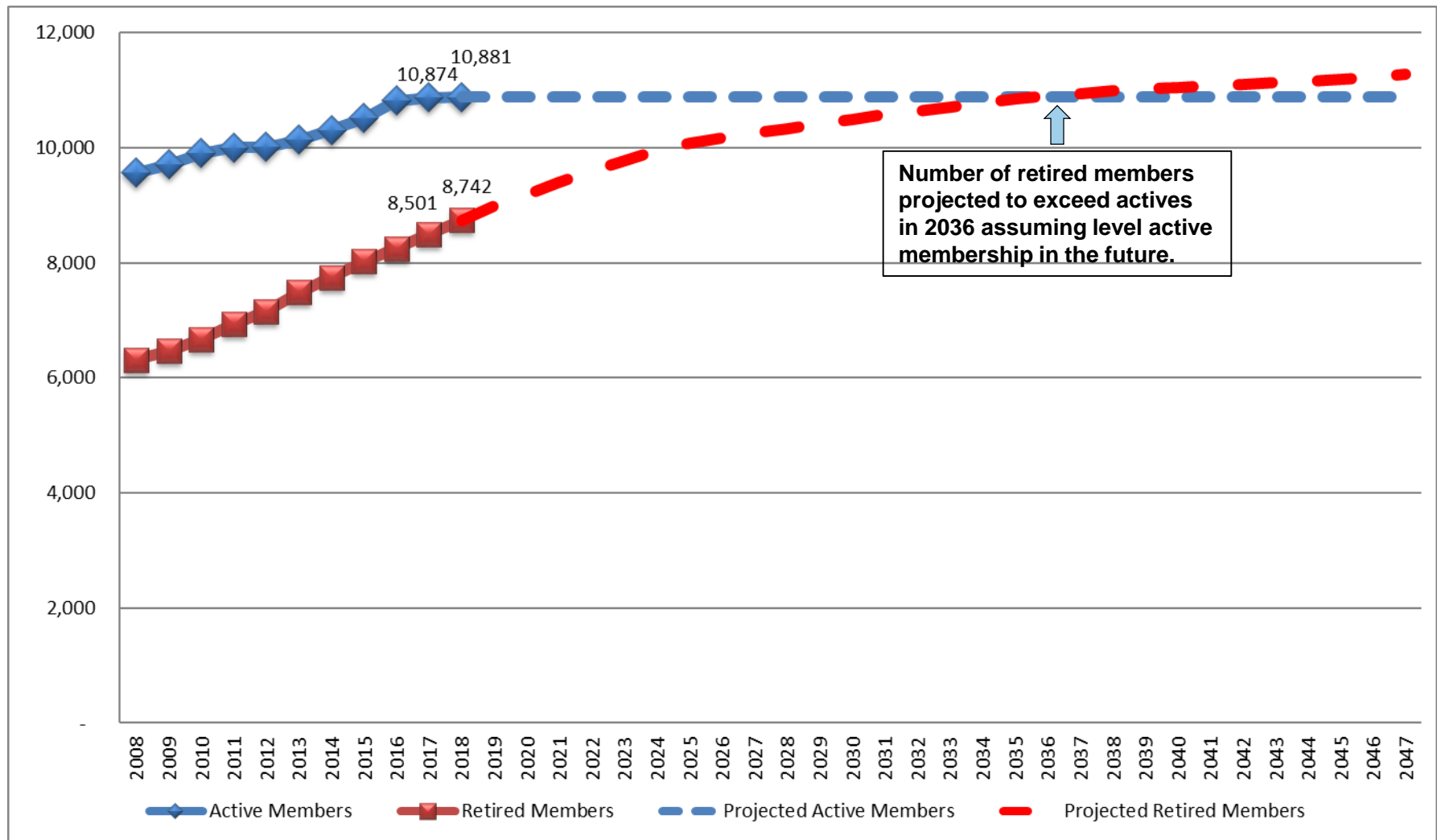
Summary of Valuation Highlights

- Market value of assets returned 9.0% for year ending 6/30/18 (Segal calculation)
 - Gradual recognition of deferred losses resulted in 7.9% return on actuarial value of assets
- Net impact on funded ratio was an increase from 63.7% (as of 7/1/2017) to 65.4% (as of 7/1/2018)
- Effective amortization period decreased from 27 years to 26 years
- Net impact on actuarially determined contribution (ADC) was a decrease from 12.99% of payroll to 12.94% of payroll
 - Based on the employer contribution rate of 12.75%, the contribution deficiency has decreased from 0.24% of payroll to 0.19% of payroll
- GASB Net Pension Liability decreased from \$1.37 billion as of 6/30/17, to \$1.33 billion as of 6/30/18

Membership

	2018	2017	Change
Active			
• Number	10,881	10,874	+0.1%
• Payroll (annualized)	\$653.5 mil	\$650.1 mil	0.5%
• Average Age	41.9 years	42.1 years	- 0.2 years
• Average Service	11.8 years	11.9 years	- 0.1 years
Retirees and Beneficiaries			
• Number	8,743	8,501	+2.8%
• Total Annual Benefits	\$211.4 mil	\$198.9 mil	+6.3%
• Average Monthly Benefit	\$2,015	\$1,950	+3.3%

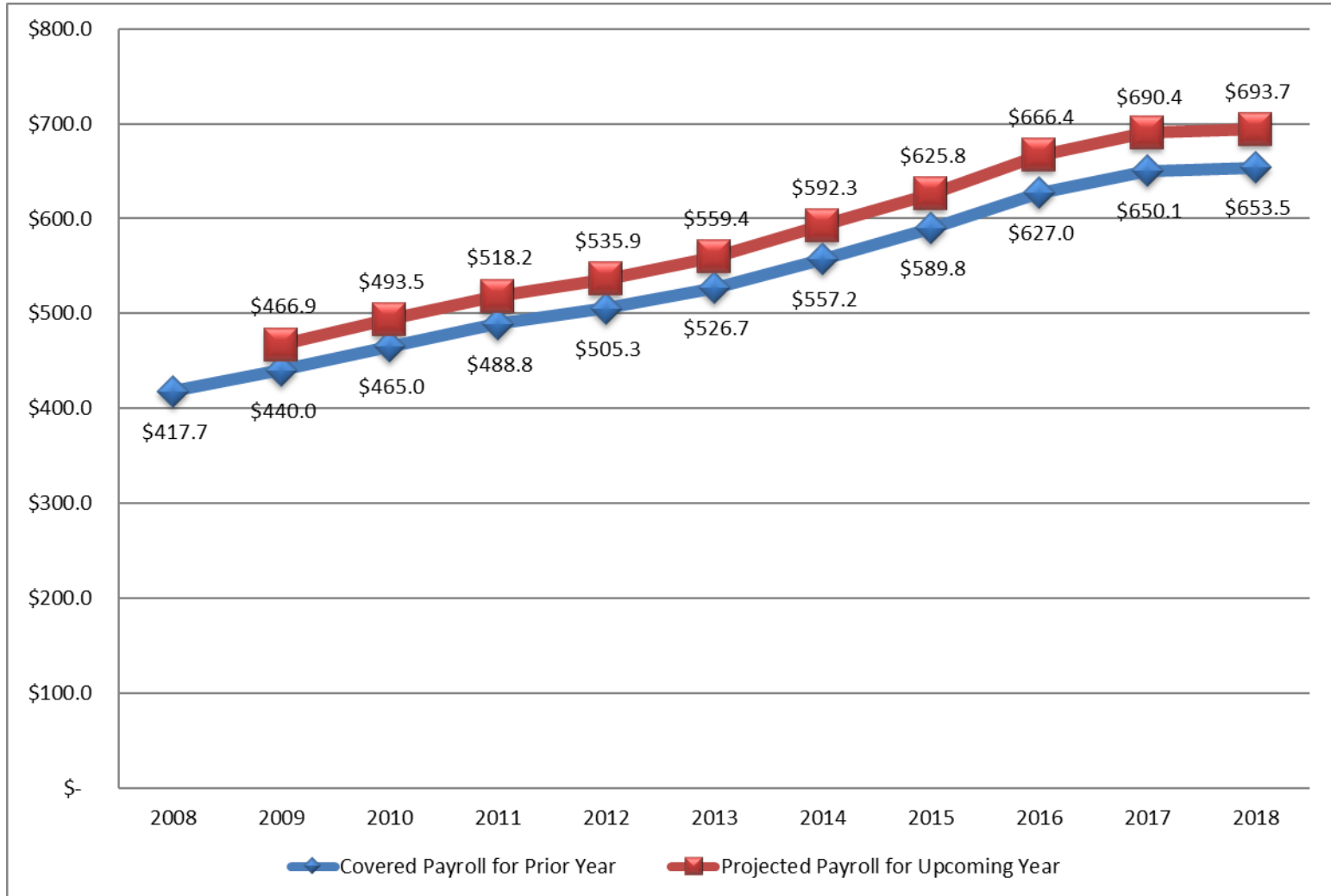
Active and Retired Membership



Since 2008, number of retirees and beneficiaries has increased 3.3% per year on average.

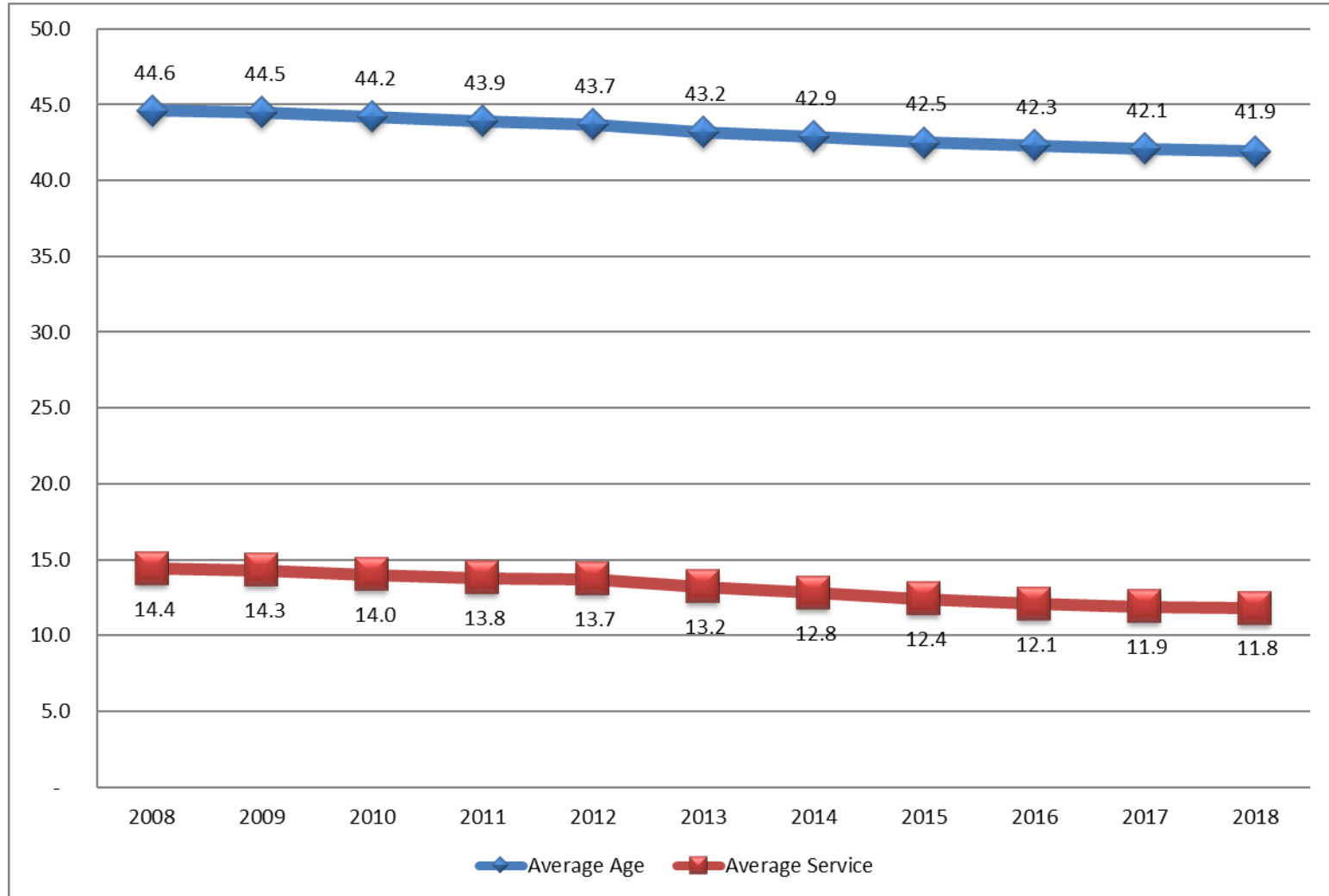
Active Payroll

\$ Millions

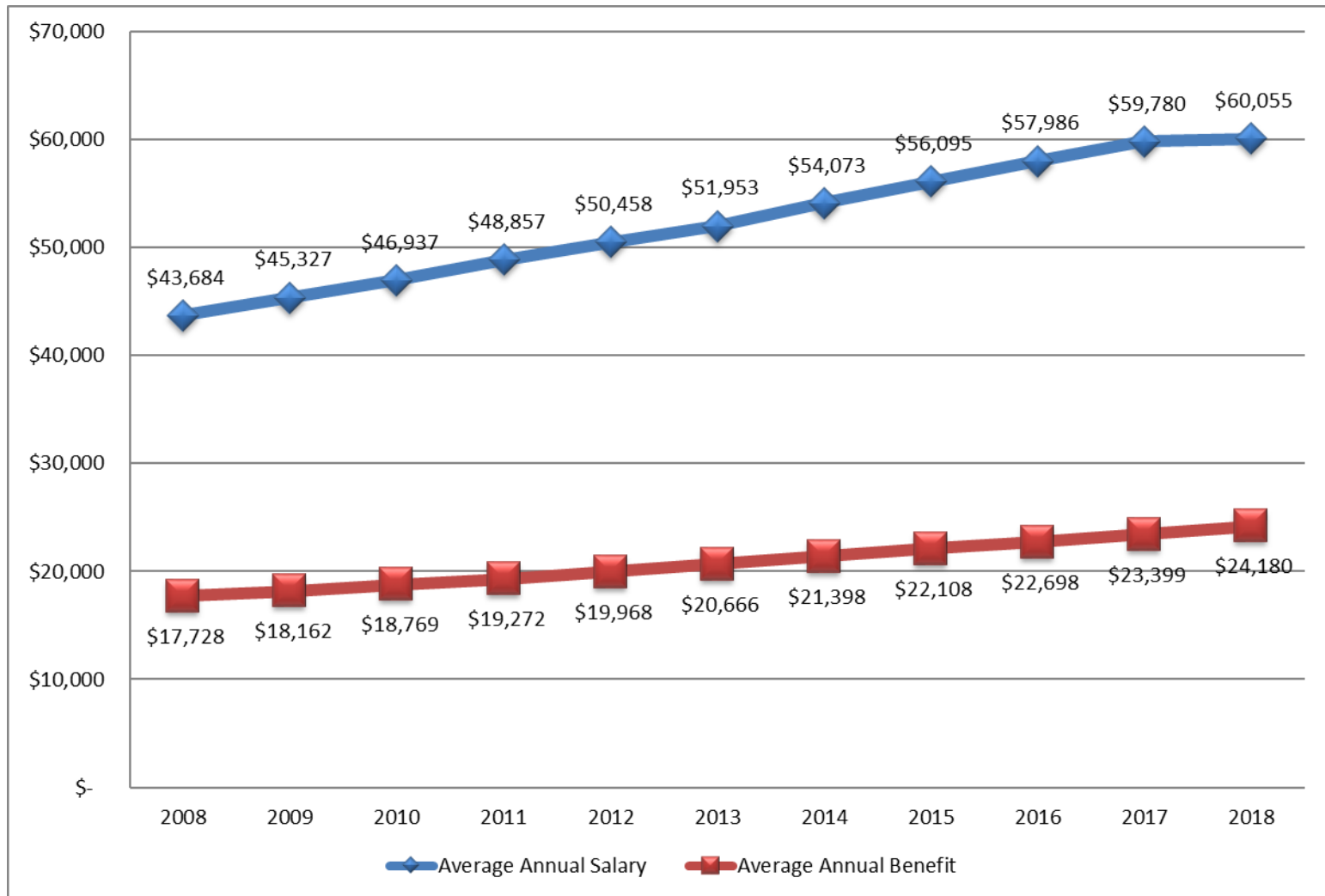


Since 2008, active payroll has increased, on average, 4.6% per year.

Average Age and Service of Active Members



Average Salary and Average Benefit



Since 2008, average salary and average annual benefit has increased, on average, 3.2% per year.

Assets

- The market value of assets increased from \$2.36 billion (as of 6/30/17) to \$2.53 billion (as of 6/30/18)
 - Segal determined the investment return was 9.03%, net of investment expenses
- The actuarial value of assets increased from \$2.38 billion (as of 6/30/17) to \$2.53 billion (as of 6/30/18)
 - Investment return of 7.94%, net of investment expenses
 - Compared to the return assumption of 7.75%
 - Actuarial value is 99.8% of market
 - There is a total of \$5 million of deferred net investment gains that will be recognized in future years
- The average annual return on market assets
 - 10-year average is 5.5%
 - 20-year average is 5.9%
 - 30-year average is 7.8%
- The average annual return on actuarial assets
 - 10-year average is 4.8%
 - 20-year average is 6.3%
 - 30-year average is 7.2%

Market Value of Assets (\$ in millions)

	Fiscal Year Ending June 30, 2018	Fiscal Year Ending June 30, 2017
Beginning of Year	\$2,360	\$2,124
Contributions:		
• Employer	87	86
• Member	80	79
• Service Purchases	<u>2</u>	<u>3</u>
• Total	169	168
Benefits and Refunds	(210)	(199)
Investment Income (net)	211	267
End of Year	\$2,531	\$2,360
Rate of Return	9.03%	12.64%

Note: numbers may not add due to rounding

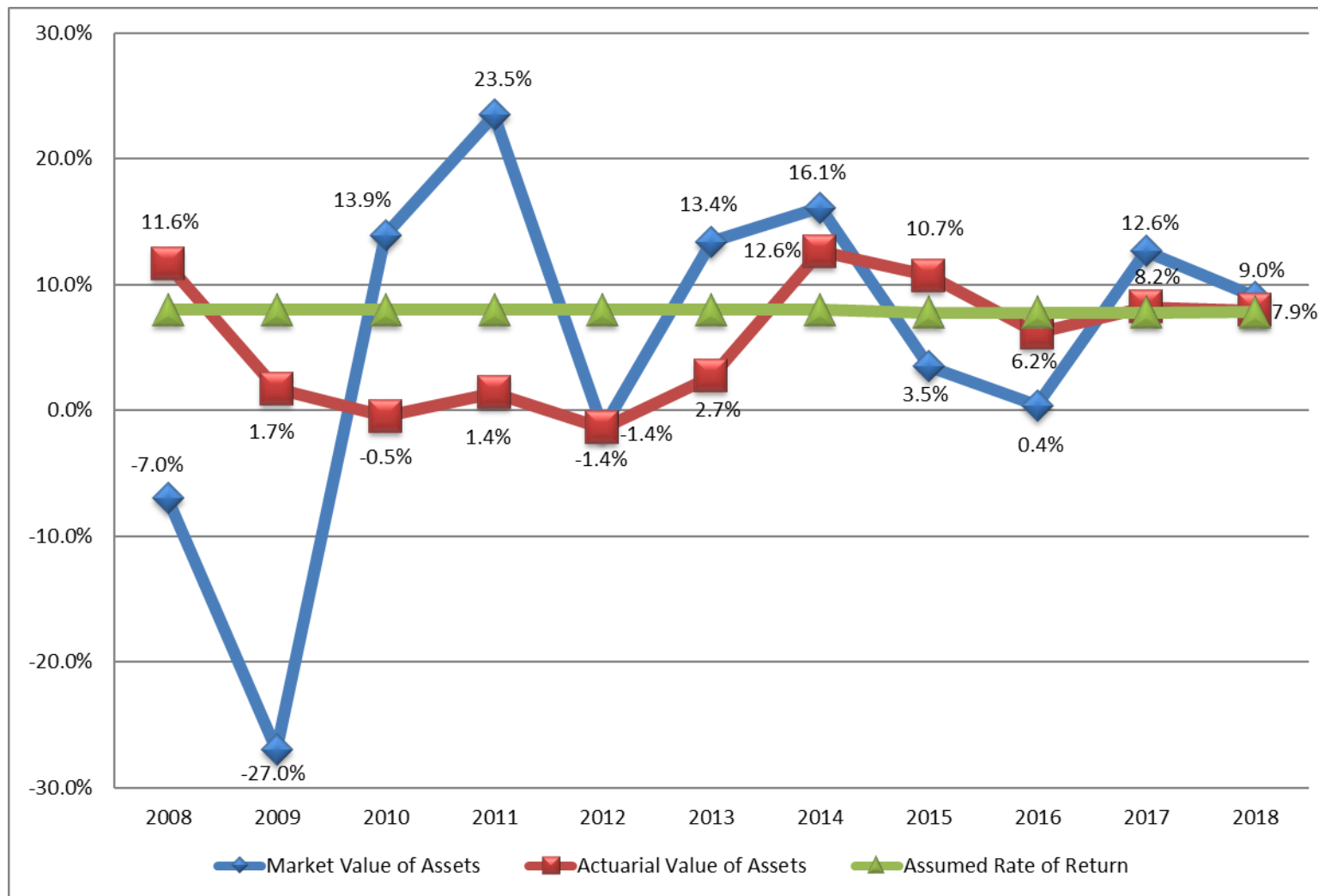
Actuarial Value of Assets (\$ in millions)

1. Market Value of Assets as of June 30, 2017	\$2,360
2. Cash Flow Items for FYE June 30, 2018	(41)
3. Expected Return	<u>181</u>
4. Expected Market Value of Assets (1) + (2) + (3)	\$2,501
5. Actual Market Value of Assets on June 30, 2018	2,531
6. Excess/(Shortfall) for FYE June 30, 2018 (5) – (4)	30
Excess/(Shortfall) Returns:	

Year	Initial Amount	Deferral %	Unrecognized Amount
2018	\$30	80%	\$24
2017	103	60%	62
2016	(157)	40%	(63)
2015	(93)	20%	(19)
2014	147	0%	<u>0</u>
7. Total			\$5
8. Actuarial Value of Assets as of June 30, 2018 (5) - (7)			\$2,526
Actuarial Value of Assets as a % of Market Value of Assets			99.8%

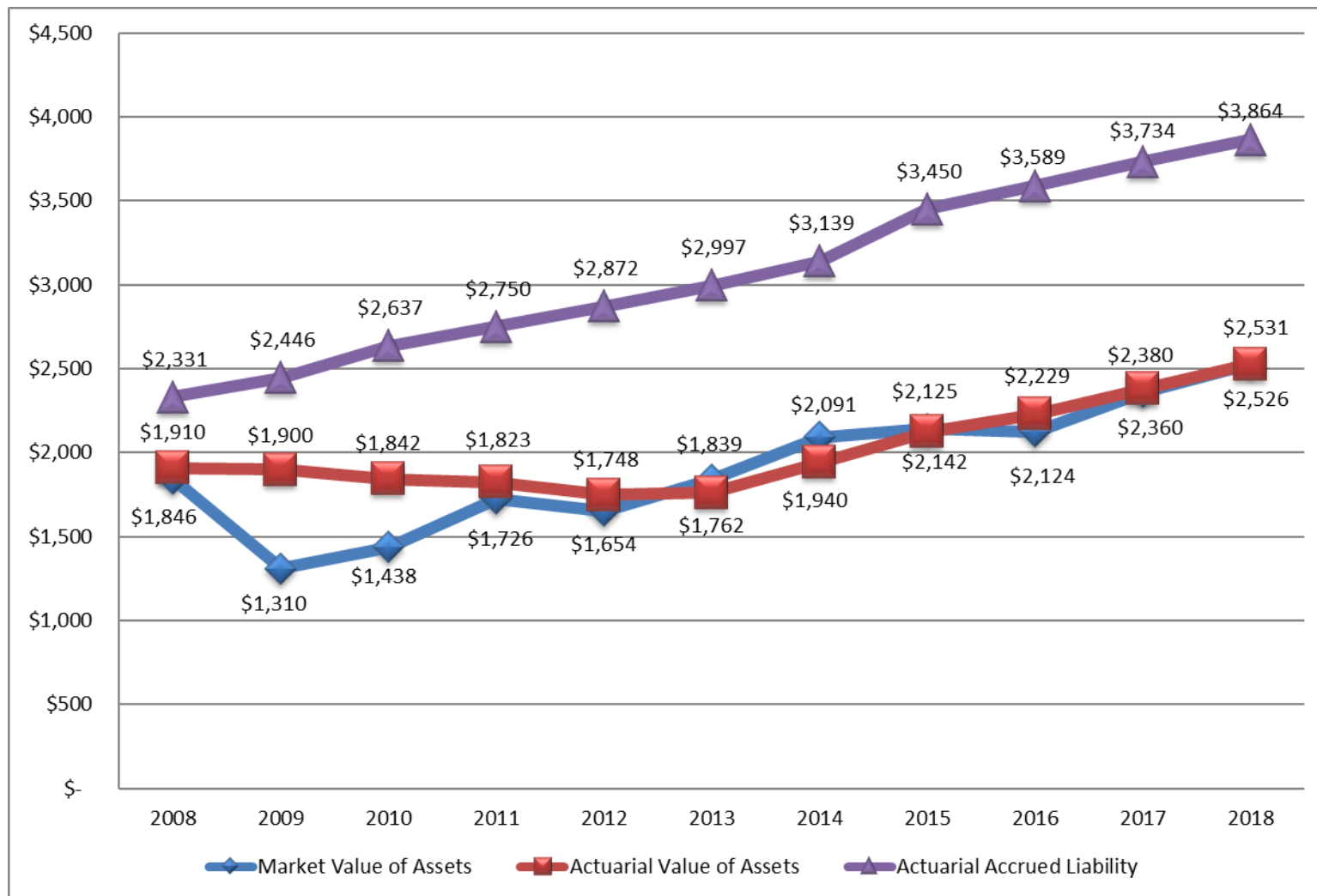
Note: numbers may not add due to rounding

Asset Returns



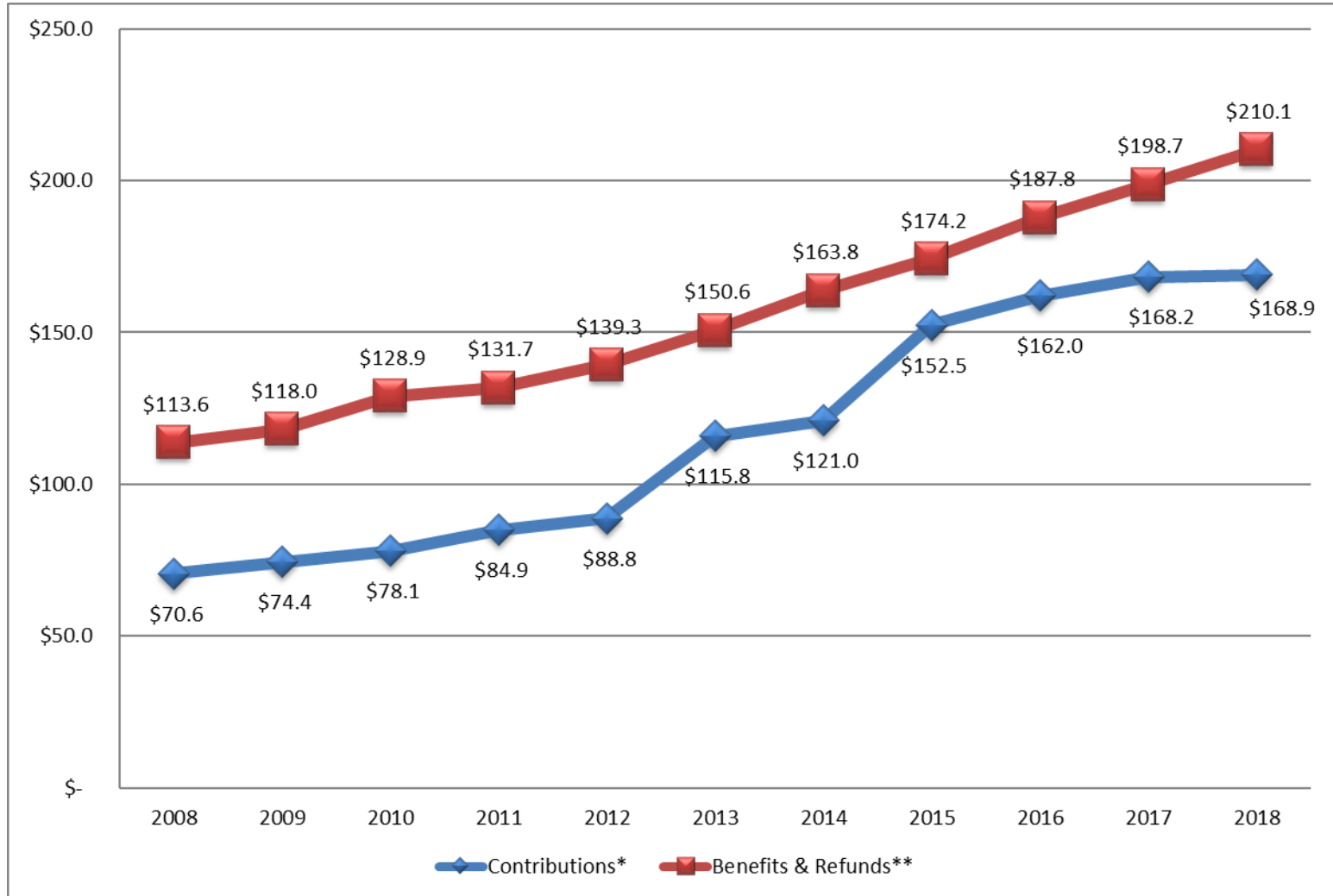
Market and Actuarial Values of Assets Compared to Actuarial Accrued Liability

\$ Millions



Contributions vs. Benefits and Refunds

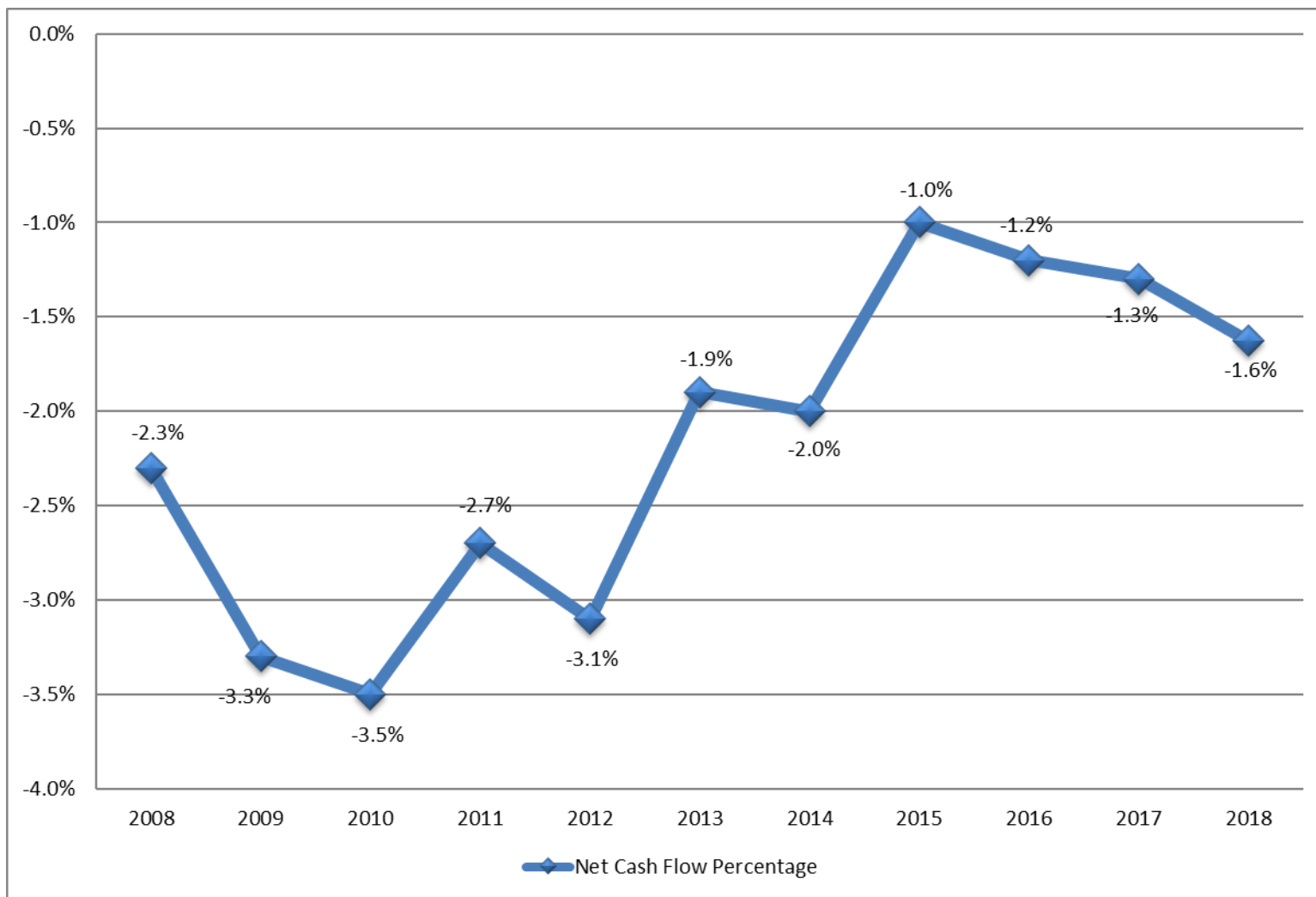
\$ Millions



* Includes member and employer contributions, and service purchases

** Includes administrative expenses

Net Cash Flow as a % of Market Value



Valuation Results (\$ in millions)

	July 1, 2018	July 1, 2017
Actuarial Accrued Liability:		
• Active Members	\$1,538	\$1,545
• Inactive Members	104	96
• Retirees and Beneficiaries	<u>2,222</u>	<u>2,093</u>
Total	\$3,864	\$3,734
Actuarial Assets	<u>2,526</u>	<u>2,380</u>
Unfunded Accrued Liability	\$1,337	\$1,354
Funded Ratio	65.4%	63.7%

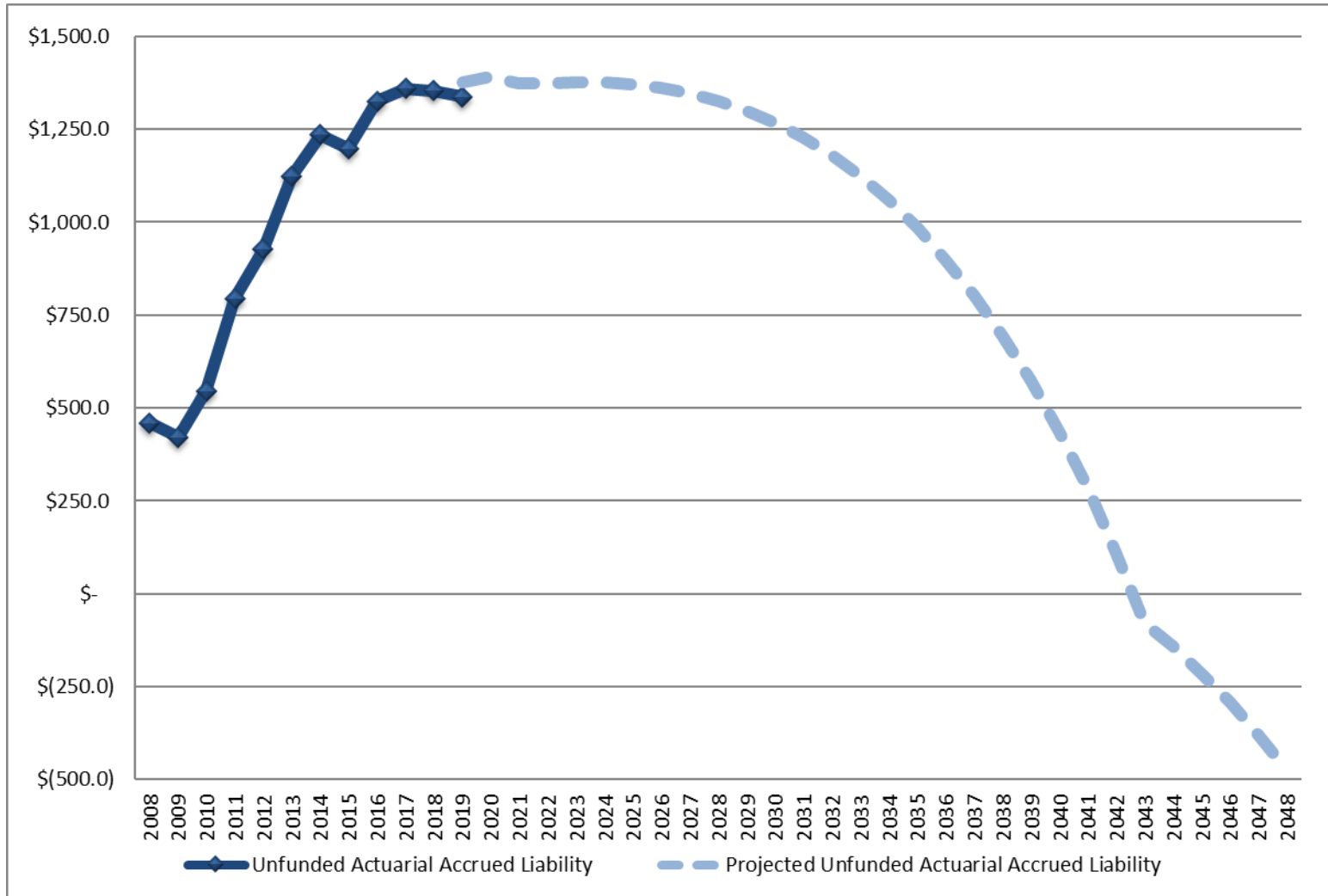
Note: numbers may not add due to rounding

Actuarially Determined Contribution

	For the Year Beginning	
	July 1, 2018	July 1, 2017
Normal Cost Rate	11.95%	12.06%
Member Rate	<u>11.75%</u>	<u>11.75%</u>
Employer Normal Cost Rate	0.20%	0.31%
Amortization of UAAL	<u>12.74%</u>	<u>12.69%</u>
Actuarially Determined Contribution	12.94%	12.99%
Statutory Employer Rate	12.75%	12.75%
Contribution Sufficiency/(Deficiency)	(0.19%)	(0.24%)

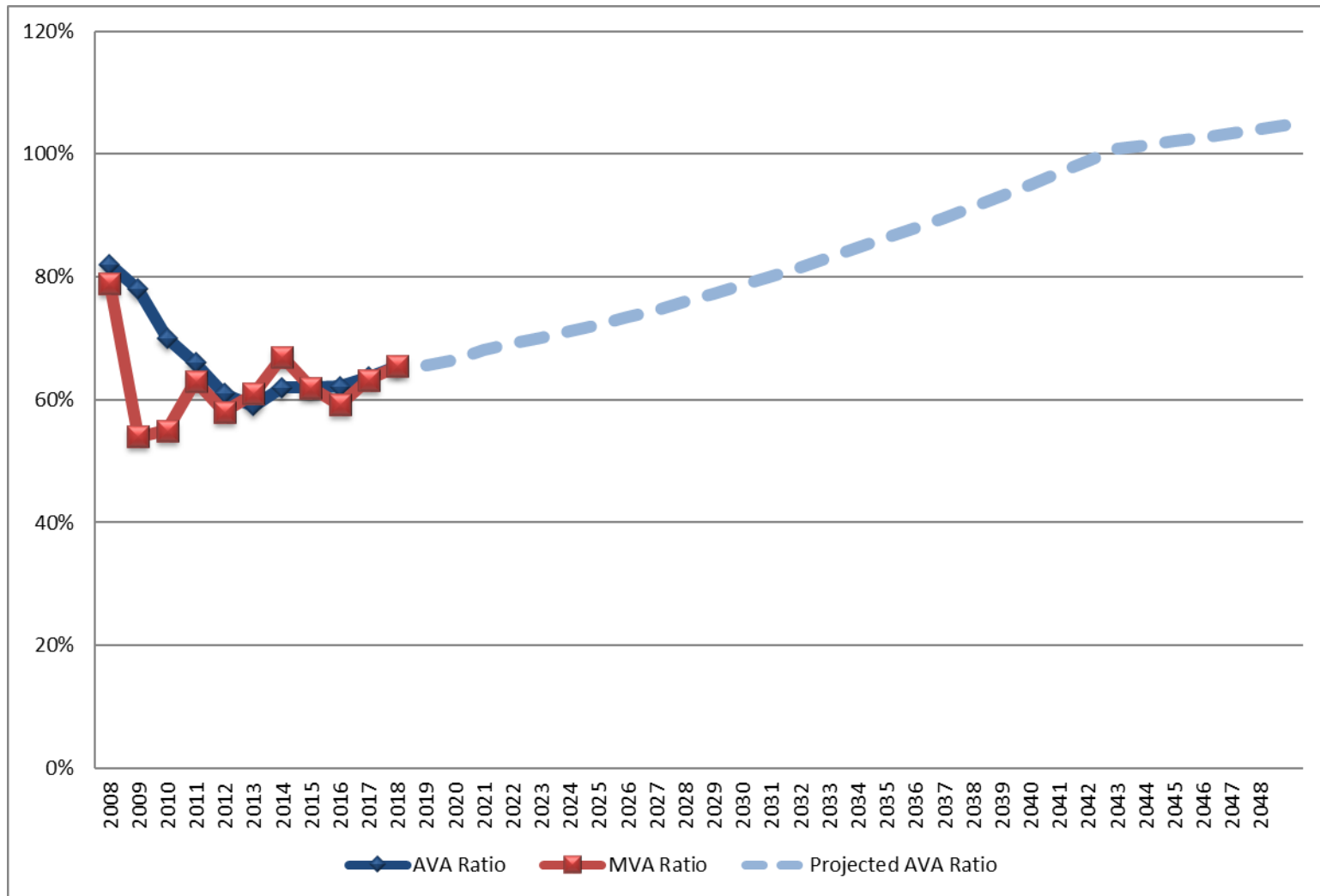
Unfunded Actuarial Accrued Liability

\$ Millions



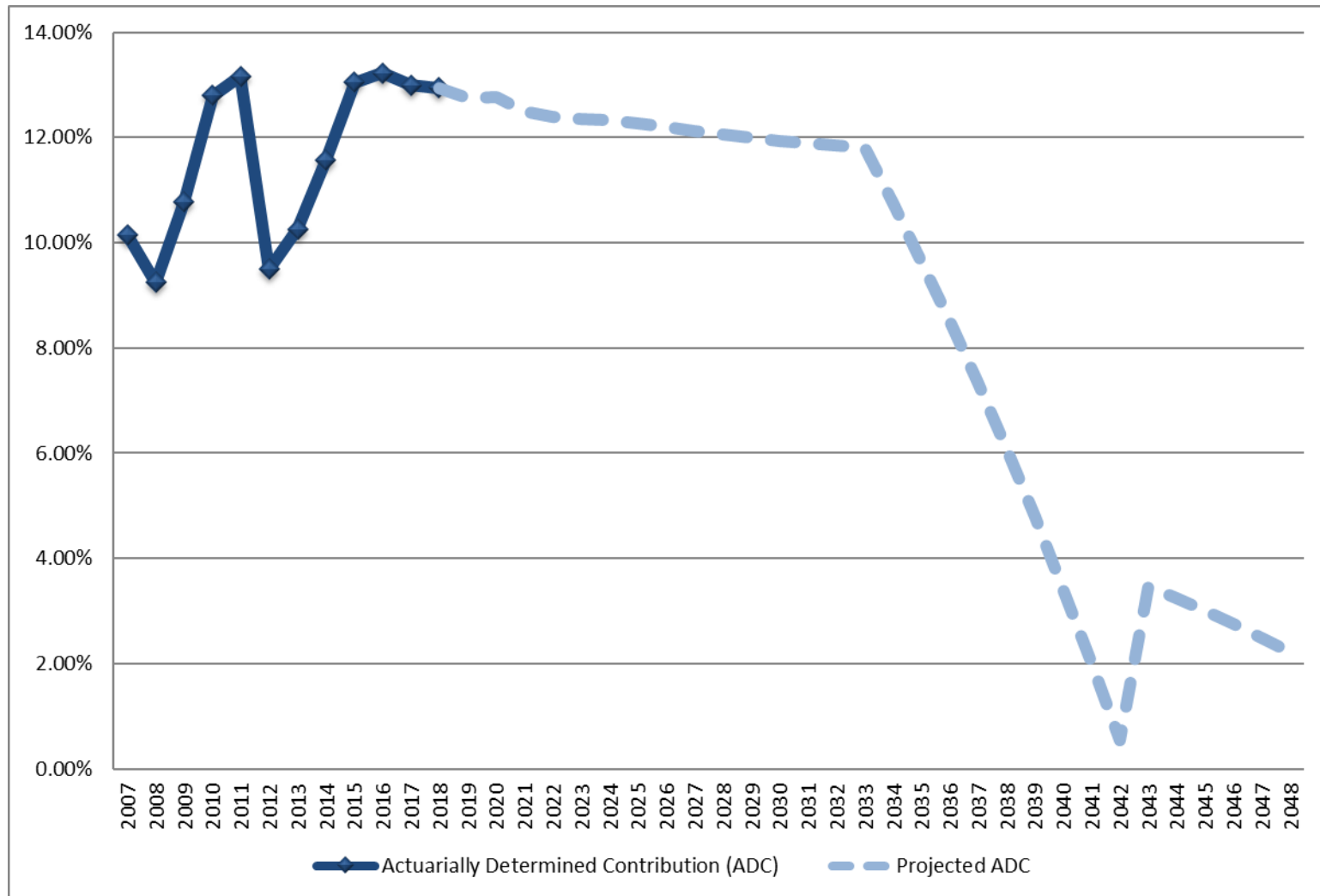
Projection based on all assumptions, including 7.75% investment return, realized as expected

Funded Ratio



Projection based on all assumptions, including 7.75% investment return, realized as expected

Actuarially Determined Contribution (ADC)



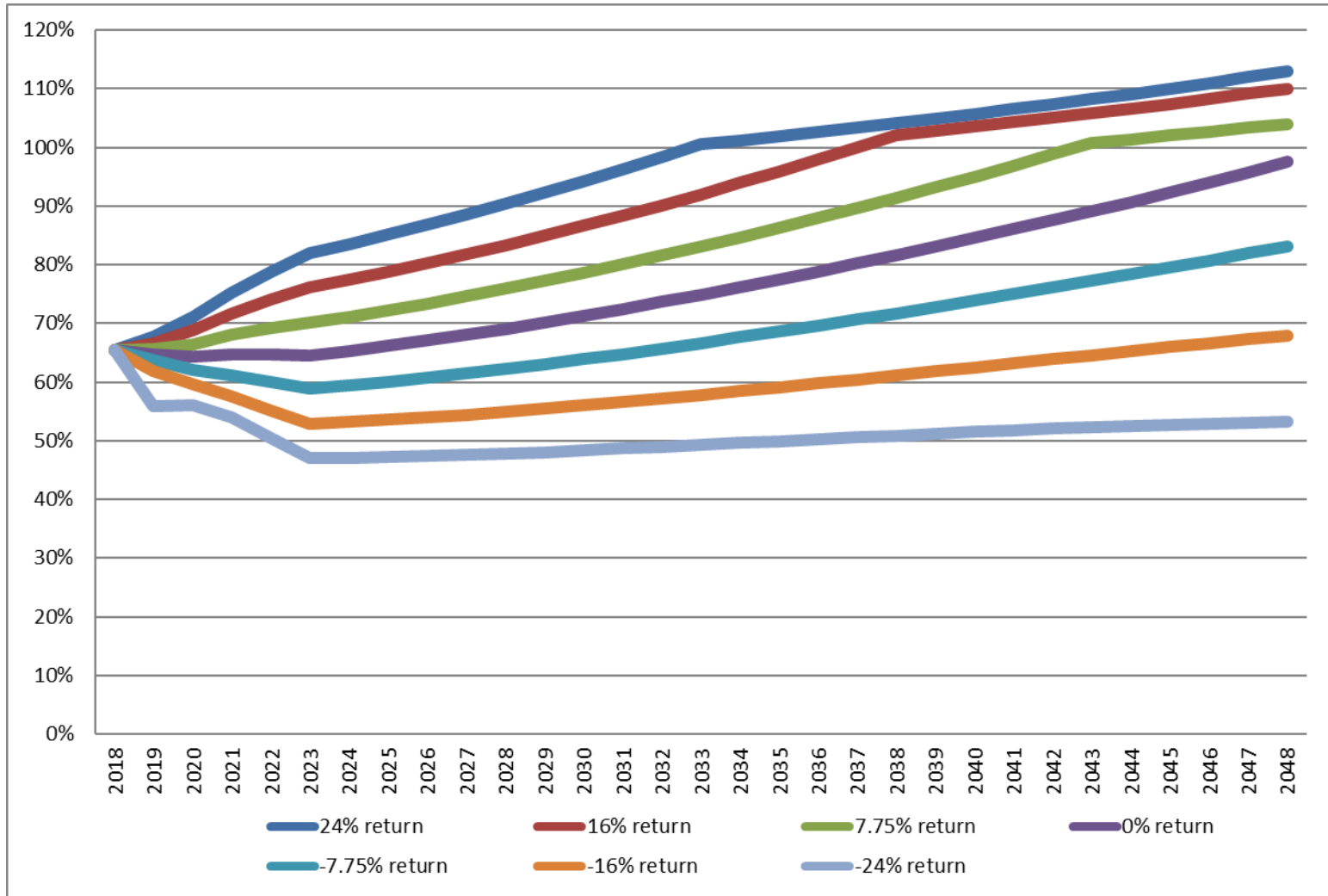
- For 2007 - 2013, the calculation of the ADC was based on a 30-year open level percentage of payroll amortization.
- Beginning in 2013, the period is 30-year closed. In 2033, when the remaining period reaches 10 years, it is assumed to operate as 10-year open
- 2012 and 2013 reflect the actuarial present value of contribution increases effective July 1, 2014.

Projection based on all assumptions, including 7.75% investment return, realized as expected

Sensitivity Projections

- Projections of estimated funded ratios for 30 years
 - Based on FY19 investment return scenarios ranging from -24% to +24%
 - Assumes Fund earns 7.75% per year in FY20 and each year thereafter
 - Additional projections assuming Fund earns 6.75% or 8.75% per year every year
 - Administrative expenses increase by 2.75% each year
 - All other experience is assumed to emerge as expected
- Includes contribution rates from HB 1134
 - Member rate is 11.75%
 - Employer rate is 12.75%
 - Member and Employer Contribution rates “sunset” back to 7.75% once the funded ratio reaches 100% (based on actuarial assets)

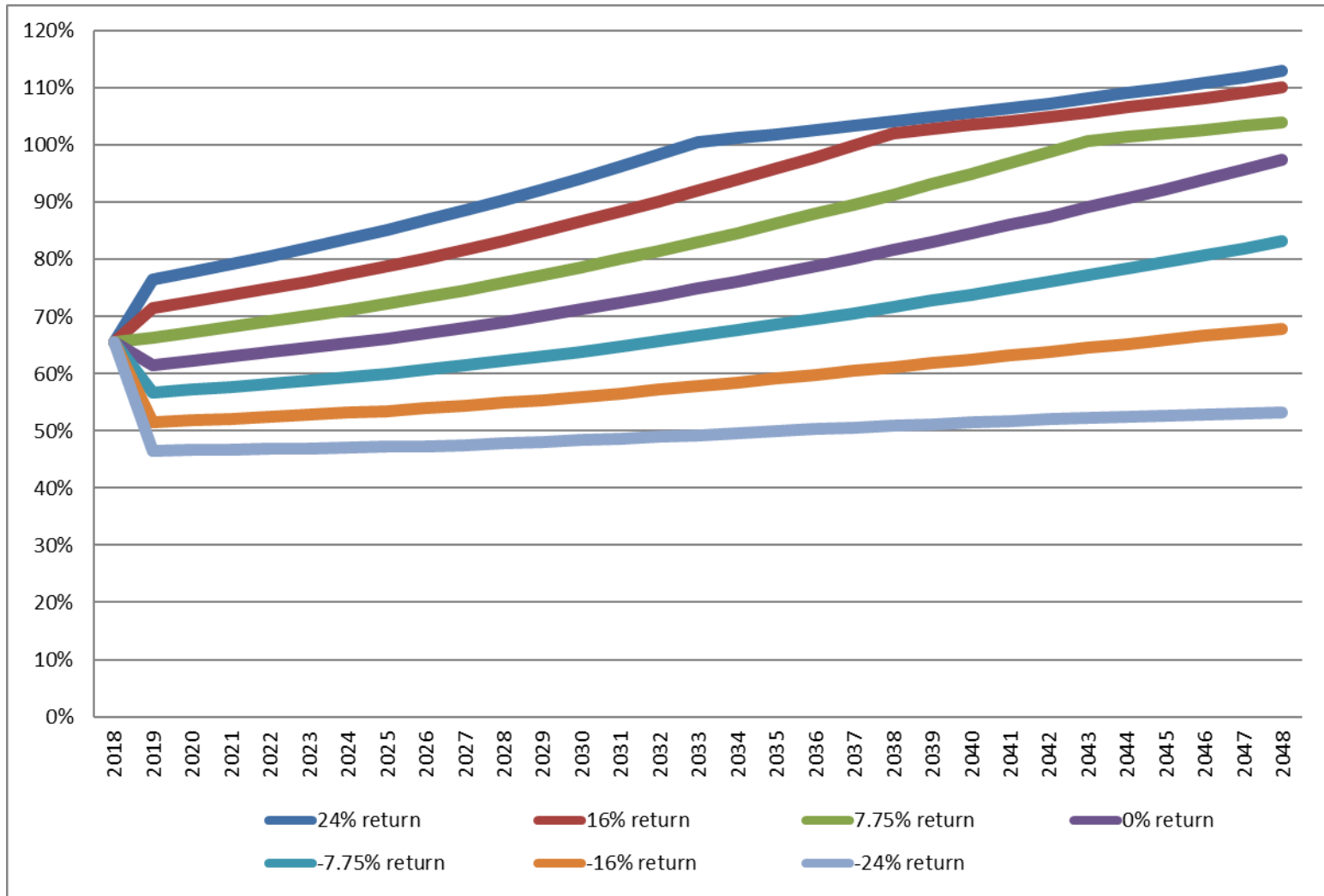
Projected Funded Ratios (AVA Basis)



Projected Funded Ratios (AVA Basis)

Valuation Year	24% for FY2019	16% for FY2019	7.75% for FY2019	0% for FY2019	-7.75% for FY2019	-16% for FY2019	-24% for FY2019
2018	65%	65%	65%	65%	65%	65%	65%
2019	68%	67%	66%	65%	64%	62%	56%
2020	71%	69%	66%	64%	62%	60%	56%
2021	75%	72%	68%	65%	61%	58%	54%
2022	79%	74%	69%	65%	60%	55%	50%
2023	82%	76%	70%	65%	59%	53%	47%
2028	90%	83%	76%	69%	62%	55%	48%
2033	101%	92%	83%	75%	67%	58%	49%
2038	104%	102%	91%	82%	72%	61%	51%
2043	108%	106%	101%	89%	77%	65%	52%
2048	113%	110%	104%	97%	83%	68%	53%

Projected Funded Ratios (MVA Basis)



Projected Funded Ratios (MVA Basis)

Valuation Year	24% for FY2019	16% for FY2019	7.75% for FY2019	0% for FY2019	-7.75% for FY2019	-16% for FY2019	-24% for FY2019
2018	66%	66%	66%	66%	66%	66%	66%
2019	76%	71%	66%	62%	57%	52%	47%
2020	78%	73%	67%	62%	57%	52%	47%
2021	79%	74%	68%	63%	58%	52%	47%
2022	81%	75%	69%	64%	58%	53%	47%
2023	82%	76%	70%	65%	59%	53%	47%
2028	90%	83%	76%	69%	62%	55%	48%
2033	101%	92%	83%	75%	67%	58%	49%
2038	104%	102%	91%	82%	72%	61%	51%
2043	108%	106%	101%	89%	77%	65%	52%
2048	113%	110%	104%	97%	83%	68%	53%

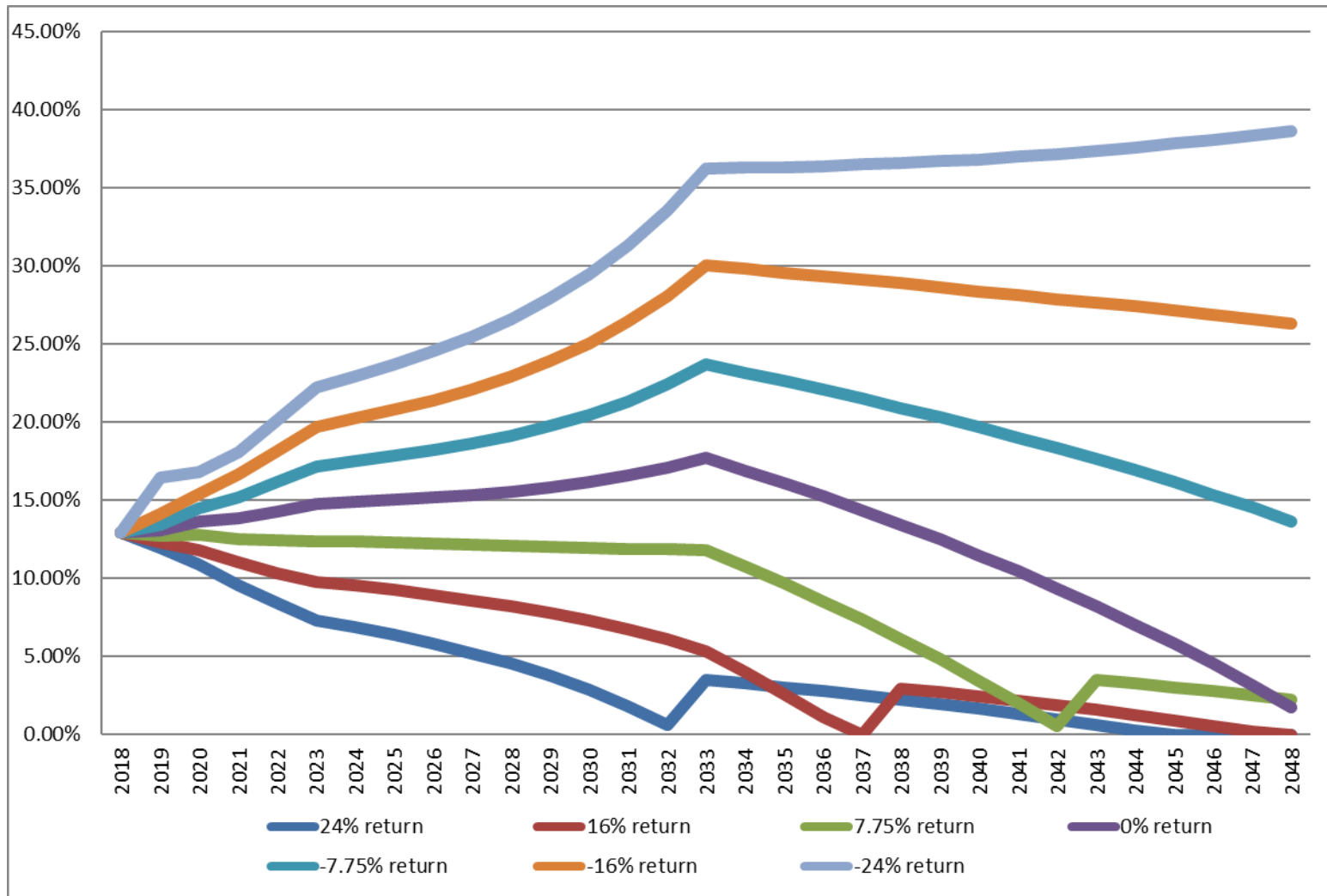
Projected Margin (AVA Basis)

Valuation Year	24% for FY2019	16% for FY2019	7.75% for FY2019	0% for FY2019	-7.75% for FY2019	-16% for FY2019	-24% for FY2019
2018	-0.19%	-0.19%	-0.19%	-0.19%	-0.19%	-0.19%	-0.19%
2019	0.81%	0.43%	0.01%	-0.33%	-0.69%	-1.40%	-3.67%
2020	1.84%	0.94%	-0.01%	-0.85%	-1.71%	-2.63%	-4.05%
2021	3.18%	1.76%	0.26%	-1.07%	-2.44%	-3.90%	-5.32%
2022	4.35%	2.40%	0.35%	-1.49%	-3.38%	-5.38%	-7.33%
2023	5.48%	3.00%	0.39%	-1.98%	-4.39%	-6.96%	-9.44%
2028	8.23%	4.55%	0.69%	-2.81%	-6.38%	-10.17%	-13.85%
2033	4.26%	7.43%	0.95%	-4.94%	-10.93%	-17.31%	-23.49%
2038	5.53%	4.80%	6.66%	-0.68%	-8.16%	-16.13%	-23.85%
2043	7.12%	6.20%	4.28%	4.53%	-4.88%	-14.90%	-24.62%
2048	7.75%	7.75%	5.53%	11.01%	-0.89%	-13.57%	-25.85%

* The projected margin is based on a 30-year closed period starting July 1, 2013. Once the period declines to 10 years remaining, the projected margin is based on a 10-year open period.

** If an overfunding exists, the surplus is amortized over a 30-year open period.

Projected ADC



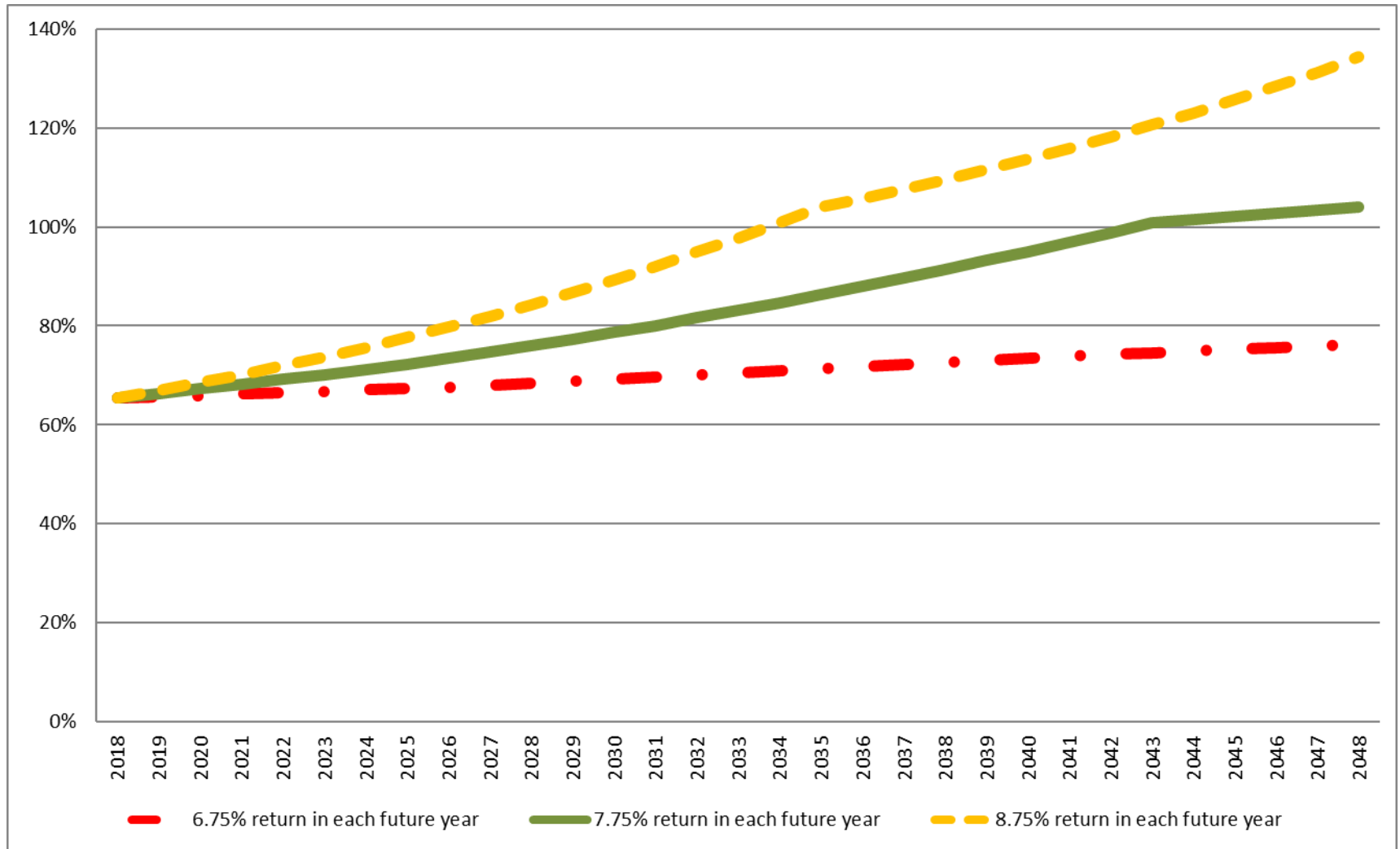
Projected ADC

Valuation Year	24% for FY2019	16% for FY2019	7.75% for FY2019	0% for FY2019	-7.75% for FY2019	-16% for FY2019	-24% for FY2019
2018	12.94%	12.94%	12.94%	12.94%	12.94%	12.94%	12.94%
2019	11.94%	12.32%	12.74%	13.08%	13.44%	14.15%	16.42%
2020	10.91%	11.81%	12.76%	13.60%	14.46%	15.38%	16.80%
2021	9.57%	10.99%	12.49%	13.82%	15.19%	16.65%	18.07%
2022	8.40%	10.35%	12.40%	14.24%	16.13%	18.13%	20.08%
2023	7.27%	9.75%	12.36%	14.73%	17.14%	19.71%	22.19%
2028	4.52%	8.20%	12.06%	15.56%	19.13%	22.92%	26.60%
2033	3.49%	5.32%	11.80%	17.69%	23.68%	30.06%	36.24%
2038	2.22%	2.95%	6.09%	13.43%	20.91%	28.88%	36.60%
2043	0.63%	1.55%	3.47%	8.22%	17.63%	27.65%	37.37%
2048	0.00%	0.00%	2.22%	1.74%	13.64%	26.32%	38.60%

* The projected ADC is based on a 30-year closed period starting July 1, 2013. Once the period declines to 10 years remaining, the projected ADC is based on a 10-year open period.

** If an overfunding exists, the surplus is amortized over a 30-year open period.

Projected Funded Ratios (MVA Basis) Actual Returns +1% or -1% of Assumed

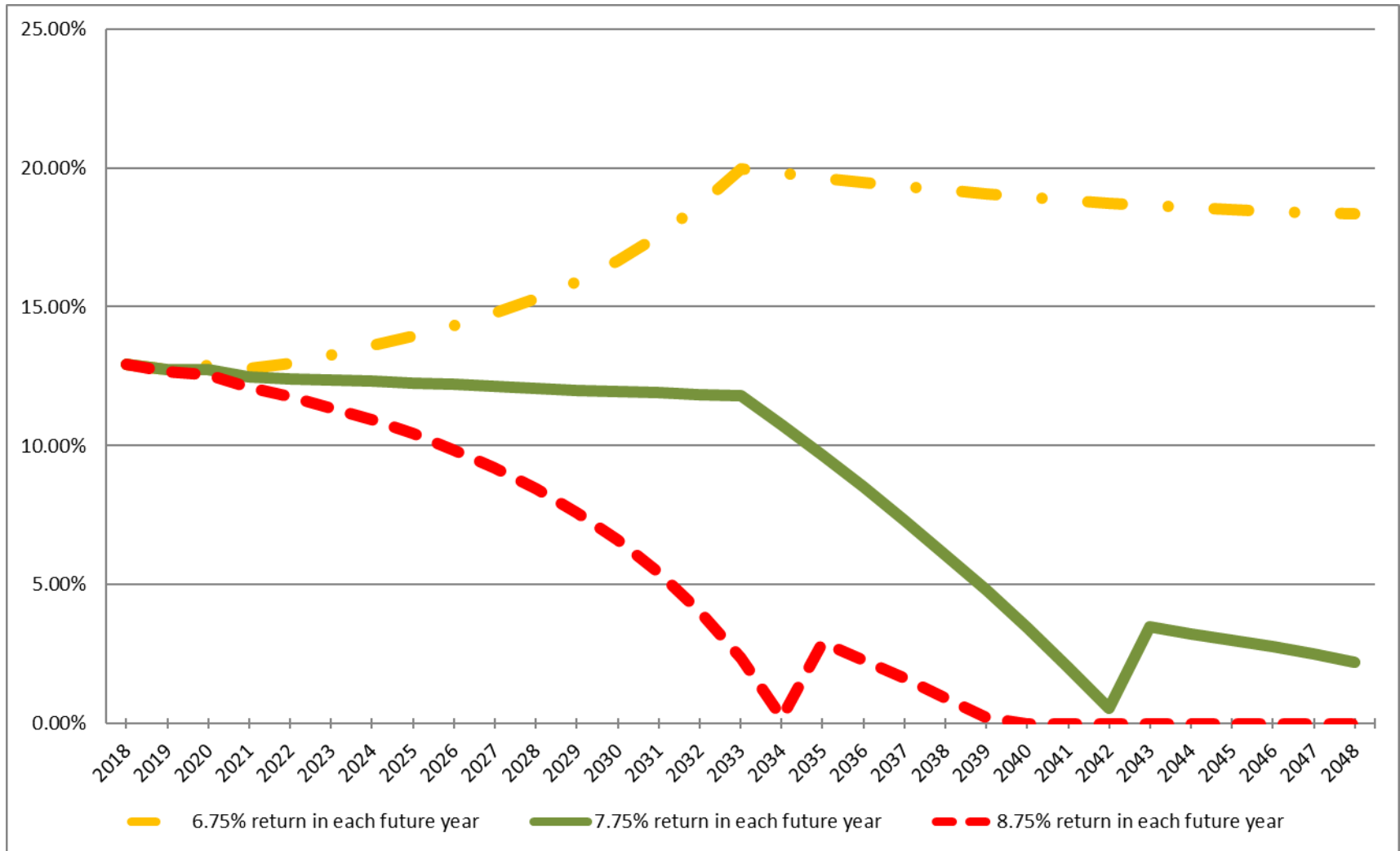


Projected Funded Ratios (MVA Basis) Actual Returns +1% or -1% of Assumed

Valuation Year	6.75% Return in Each Future Year	7.75% Return in Each Future Year	8.75% Return in Each Future Year
2018	66%	66%	66%
2019	66%	66%	67%
2020	66%	67%	69%
2021	66%	68%	70%
2022	67%	69%	72%
2023	67%	70%	74%
2028	67%	76%	84%
2033	71%	83%	98%
2038	73%	91%	110%
2043	75%	101%	121%
2048	76%	104%	134%

Projected ADC

Actual Returns +1% or -1% of Assumed



Projected ADC

Actual Returns +1% or -1% of Assumed

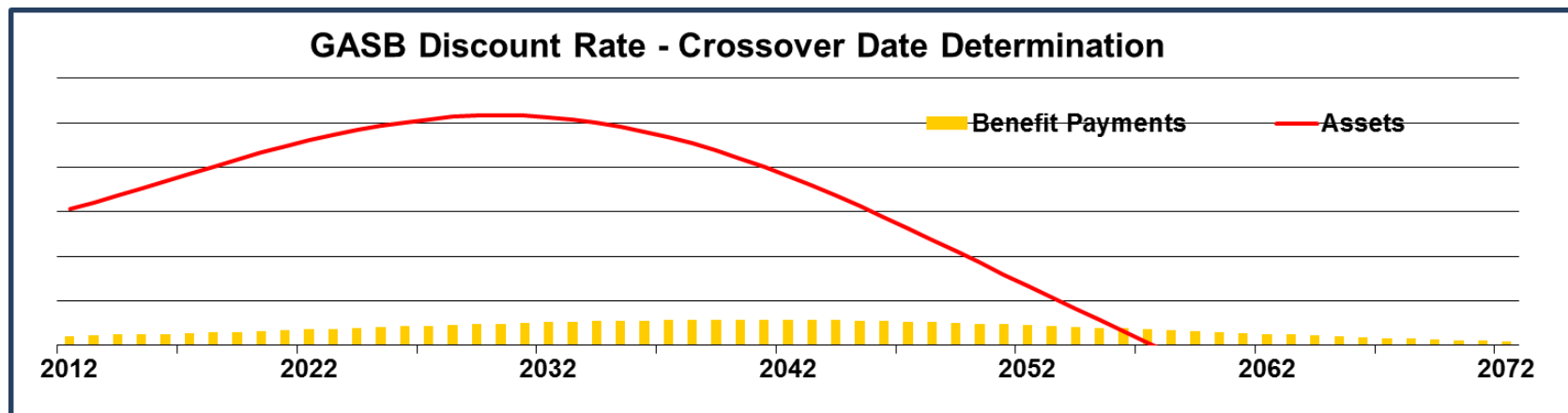
Valuation Year	6.75% Return in Each Future Year	7.75% Return in Each Future Year	8.75% Return in Each Future Year
2018	12.94%	12.94%	12.94%
2019	12.76%	12.74%	12.66%
2020	12.89%	12.76%	12.57%
2021	12.79%	12.49%	12.10%
2022	12.95%	12.40%	11.75%
2023	13.25%	12.36%	11.36%
2028	15.30%	12.06%	8.45%
2033	19.97%	11.80%	2.37%
2038	19.20%	6.09%	0.94%
2043	18.63%	3.47%	0.00%
2048	18.33%	2.22%	0.00%

GASB Discount Rate

- Determined annually based on a projection of benefit payments and assets
 - Benefit payment projection is for current members
 - Asset projection is based on expected investment return assumption (7.75%) and contributions on behalf of current members
- If projected assets are always sufficient to pay projected benefit payments, the GASB discount rate is equal to the expected investment return assumption
- If not, a blended discount rate must be used
 - For projected benefit payments that are covered by projected assets, the expected return assumption is used
 - For projected benefit payments that are not covered by projected assets, the 30-year AA/Aa tax-exempt municipal bond index is used (3.87%)
 - The date at which projected assets are not sufficient to cover projected benefit payments is called the “crossover date”

GASB Discount Rate

- As an example, the graph below shows the crossover occurring in 2058 for a hypothetical plan.



- Determination if a plan has a crossover date depends on
 - The Fund's current funded ratio
 - Projected future contributions and benefit payments
 - Expected investment return
- As of July 1, 2018, TFFR does not have a crossover date

Net Pension Liability (\$ in millions)

Collective TFFR	June 30, 2018	June 30, 2017
Total Pension Liability at 7.75%	\$3,864	\$3,734
Fiduciary Net Plan Position (i.e., MVA)	2,531	2,360
Net Pension Liability (NPL)	1,333	1,374
Sensitivity to changes in discount rate		
<ul style="list-style-type: none"> • 1% decrease (6.75%) 	\$1,780	\$1,826
<ul style="list-style-type: none"> • Current discount rate (7.75%) 	1,333	1,374
<ul style="list-style-type: none"> • 1% increase (8.75%) 	945	997

Reconciliation of Collective Net Pension Liability

(\$ in millions)	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability
Balance as of June 30, 2018	\$3,734	\$2,360	\$1,374
Changes for the year			
Service cost	78		78
Interest	287		287
Difference between expected and actual experience	(28)		(28)
Contributions – employer		87	(87)
Contributions – member		80	(80)
Contributions – purchased service credit and other		2	(2)
Net investment income		211	(211)
Benefit payments and refunds of contributions	(208)	(208)	-
Administrative expense		(2)	2
Changes of assumptions	-		-
Change of benefit terms	-		-
Net changes	<u>129</u>	<u>171</u>	<u>(41)</u>
Balance as of June 30, 2018	\$3,864	\$2,531	\$1,333

Note: numbers may not add due to rounding

Collective Pension Expense (\$ in millions)

	Year ending June 30, 2018	Year ending June 30, 2017
Service cost	\$78	\$75
Interest on the total pension liability	287	276
Projected earning on plan investments	(181)	(163)
Contributions – member	(80)	(79)
Contributions – purchased service credit and other	(2)	(3)
Administrative expense	2	2
Current year of recognition of:		
• Change of assumptions	24	24
• Difference between expected and actual experience	(5)	(1)
• Difference between projected and actual earning on pension plan investments	(6)	0
• Change of benefit terms	0	0
Total pension expense	\$117	\$132

Note: numbers may not add due to rounding

Actuarial Issues and Board Education

- Society of Actuaries' Public Sector Mortality Table Analysis
- Actuarial Standards of Practice
 - ASOP 4 - Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
 - ASOP 51 - Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions
- Pension Plan Risk Analysis and Stress Testing

SOA's Public Sector Mortality Table Analysis

- The analysis is complete and a new series of tables have been released in “exposure draft” form for comment.
 - New nomenclature as table name refers to central year of the data
 - New public sector tables are called Pub-2010, which are actually 4 years newer than the RP-2014 tables, NOT 4 years older
 - Base mortality rates of RP-2014 tables have been released as “RP-2006”
- Study identified differences among three job categories that were studied individually, and published mortality tables accordingly: general employees (PubG-2010), safety employees (PubS-2010) and teachers (PubT-2010).

Key Findings

- PubT-2010 annuity factors exceed the comparable average annuity factor under assumptions currently used by public sector plans.
 - PubT-2010 factors are 6.3% greater than the average annuity factor for age 75 male teachers.
 - NOT the case for TFFR whose annuity factors are 1% to 5% greater than the PubT-2010 factors.

SOA's Public Sector Mortality Table Analysis (cont.)

Key Findings

- Mortality assumptions for teachers tend to result in larger annuity factors than for other job categories.
 - We observed this longer life expectancy when working on the most recent experience study and the TFFR mortality assumptions reflect this.

- One-third of the plans studied have adopted the RP-2006 or RP-2014 mortality rates or a variation of them. Because many are adjusted based on plan experience annuity factors vary by plan.
 - TFFR data has sufficient data credibility such that we based the recommended mortality assumption partly on the TFFR data blended with the RP-2014 table.

- Teacher plans that are using unadjusted mortality tables will see an increase in liabilities when adopting PubT-2010.
 - As part of the next TFFR experience study, we anticipate recommending an adjusted version of the PubT-2010 table, but we expect the resulting annuity factors will not result in any significant increase (or decrease) in accrued liability.

Actuarial Standard of Practice (ASOP) 4

- ASOP 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
- Actuarial Standards Board (ASB) released exposure draft in March 2018
- ASB requested comments by July 31, 2018
 - Segal comments included concerns and suggested clarifying revisions
- Exposure draft includes two new requirements
 - Calculate and disclose a reasonable actuarially determined contribution
 - TFFR already does, based on the Board's funding policy
 - Calculate and disclose an Investment Risk Defeasement Measure (IRDM)
 - Obligation measure that reflects cost of defeasing the investment risk
 - Present value of benefits accrued to date (no future service or salary increase)
 - Discount rate based on market yields for hypothetical bond portfolio
 - » U.S. Treasury yields; or
 - » Fixed income security yields that receive one of the two highest ratings
 - Intended to measure the amount of investment risk taken by a System

Actuarial Standard of Practice (ASOP) 4 (cont.)

- Concerns about IRDM
 - Investment risk cannot be defeased in any practical sense
 - The IRDM will not measure the amount of investment risk taken by TFFR
 - The IRDM is not comparable to any other liability calculated for TFFR (or most public retirement systems) because the “present value of benefits accrued to date” method is not used in any other liability
 - The IRDM is likely to be misused, misinterpreted, and/or misunderstood
- Segal has members on both the ASB and the ASB’s Pension Committee
 - ASB’s next steps
 - Review comments submitted
 - Release a second exposure draft that will request additional comments
 - Review those comments and develop the final ASOP
 - The final ASOP is not expected anytime soon (possibly 2019 or 2020) and will be effective after it is issued

Actuarial Standard of Practice (ASOP) 51

Understanding Pension Risk

- Important for stakeholders to understand risk
 - Considerations when Plans mature, populations change and investments are volatile
 - Considerations when looking at plan design changes
- Actuarial valuation reports use a single set of assumptions, and have limited usefulness for risk analysis
- Risk evaluation requires an analysis of potential future outcomes under different scenarios
- ASOP 51 requires that actuaries help users of our actuarial reports gain a better understanding of the risks inherent in the measurement of pension plan obligations (i.e., perform a risk evaluation)

Examples of Pension Plan Risks

➤ Investment Return Risk

- Risk that investment returns will fall short of assumption

➤ Plan Maturity Risk

- Asset size as a percentage of payroll

➤ Contribution Risk

- Risk that contribution rates will be inadequate

➤ Longevity (or Mortality) Risk

- Retirees and beneficiaries living longer than assumed

➤ Retirement Risk

- Members retiring earlier than assumed

➤ Legislative Risk

Measures of Investment Risk

Sensitivity Tests

- *Example:* Effect of lowering the investment return assumption on the funded status and ADC

Stress Tests

- *Example:* Solve for an investment return where any return lower will ultimately move the plan below a set funded level

Scenario Tests

- *Example:* Projections based on a single set of assumptions, e.g., using the current investment return assumption and other scenarios varying the market return

Stochastic Projections

- *Example:* Projections using a defined asset allocation mix to produce a distribution of possible returns and determine, for example, the probability of the Plan being funded at a set level in 10 years

Why Projections Are Important



If you don't know where you are going, any road will get you there.

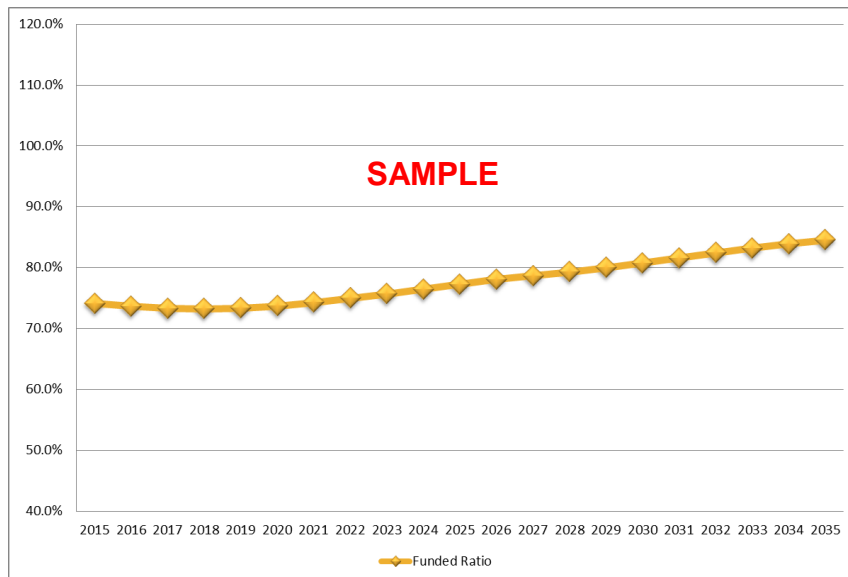
—*Lewis Carroll, Alice in Wonderland*



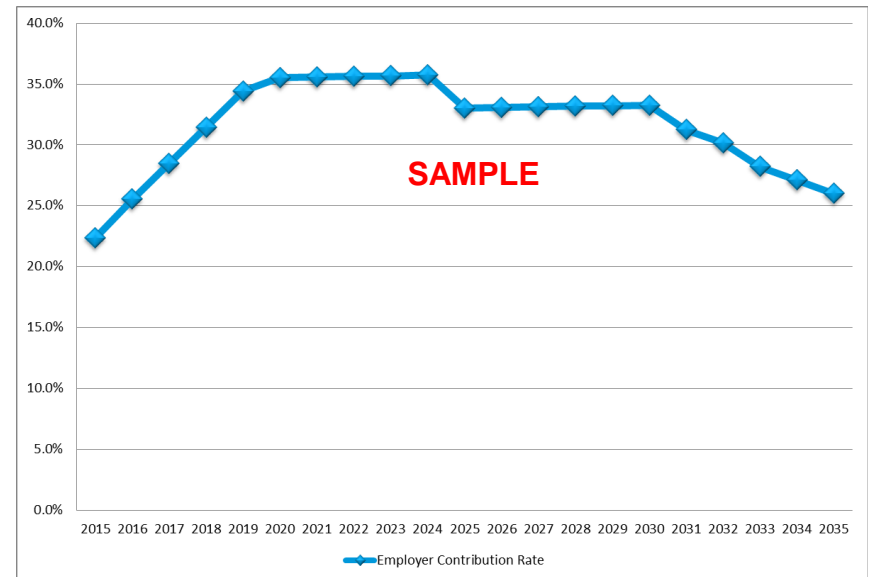
Deterministic Projections

- Projections provide a meaningful way to assess the long-term health of a pension plan
 - Provides information on what future funding measures might look like relative to the current valuation date
- Deterministic projections are based on a defined set of inputs
 - “If this happens, then this is the result”
 - Useful for evaluating expected values for a given set of parameters

FUNDED RATIO



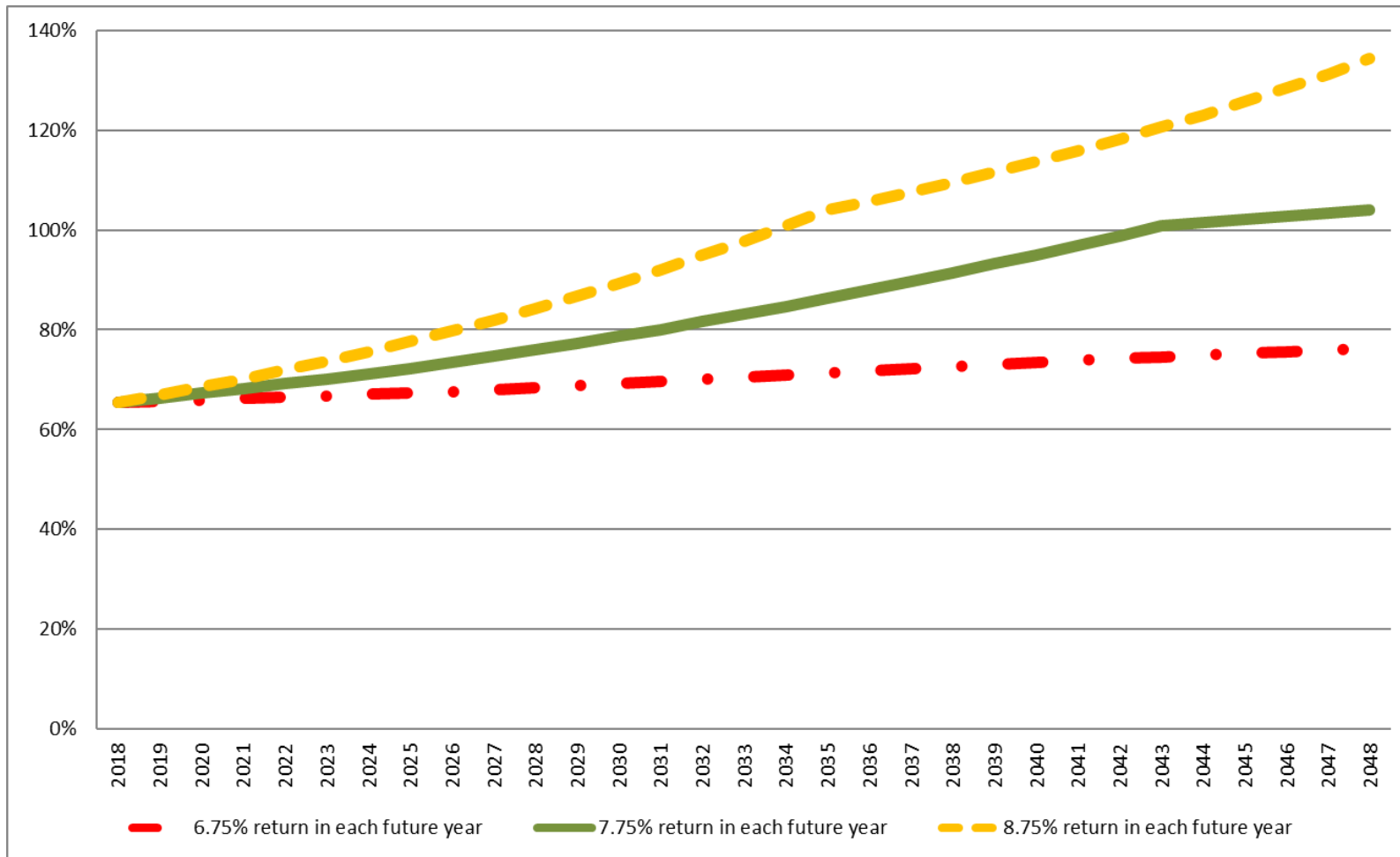
ACTUARIALLY DETERMINED CONTRIBUTION



Deterministic Scenario Test Illustration

➤ Funded Ratio

- Investment return for next year either +1% or -1% from assumption



Stochastic Modeling

➤ **Given a certain set of assumptions:**

- What is the range of possible results?
- What is the probability of achieving certain metrics (e.g., funded percentage, stable ADC, etc.)?
- Alternatively, what is the likelihood of long-term “success?”

➤ **What are metrics for success?**

- Probability of reaching a 100% funding level?
- Probability of being able to improve benefits or reduce contributions?
- Probability of avoiding insolvency?
- Other?

➤ **More than one metric can be modeled**

- Stochastically model investment returns and overlay the results on various payroll growth or decline assumptions

Stochastic Projections

- Stochastic projections provide a view of expected outcomes with an element of probability attached
- Capital Market Assumptions (CMAs) are estimates for expected risk and return for a given set of asset classes, as well as the expected relationship between classes

Correlation Coefficients

Sample CMAs

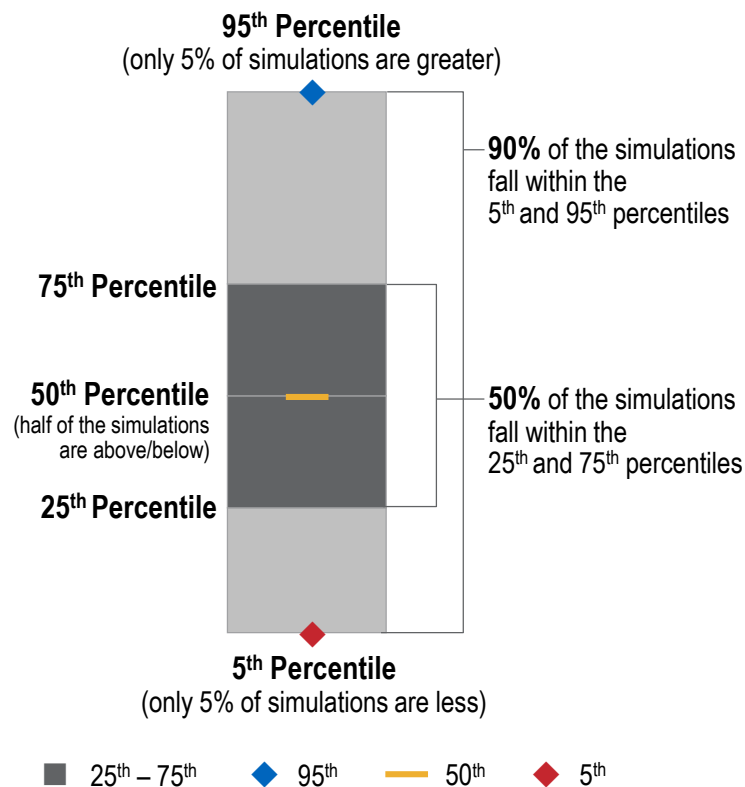
Class	Expected Return	Risk/Volatility	Core Fixed	Non-Core Fixed	US Equity	Non-US Equity	Emerging Equity	Real Estate
Core Fixed	2.6%	4.75%	1.00					
Non-Core Fixed	4.3%	14.25%	0.43	1.00				
US Equity	6.7%	19.00%	-0.07	0.64	1.00			
Non-US Equity	9.1%	24.00%	0.05	0.77	0.86	1.00		
Emerging Equity	11.2%	29.75%	0.09	0.77	0.76	0.92	1.00	
Real Estate	6.3%	18.75%	0.28	0.54	0.49	0.45	0.44	1.00

Stochastic Projections

(Monte Carlo Simulations)

The data is grouped into percentiles and summarized as a range

Sample Funded Percentage



Summarize results as a range:

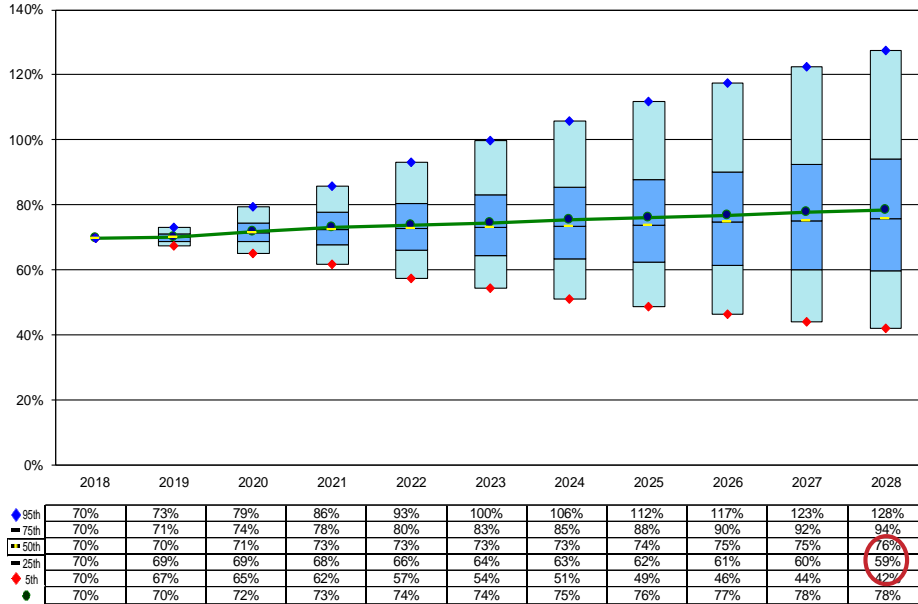
- **Best Case:** Better cases would occur only 5% of the time (above 95th percentile in this example)
- **Most Likely:** Better or worse cases (50th percentile) are equally likely
- **Worst Case:** Worse cases would occur only 5% of the time (below 5th percentile in this example)

Stochastic Projections

Below are two graphs that show the funded ratio and employer contribution for a sample pension plan

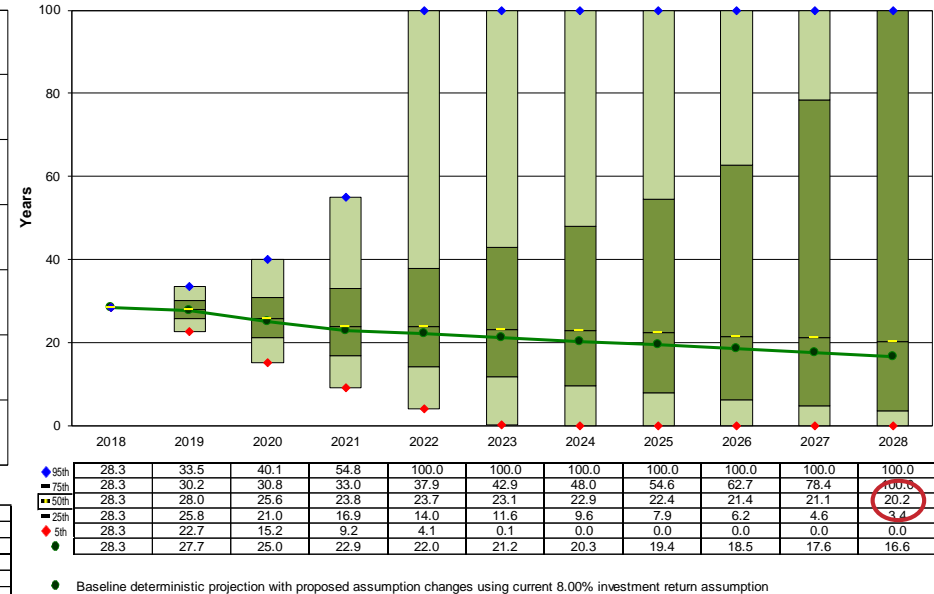
FUNDED RATIO

Projected Funded Ratio as of January 1



FUNDING PERIOD

Projected Funding Period for Plan Years Beginning January 1



● Baseline deterministic projection with proposed assumption changes using current 8.00% investment return assumption

For example, the sample tables above illustrate that by 2028, there is a 25% probability of being less than 59% funded and 50% probability of the funding period being more than 20.2 years

Stochastic modeling can be used to establish and assess parameters for monitoring the health and direction of a System

Plan Funding Policy vs. Plan Management Policy

A funding policy sets actuarially sound contribution rates

- A funding policy serves as a benchmark, which can be compared to the fixed employer contribution rates
- Actuarially determined contribution is equal to Normal Cost plus 25 year amortization of Unfunded Accrued Liability (as of 7/1/2018)
 - Amortization targets 100% funding in 25 years
 - TFFR's amortization method is 30 year closed period that began on July 1, 2013

TFFR should consider developing a plan management policy

- Identify and establish objective criteria to evaluate health of TFFR
- Illustrates market volatility and contribution inadequacy risks through stochastic modeling
- Allows Board to evaluate pension plan changes for effectiveness

A plan management policy is a more robust way to evaluate the ongoing health and sustainability of TFFR

Steps to Develop Plan Management Policy



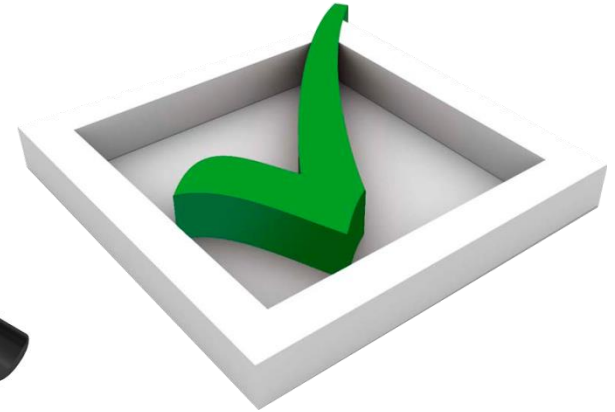
Establish financial metrics

- Funded percentage
- Funding period



Determine how the plan management policy will be monitored

- Projections and stochastic analysis prepared subsequent to the annual valuation



Develop scoring system that will identify triggers for action

- Design so each metric contributes to overall score with appropriate weighting

Development of the plan management policy will require input from TFFR staff, the Board, actuary and possibly other stakeholders

Sample Scoring System

Criteria 1

Based on current year funded ratio

- **Ideal condition:** 85% or higher: **+0**
- **Intermediate condition:** 60% to 85%: **+1**
- **Problematic condition:** Less than 60%: **+2**

Criteria 2

Based on projected funded ratio in 10 years

- **Ideal condition:** >90% with 75% probability: **+0**
- **Problematic condition:** <60% with 50% probability: **+2**
- **Intermediate condition:** between ideal and problematic: **+1**

Criteria 3

Based on projected funding period in 10 years

- **Ideal condition:** At or below “policy period* minus 10” with 50% probability: **+0**
- **Problematic condition:** Above 30 years with 50% probability: **+2**
- **Intermediate condition:** between ideal and problematic: **+1**

Criteria 4

Based on current economic cycle

- **Bear market:** 5-year return less than 7.75%: **-1**
- **Bull market:** 5-year return greater than 7.75%: **+1**

* Based on closed amortization period of 30 years, established as of July 1, 2013

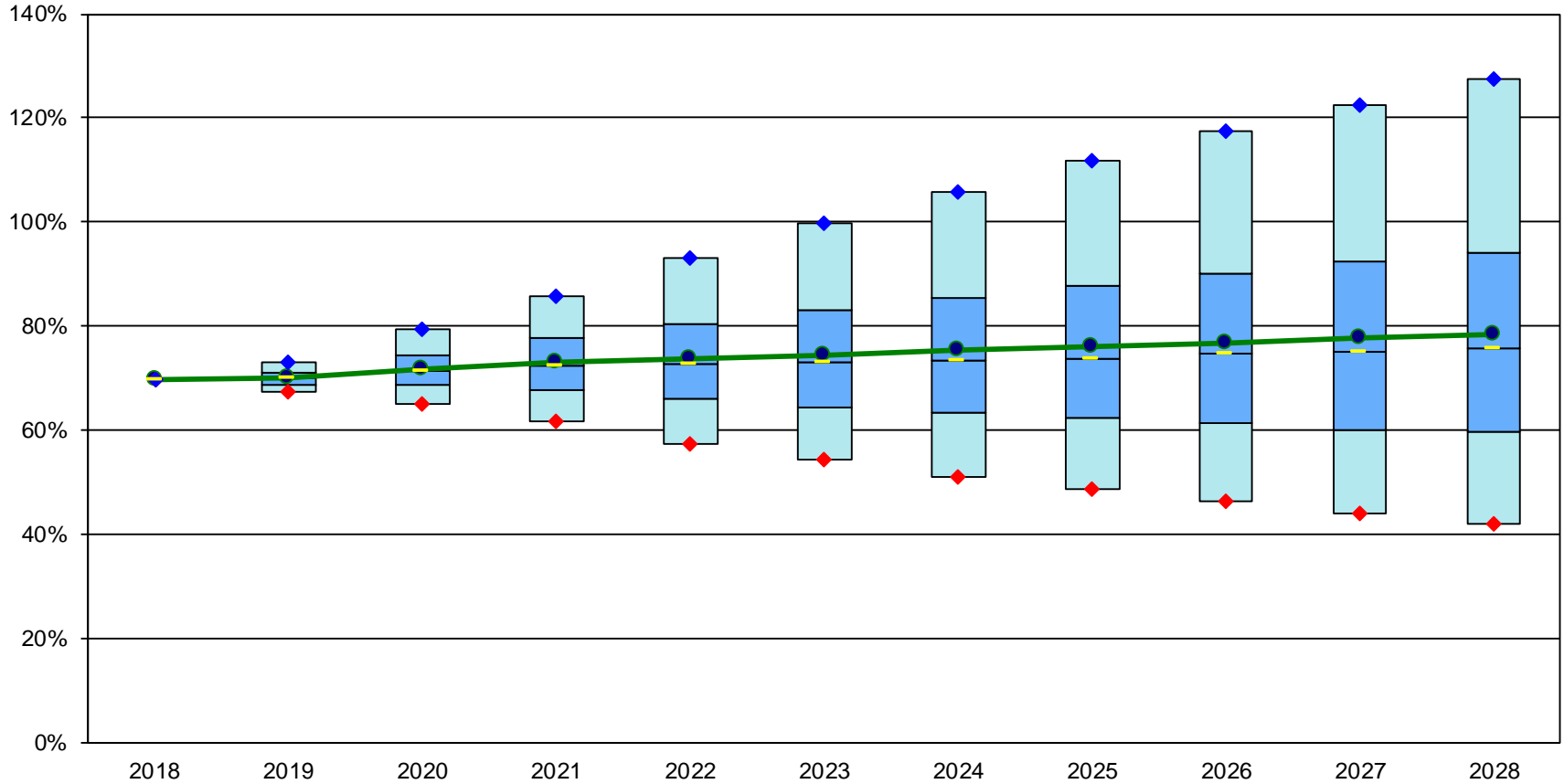
Sample Scoring System *(continued)*

- Total summary score could range from -1 to +7
 - 0 to 6 score based on plan metrics
 - Additional +1 or -1 based on where the economy is in the current market cycle
 - Further stratification can be used as well

- Recommendation for action is based on the total summary score. Summary “health” can be summed up as follows:
 - **Green** (summary score of -1 to 2) to indicate “*all clear*”
 - **Yellow** (summary score of 3 to 5) to indicate “*closely monitor*”
 - **Red** (summary score of 6 or 7) to indicate “*take action*”

Criteria 1 and 2 – Current and Projected Funded Ratio (Sample)

Projected Funded Ratio as of January 1

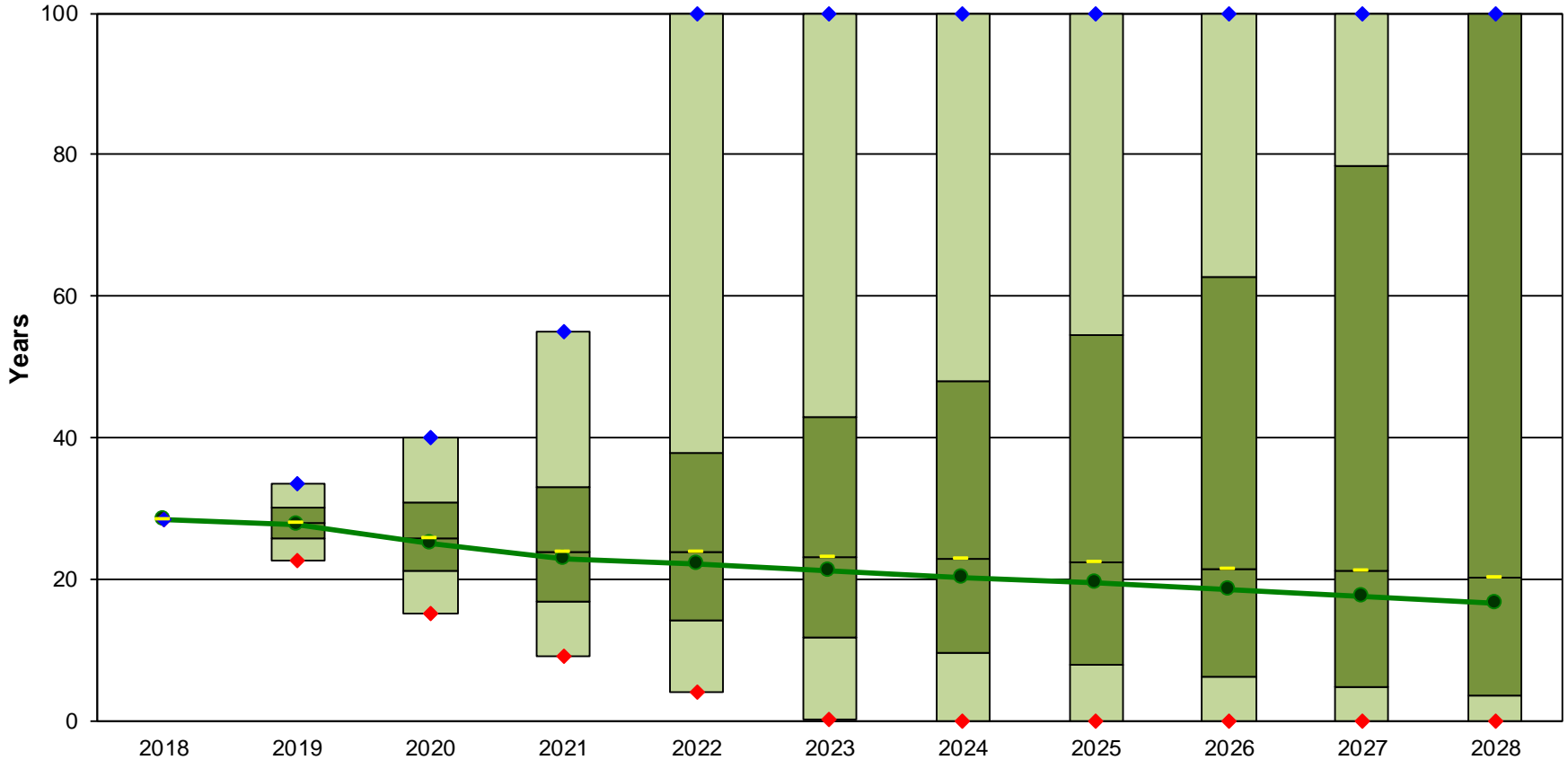


◆ 95th	70%	73%	79%	86%	93%	100%	106%	112%	117%	123%	128%
— 75th	70%	71%	74%	78%	80%	83%	85%	88%	90%	92%	94%
■ 50th	70%	70%	71%	73%	73%	73%	73%	74%	75%	75%	76%
— 25th	70%	69%	69%	68%	66%	64%	63%	62%	61%	60%	59%
◆ 5th	70%	67%	65%	62%	57%	54%	51%	49%	46%	44%	42%
●	70%	70%	72%	73%	74%	74%	75%	76%	77%	78%	78%

● Baseline deterministic projection with proposed assumption changes using current 8.00% investment return assumption

Criteria 3 – Projected Funding Period (Sample)

Projected Funding Period for Plan Years Beginning January 1



◆ 95th	28.3	33.5	40.1	54.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
■ 75th	28.3	30.2	30.8	33.0	37.9	42.9	48.0	54.6	62.7	78.4	100.0	100.0
■ 50th	28.3	28.0	25.6	23.8	23.7	23.1	22.9	22.4	21.4	21.1	20.2	20.2
■ 25th	28.3	25.8	21.0	16.9	14.0	11.6	9.6	7.9	6.2	4.6	3.4	3.4
◆ 5th	28.3	22.7	15.2	9.2	4.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
●	28.3	27.7	25.0	22.9	22.0	21.2	20.3	19.4	18.5	17.6	16.6	16.6

● Baseline deterministic projection with proposed assumption changes using current 8.00% investment return assumption

Criteria 4 – Historical Returns

- Rates of return on market value of assets, gross of fees, as calculated by Segal
 - 9.0% for year ending 6/30/18
 - 5-year average is 8.2%
 - 10-year average is 5.5%

Calculating the Summary Score (Sample)

Criteria 1	<p>Current year funded ratio is 66%</p> <ul style="list-style-type: none">• Ideal condition: 85% or higher• Problematic condition: Less than 60% <p><u>Intermediate condition met</u></p>	+1
Criteria 2	<p>For illustration, projected 25th percentile funded ratio in 10 years is 59%</p> <p>For illustration, projected 50th percentile funded ratio in 10 years is 76%</p> <ul style="list-style-type: none">• Ideal condition: 90% or higher with 75% probability• Problematic condition: Less than 60% with 50% probability <p><u>Result is between ideal and problematic</u></p>	+1
Criteria 3	<p>For illustration, projected 50th percentile funding period in 10 years is 20.2 years</p> <ul style="list-style-type: none">• Ideal condition: At or below 19 years with 50% probability• Problematic condition: Above 30 years with 50% probability <p><u>Result is between ideal and problematic</u></p>	+1
Criteria 4	<p>Trailing 5-year average return is 8.2%</p> <ul style="list-style-type: none">• Bear market: 5-year return less than 7.75%• Bull market: 5-year return more than 7.75% <p><u>Currently in a bull market cycle</u></p>	+1
		<hr/> 4

Calculating the Summary Score *(continued)*

➤ Composite summary score equal to 4

Assessment:

Summary score of -1 to 2: **No action necessary**

Summary score of 3 to 5: **“Alert” status; additional monitoring required**

Summary score of 6 to 7: **Changes should be considered**

Based on a summary score of 4, Plan is: **Yellow**

What Happened in KY, CO, AZ and Why?

Kentucky Teachers' Retirement System

- Plan is about 56% funded
- Contributions have been much lower than the actuarially determined contributions
- Members hired after January 1, 2019:
 - Will enter hybrid cash-balance plan – members will contribute 9.105% and employers will contribute 8%
 - Cash balance plan creates notional individual accounts that are credited with contributions and 85% of investment returns
 - The cash balance plan is a defined benefit plan that provides lower benefits
 - Retirement eligibility will change from 27 years of service to Rule of 87 or age 65
- Members hired before January 1, 2019:
 - No longer able to accumulate sick days for retirement credit
- Kentucky Senate Bill 151 (SB 151):
 - Case is now before the Supreme Court with a ruling expected after the November elections

What Happened in KY, CO, AZ and Why?

Colorado Public Employees' Retirement Association

- Plan is about 55% funded
- Contribution rates were fixed and lower than the actuarially determined contribution rates
- Current members:
 - Member contribution rate will increase from 8% to 10% by July 1, 2021
 - COLA capped at 1.5%, three year deferral for first COLA
- Current retirees:
 - COLA suspended for two years and capped at 1.5% per year
- Members hired on or after January 1, 2020:
 - Member contribution rate of 10% by July 1, 2021
 - Retirement eligibility at later ages
 - COLA capped at 1.5%, three year deferral for first COLA
- Other increases in contributions:
 - Direct State contribution of \$225 million beginning July 1, 2018
 - Automatic adjustment in member and employer contribution rates to keep PERA on path of full funding in 30 years

What Happened in KY, CO, AZ and Why?

Arizona Public Safety Personnel Retirement System

- Plan is about 45% funded
- Contribution rates were lower than the actuarially determined contribution rates
- Current members and retirees:
 - COLA based on Phoenix CPI, capped at 2% and will be prefunded
- Members hired on or after January 1, 2017:
 - Salary considered for pension benefits capped at \$110,000 per year
 - Retirement age increased from age 52.5 to age 55
 - Multiplier decreased to a graded schedule starting at 1.5% per year up to 2.5% for service earned after 25 or more years of service
 - If plan does not meet return assumptions, members will have to pay 50% of plan costs

Teacher Strikes

- Lobbying for more pay
 - Increases in salaries will increase the cost of pension plans as benefits are based on salary levels
- Protesting pension cuts
 - Slow but continuing pressure to share or transfer pension plan risks with/to member
 - Increased interest in hybrid and defined contribution plans
 - Risks are shared in hybrid plans
 - Risks are transferred in defined contribution plans

Continuum of Risk Sharing In Retirement Plans

- Allocation of risk between employer and employee in retirement plan design

Employer

Employee

Risk

Traditional DB

- ▲ Employer-pay-all DB
 - ▲ Contributory DB
 - ▲ Contributory DB with rate based on share of total contribution

Hybrid

- ▲ Cash Balance, fixed credit
 - ▲ Cash Balance, interest credits based on market returns
 - ▲ DB base benefit plus DC component
 - ▲ Variable Annuity Plan with features
 - ▲ “Pure” Variable Annuity Plan

Defined Contribution

- ▲ 401(k) with employer match
 - ▲ Employee-pay-all DC

Risks and Features of Different Types of Plans

Defined Benefit Plan Designs

Type	Example	Pros	Cons
1. Final Average Salary	$1.5\% \times \text{Final 5-year Average Salary} \times \text{Years of Service}$	Benefit linked to salary growth; Keeps pace with inflation	Back-loaded accrual pattern
2. Career Average Salary	$1.5\% \times \text{Career Average Salary} \times \text{Years of Service}$	Benefit partially linked to salary growth; Level accrual/cost pattern	Does not keep pace with inflation; Increased administration
3. Cash Balance (Hybrid)	7.5% of annual salary contributed to account; account balance grows 5% per year for interest	Benefit partially linked to salary growth; Keeps pace with inflation; Benefit defined in terms of notional account balance	Lack of familiarity; Administrative complexity
4. Combined Plan (Hybrid)	Combination of modest defined benefit plan and a defined contribution plan	Benefit partially linked to salary growth; Keeps pace with inflation; Benefit defined in terms of account balance	Lack of familiarity; Administrative complexity

Risks and Features of Different Retirement Plans

Employer and Employee Risks of Different Designs

	Defined Benefit						Defined Contribution	
	Final Average		Career Average		Hybrid		401(a), 401(k), 403(b)	
	ER	EE	ER	EE	ER	EE	ER	EE
Plan Risks								
Investment Risk	4	1	4	1	3	2	0	4
Inflation Risk	3	2	1	3	2	2	1	3
Payroll Risk	4	1	4	1	3	1	1	1
Longevity Risk	4	0	4	0	3	2	0	4
Retirement Risk	3	0	3	0	2	2	0	2
Demographic Risk	2	0	2	0	2	2	0	0
Features								
Rewards older/longer service employees	3		3		2		1	
Planning Tool	2		2		1		1	
Hiring Attractiveness	2		2		3		3	

Risks	Features
0 None	Not applicable
1 Low	Minor importance
2 Somewhat low	Somewhat minor importance
3 Somewhat high	Relatively important
4 High	Very Important

Manage Pension Risk Through Plan Design

- Alternative plan designs that provide for sharing of investment risk with members
- Cannot completely eliminate risks
 - However, can significantly reduce risks
 - Share risk between members and employers
- A few states have adopted hybrid plans
 - Hybrid design applies to future benefit accruals or new tier of members
 - Existing unfunded actuarial accrued liability remains
 - Some risk is transferred to members
- Keep in mind benefit adequacy
 - Consider target income replacement ratio
 - Consider other sources of retirement income

Hybrid Plans – Key Advantages and Disadvantages

Combine Elements of DB and DC plans

- DB: Defined benefit plan
- DC: Defined contribution plan

Key Advantages	Key Disadvantages
<ul style="list-style-type: none">• Provide lifetime income• Reduce volatility in funding requirements• Higher probability of delivering promised benefits	<ul style="list-style-type: none">• Legacy liability remains• Benefit levels may vary, therefore uncertain• May be more difficult to communicate, understand

Characteristics of DB and DC Plans

Employer Perspective

Objective	Defined Benefit	Defined Contribution
✓ Funding certainty	<ul style="list-style-type: none">• Plan liabilities change based on assumptions and plan experience• Reduce volatility in funding requirements• Higher probability of delivering promised benefits	<ul style="list-style-type: none">• Employer liability is fulfilled as contributions made• Benefit levels may vary, therefore uncertain• May be more difficult to communicate, understand
✓ Predictable Contribution Costs	<ul style="list-style-type: none">• Annual Contributions may vary from year-to-year based upon actuarial assumptions• Rates may be set by statute to increase predictability	<ul style="list-style-type: none">• Annual cash expenditures are more predictable as they are based on a set percentage of employee salaries
✓ Recruitment Tool	<ul style="list-style-type: none">• Some portability through vesting or return of employee contributions	<ul style="list-style-type: none">• Assets are portable

Characteristics of DB and DC Plans

Employer Perspective

Objective	Defined Benefit	Defined Contribution
✓ Expenses	<ul style="list-style-type: none">Expenses include actuarial valuation and investment fees including recordkeeping and investment management	<ul style="list-style-type: none">Expenses may be lower than a defined benefit plan because no actuarial valuation is necessary and investment fees are shifted to the employee.Employee education costs may be higher
✓ Investment Risk	<ul style="list-style-type: none">Investment risk is assumed by the employerContributions may be lowered by earnings that exceed assumed rates of return.	<ul style="list-style-type: none">Investment risk is assumed by the employee

Characteristics of DB and DC Plans

Member Perspective

Objective	Defined Benefit	Defined Contribution
✓ Benefit Potential	<ul style="list-style-type: none">• Benefits paid at retirement are for life and are guaranteed by the plan's benefit formula• Cost of living increases.	<ul style="list-style-type: none">• Benefits paid at retirement are based on contributions and earnings.• Final retirement benefit can be eroded by pre-retirement distributions
✓ Understanding Benefits	<ul style="list-style-type: none">• Benefits require explanation• There are no separate accounts	<ul style="list-style-type: none">• Benefits accumulate each year• Contributions are generally based on a percentage of earnings• Each individual has a separate account
✓ Access to Benefit While Employed	<ul style="list-style-type: none">• Benefit may not be withdrawn while actively employed	<ul style="list-style-type: none">• Benefits may be withdrawn or loaned

Characteristics of DB and DC Plans

Member Perspective

Objective	Defined Benefit	Defined Contribution
✓ Reward Career Employees	<ul style="list-style-type: none">• Benefits are based on final average salary	<ul style="list-style-type: none">• Benefits are based upon accumulated contributions and earnings
✓ Recruitment Tool	<ul style="list-style-type: none">• Benefits have limited portability	<ul style="list-style-type: none">• Benefits are portable
✓ Expenses	<ul style="list-style-type: none">• Employer pays administrative and investment expenses	<ul style="list-style-type: none">• Employee pays administrative and investment expenses
✓ Investment Risk	<ul style="list-style-type: none">• Investment risk is assumed by the employer	<ul style="list-style-type: none">• Investment risk is assumed by the individual

Other Topics

Draft Bills 20 and 126

Draft Bill 20

- Legislative Employee Benefits Programs Committee would no longer be required to submit a draft measure on proposed bills or amendments affecting TFFR for review to ensure an actuarial study is done.
- Segal Comments
 - If passed, Draft Bill 20 could lead to a scenario that has a significant impact on the financial health of the TFFR and other North Dakota retirement systems.
 - Since no actuarial study would be required, legislators or legislative committees might not identify the potential range and impact of the risks associated with amendments introduced by them, resulting in a significant actuarial cost impact on the TFFR, or affect the benefits payable from the retirement system.
 - A seemingly innocuous draft bill may have material cost or administrative implications.
 - An actuarial study identifies risks associated with the retirement system's future financial condition, and if those risks are anticipated to be significant, assess those risks.

Draft Bill 126

- Proposed legislation modifies Dakota Century Code §15-39.1-34, which describes the detailed rules for direct rollovers under Internal Revenue Code sections 401(a)(31) and 402.
 - The modified language was approved by the IRS as satisfying qualification rules for governmental pension plans under these sections of the Internal Revenue Code.
 - The IRS provided the TFFR a favorable determination letter on the tax-qualified status of the plan, which is contingent upon adopting the approved language.
- Segal Comments
 - The bill generally clarifies existing statutory provisions to more accurately reflect actual operations of the TFFR. The provisions of this bill do not appear to
 - There are no compliance issues as the IRS has approved the modified language, rather it helps TFFR maintain compliance with applicable federal requirements.

Glossary

Actuarial Accrued Liability For Actives: The equivalent of the accumulated Normal Costs allocated to the years before the valuation date.

Actuarial Accrued Liability For Pensioners: The single-sum value of lifetime benefits to existing pensioners. This sum takes account of life expectancies appropriate to the ages of the pensioners and the interest that the sum is expected to earn before it is entirely paid out in benefits.

Actuarial Cost Method: A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the Actuarially Determined Contribution.

Actuarial Gain or Actuarial Loss: A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuation dates. Through the Actuarial Assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the plan's assets earn more than projected, salary increases are less than 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, actuarial losses are the result of unfavorable experience, i.e., actual results yield in actuarial liabilities that are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period

Actuarially Equivalent: Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

Actuarial Present Value (APV): The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. Each such amount or series of amounts is adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.), multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Glossary

Actuarial Present Value of Future Plan Benefits: The Actuarial Present Value of benefit amounts expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age, anticipated future compensation, and future service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive 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 be provide sufficient assets to pay all projected benefits and expenses when due.

Actuarial Valuation: 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, such as the ADC and the NPL.

Actuarial Value of Assets (AVA): The value of the plan's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

Actuarially Determined: Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

Actuarially Determined Contribution (ADC): 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 the Amortization Payment.

Amortization Method: 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 assumed rate at which total covered payroll of all active members will increase.

Glossary

Amortization Payment: The portion of the pension plan contribution, or ADC, that is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Assumptions or Actuarial Assumptions: The estimates on which the cost of a plan is calculated including:

- (a) Investment return - the rate of investment yield that the plan will earn over the long-term future;
- (b) Mortality rates - the death rates of employees and pensioners; life expectancy is based on these rates;
- (c) Retirement rates - the rate or probability of retirement at a given age;
- (d) Turnover rates - the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement;
- (e) Salary increase rates - the rates of salary increase due to inflation and productivity growth

Closed Amortization Period: A specific number of years that is counted down by one each year, and therefore 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. See Funding Period and Open Amortization Period.

Decrements: Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

Defined Benefit Plan: A retirement plan in which benefits are defined by a formula applied to the member's compensation and/or years of service.

Defined Contribution Plan: A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

Employer Normal Cost: The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

Glossary

Experience Study: A periodic review and analysis of the actual experience of a plan that may lead to a revision of one or more Actuarial Assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the actuary.

Funded Ratio: The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

Funding Period or Amortization Period: The term “Funding Period” is used in two ways. First, it is the period used in calculating the Amortization Payment as a component of the ADC. Second, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on the statutory employer contribution rate, and assuming no future actuarial gains or losses.

GASB: Governmental Accounting Standards Board.

GASB 67 and GASB 68: Governmental Accounting Standards Board Statements No. 67 and No. 68. 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 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves.

Investment Return: The rate of earnings of a plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the plan’s assets. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.

Margin: The difference, whether positive or negative, between the statutory employer contribution rate and the Actuarially Determined Contribution.

Net Pension Liability (NPL): The Net Pension Liability is equal to Total Pension Liability minus Plan Fiduciary Net Position.

Glossary

Normal Cost: That portion of the Actuarial Present Value of pension plan benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability, or retirement.

Open Amortization Period: An Open Amortization Period is one that is used to determine the Amortization Payment, but which does not change over time. 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 with level percentage of payroll is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never decrease, but will become smaller each year, in relation to covered payroll, if the Actuarial Assumptions are realized.

Plan Fiduciary Net Position: GASB term for the market value of assets.

Total Pension Liability (TPL): The actuarial accrued liability based on the blended discount rate as described in GASB 67/68.

Unfunded Actuarial Accrued Liability (UAAL): The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

Valuation Date or Actuarial Valuation Date: The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Caveats

This presentation is based on the results of the July 1, 2018, actuarial valuation performed for the Board of Trustees of the North Dakota Teachers' Fund for Retirement. The actuarial valuation report has information on the plan provisions, data, methods and assumptions used in the valuation. Use of the information in this presentation is subject to the caveats described in that document. The measurements in this presentation may not be appropriate for purposes other than those described in the actuarial valuation report.

MEMORANDUM

TO: TFFR Board
FROM: Fay Kopp
DATE: October 18, 2018
SUBJ: Actuarial Issues

Kim Nicholl and Tanya Dybal, Segal Consultants, will present information related to recent actuarial issues and how they might affect the NDTFFR plan in the future.

- Society of Actuaries (SOA) Public Sector Mortality Table Analysis
- Actuarial Standards of Practice (ASOP 51 and ASOP 4) Implications
- Pension Plan Risk Analysis and Stress Testing

Segal's presentation will be added to the Board materials on the website prior to the meeting next week.

MEMORANDUM

TO: TFFR Board
FROM: Fay Kopp
DATE: October 18, 2018
SUBJ: Board Education

Kim Nicholl and Tanya Dybal, Segal Consultants, will also provide board education on the following topics:

- Defined Benefit / Defined Contribution / Hybrid / Cash Balance Plans
- Implications of 2018 Teacher Strikes on Public Pension Plans (or what happened in Kentucky, Colorado, Arizona and other states and why?)

Segal's presentation will be added to the Board materials on the website prior to the meeting next week.

MEMORANDUM

TO: TFFR Board
FROM: Fay Kopp
DATE: October 18, 2018
SUBJ: Actuarial Review of Proposed Legislation

Kim Nicholl, Segal Consultants, will comment on the September 4, 2018 letters related to Segal's actuarial review of proposed legislation related to the NDTFFR plan.

- **Bill Draft #126 – submitted by TFFR Board**
Makes technical corrections required by IRS favorable determination letter.
- **Bill Draft #20 – Submitted by Rep. Streyle**
Changes the powers and duties of the Legislative Employee Benefits Programs Committee. Legislators and legislative committees would no longer be required to submit proposed bills or amendments to this committee for review to ensure an actuarial study is done, although executive and judicial branch entities would need to continue doing so.

Enclosures



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September 4, 2018

Via E-mail

Ms. Fay Kopp
NDRIO Deputy Executive Director / NDTFFR Chief Retirement Officer
ND Retirement & Investment Office | ND Teachers' Fund for Retirement
3442 East Century Avenue | P.O. Box 7100
Bismarck, ND 58505-7100

Re: **Technical Comments on Draft Bill 126 (IRS compliance changes)**

Dear Fay:

As requested, we reviewed draft Bill 126 (Bill No. 19.0126.01000), which proposes technical changes to the North Dakota Teachers' Fund for Retirement (TFFR) that are required to be made under the terms of the Fund's determination letter from the Internal Revenue Service (IRS) on the tax-qualified status of the plan. The following presents our analysis of such proposed changes found in draft Bill 126.

Summary: The proposed legislation adds new paragraph 2 to North Dakota Century Code §15-39.1-34, which describes the detailed rules for direct rollovers under Internal Revenue Code sections 401(a)(31) and 402. The language in this paragraph 2 was approved by the IRS as satisfying qualification rules for governmental pension plans under these sections of the Internal Revenue Code. The IRS provided the TFFR a favorable determination letter on the tax-qualified status of the plan, which is contingent upon adopting the approved language.

Actuarial Cost Analysis: This bill would have no actuarial cost impact on the TFFR.

Technical Comments: Our comments on the bill are as follows:

General Comments

The bill generally clarifies existing statutory provisions to more accurately reflect actual operations of the TFFR. The provisions of this bill do not appear to directly or significantly impact the benefits payable from the TFFR.

Compliance Issues

The bill amends North Dakota Century Code §15-39.1-34 by adding paragraph 2 to describe the direct rollover rules under the plan in a manner that complies with Internal Revenue Code section 401(a)(31). Since the IRS approved the language in paragraph 2 for this purpose, the bill does not present any compliance issues.

Administrative Issues

The language of the bill accurately reflects the actual operations of the rollover rules under the plan and helps the plan maintain compliance with applicable federal requirements for tax-qualified pension plans.

The information contained in this letter is provided within our role as the plan's actuary and benefits consultant and is not intended to provide tax or legal advice. We recommend that you address all issues described herein with your legal counsel.

Please contact us if you have any questions or comments.

Sincerely yours,



Kim Nicholl, FSA, EA, FCA
Senior Vice President and Consulting Actuary



Melanie Walker, JD
Senior Vice President

cc: Matthew Strom



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T 312.984.8500 www.segalco.com

September 4, 2018

Via E-mail

Ms. Fay Kopp
NDRIO Deputy Executive Director / NDTFFR Chief Retirement Officer
ND Retirement & Investment Office | ND Teachers' Fund for Retirement
3442 East Century Avenue | P.O. Box 7100
Bismarck, ND 58507-7100

Re: **Technical Comments on Draft Bill 20**

Dear Fay:

As requested, we reviewed draft Bill 20 (Bill No. 19.0020.01000), which proposes administrative changes relating to the powers and duties of the Legislative Employee Benefits Programs Committee. The following presents our analysis of such proposed changes found in draft Bill 20.

Summary: The proposed legislation updates North Dakota Century Code §54-35-02.4 such that legislators or legislative committees would no longer be required to submit a draft measure or proposed bills or amendments, affecting a public employees retirement program, public employees health insurance program, or public employee retiree insurance program, for review to ensure an actuarial study is done. However, the judicial and executive branch agency may not introduce a legislative measure unless the legislative measure is accompanied by a report.

Actuarial Cost Analysis: This bill, in and of itself, would have no actuarial cost impact on the TFFR.

Technical Comments: Our comments on the bill are as follows:

General Comments

While the bill itself does not have an actuarial cost impact, this bill could lead to a scenario that has a significant impact on the financial health of the TFFR and other North Dakota retirement systems.

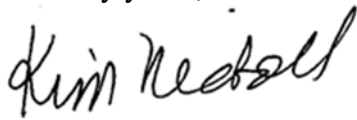
Since no actuarial study would be required if this bill were passed, legislators or legislative committees might not identify the potential range and impact of the risks associated with amendments introduced by them. As a result, this could have significant actuarial cost impact on the TFFR, or affect the benefits payable from the retirement system. A seemingly innocuous draft bill may, in fact, have material or even significant cost or administrative implications. If not properly evaluated within the context of an actuarial analysis, proposed legislation could adversely impact TFFR.

In addition, an actuarial study would help to identify risks associated with the retirement system's future financial condition, and if those risks are anticipated to be significant, assess those risks. As part of a risk assessment, an actuarial study may include scenario testing, sensitivity testing, stress testing, and/or stochastic modeling. A more detailed actuarial study could help legislators or legislative committees to develop a better understanding of the risks associated to changes introduced by draft legislation.

The information contained in this letter is provided within our role as the plan's actuary and benefits consultant and is not intended to provide tax or legal advice. We recommend that you address all issues described herein with your legal counsel.

Please contact us if you have any questions or comments.

Sincerely yours,



Kim M. Nicholl, FSA, EA, FCA
Senior Vice President & Actuary

cc: Matthew Strom

MEMORANDUM

TO: TFFR Board
FROM: Fay Kopp
DATE: October 18, 2018
SUBJ: TFFR Legislative Update

The [Legislative Employee Benefits Programs Committee](#) (LEBPC) is meeting on [October 25-26, 2018](#) to receive the 2018 TFFR and PERS actuarial valuation reports. The Committee will also review actuarial and technical comments, and take public comment on legislative proposals related to retirement and health programs.

We will provide you with an update on the morning Legislative Committee meeting at the TFFR Board meeting that afternoon.

NORTH DAKOTA LEGISLATIVE MANAGEMENT

Tentative Agenda

EMPLOYEE BENEFITS PROGRAMS COMMITTEE

Thursday and Friday, October 25-26, 2018

Roughrider Room, State Capitol

Bismarck, North Dakota

Thursday, October 25, 2018

10:00 a.m. Call to order
Roll call
Consideration of the minutes of the October 19, 2018, meeting
Comments by the Chairman

RECRUITMENT AND RETENTION BONUSES REPORT

10:05 a.m. Presentation by Ms. Becky Sicble, Interim Director, Human Resource Management Services Division, Office of Management and Budget, of a report, as required under North Dakota Century Code Section 54-06-31, on the implementation, progress, and bonuses provided by state agency programs to provide bonuses to recruit or retain employees in hard-to-fill positions
Comments by interested persons
Committee discussion and directives

ACTUARIAL VALUATIONS OF THE TEACHERS' FUND FOR RETIREMENT

10:20 a.m. Presentations by Ms. Kim Nicholl, Senior Vice President, and Ms. Tanya Dybal, Senior Actuarial Analyst, The Segal Group, Inc., regarding:

- An overview of the Teachers' Fund for Retirement (TFFR) valuation process
- The July 1, 2018, actuarial valuation of TFFR

Comments by interested persons
Committee discussion and directives

BILL DRAFT ACTUARIAL REVIEWS

11:20 a.m. Committee consideration of bill drafts to determine whether the bill drafts affect, actuarially or otherwise, the retirement programs of state employees or employees of any political subdivision, and health and retiree health plans of state employees or employees of any political subdivision pursuant to Section 54-35-02.4
Committee discussion and directives

11:30 a.m. Committee consideration and receipt of technical comments, actuarial information, and public comments relating to the following bill drafts over which the committee has taken jurisdiction which affect, actuarially or otherwise, the retirement programs of state employees or employees of any political subdivision, and health and retiree health plans of state employees or employees of any political subdivision pursuant to Section 54-35-02.4:

- Bill Draft No. 126, which updates Century Code relating to the TFFR to remain in compliance with the federal Internal Revenue Code
- Bill Draft No. 20, which revises the duties of the Employee Benefits Programs Committee

12:00 noon Luncheon recess

1:00 p.m.

Committee consideration of bill drafts continued

- Bill Draft No. 19, which provides if a state employee elects family health benefits coverage, the employee pays the difference between the cost of the individual coverage and the family coverage
- Bill Draft No. 117, which provides contracts for the provision of health benefits coverage may not exceed 2 years and may not be renewed and updates the law relating to the Public Employees Retirement System (PERS) self-insurance health plans
- Bill Draft No. 128, which provides if health benefits are provided through a self-insurance health plan, PERS is not required to provide prescription drug coverage through a third-party administrator and is not required to provide stop-loss coverage for prescription drug coverage. The bill draft also clarifies only vested members of the Highway Patrolmen's retirement system are qualified to purchase service credit and that retiree health benefits are able to be used for any dental, vision, and long-term care benefits
- Bill Draft Nos. 129.01 and 129.02, which for new hires, reallocate the 1.14 percent employer contribution currently allotted to the retiree health insurance credit fund to the general pool of funds in the main plan
- Bill Draft Nos. 130.01 and 130.02, which for new hires, decrease the retirement multiplier from 2.0 to 1.75 percent
- Bill Draft No. 131, which provides for an increase in employee and employer contribution for the main retirement fund and the defined contribution plan
- Bill Draft No. 135, which provides for future terminations, final average salary is the higher of two alternative calculations
- Bill Draft No. 146, which provides for a health savings account alternative to the traditional health benefits coverage for state employees and provides for a report to the Employee Benefits Programs Committee
- Bill Draft No. 289, which provides the Insurance Department regulates PERS self-insurance health plans, revises the requirements of a self-insurance health plan, and revises the contract renewal requirements for a PERS health benefits contract

Comments by interested persons

Committee discussion and directives

4:00 p.m.

Recess

Friday, October 26, 2018

8:30 a.m.

Presentation by Mr. Scott Miller, Executive Director, Public Employees Retirement System, providing an update on the activities of the PERS Board

Committee discussion and directives

9:00 a.m.

Presentation by Mr. Lance Weiss, Senior Consultant, Gabriel, Roeder, Smith & Company Holdings, Inc., regarding:

- An overview of the PERS valuation process
- The July 1, 2018, actuarial valuations of the PERS main retirement system, judges retirement fund, Public Safety retirement system, Highway Patrolmen's retirement system, Job Service North Dakota retirement system, and Retiree Health Insurance Credit Program

Committee discussion and directives

10:30 a.m.

Adjourn

Committee Members

Representatives: Mike Lefor (Chairman), Randy Boehning, Jason Dockter, Vernon Laning, Alisa Mitskog,
Mark S. Owens, Roscoe Streyle

Senators: Brad Bekkedahl, Dick Dever, Karen K. Krebsbach, Oley Larsen, Gary A. Lee, Carolyn C.
Nelson

Staff Contact: Jennifer S. N. Clark, Counsel

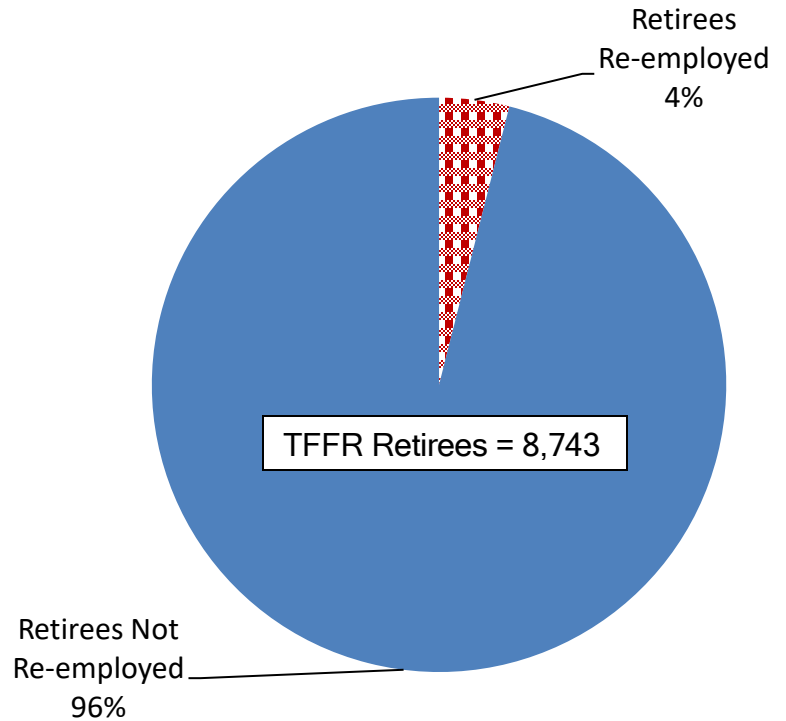
TFFR RE-EMPLOYED RETIREE REPORT 2017-18

**Total number of
Re-employed Retirees: 347**

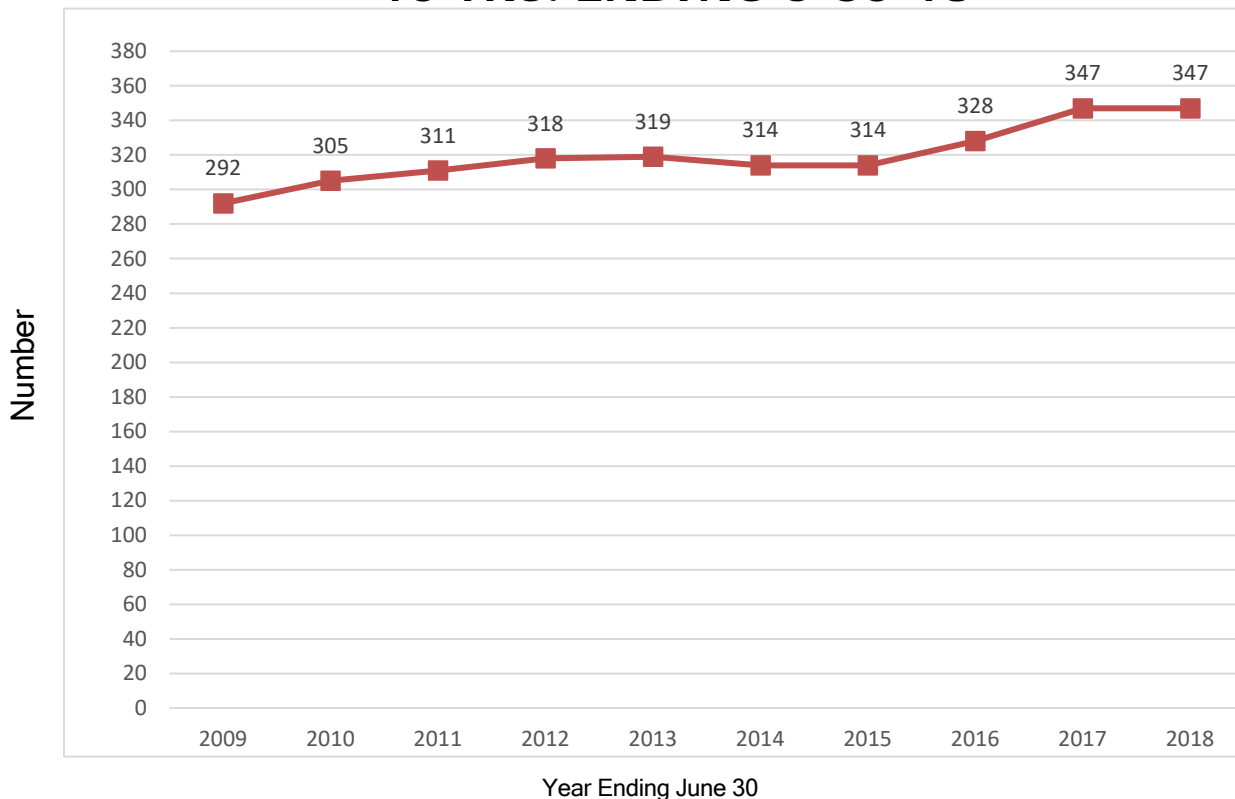
Superintendents	20
Administrators	24
Teachers	<u>303</u>

General Rule	300
Critical Shortage Area	45
Suspend and Recalculate	<u>2</u>

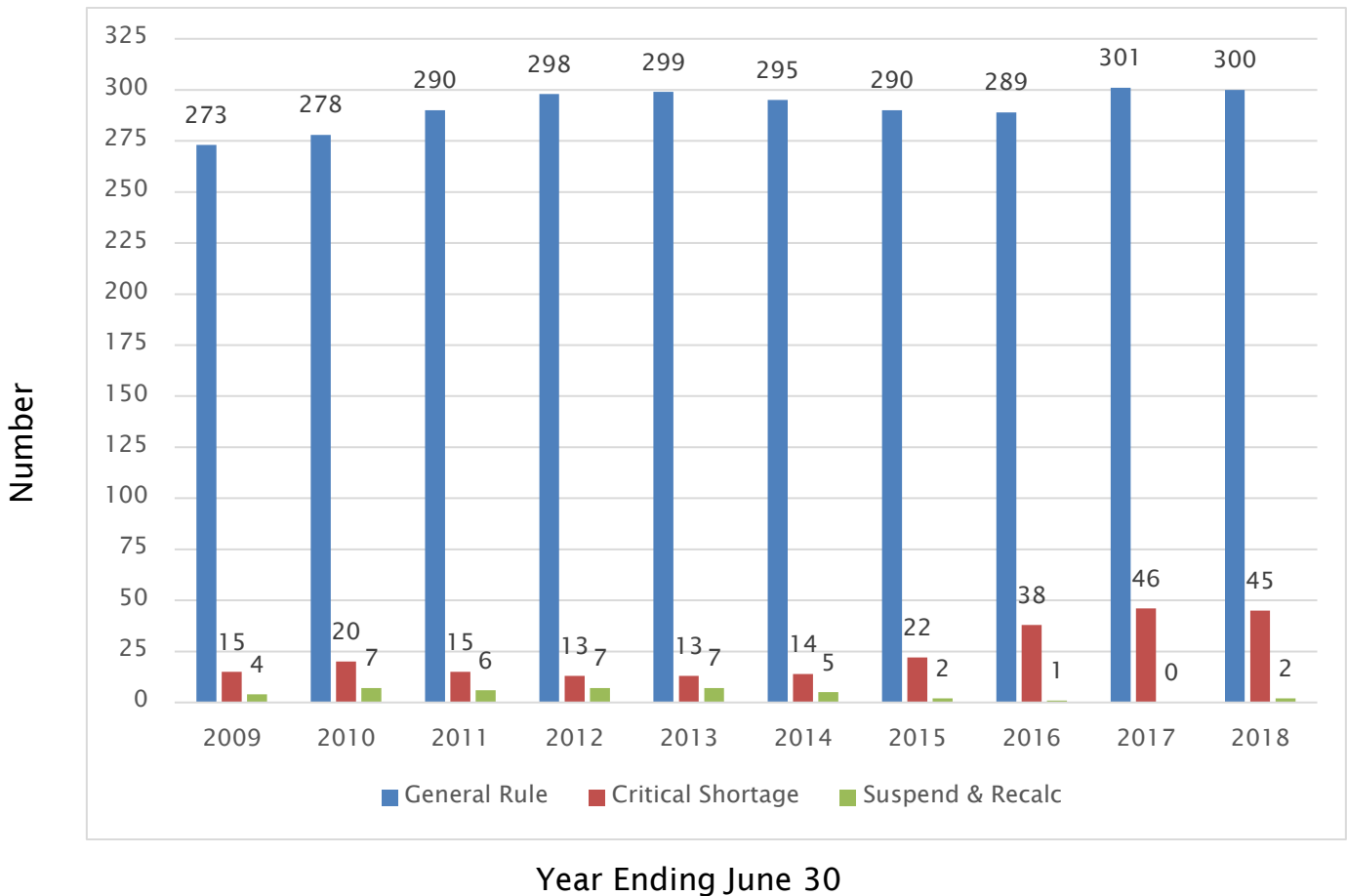
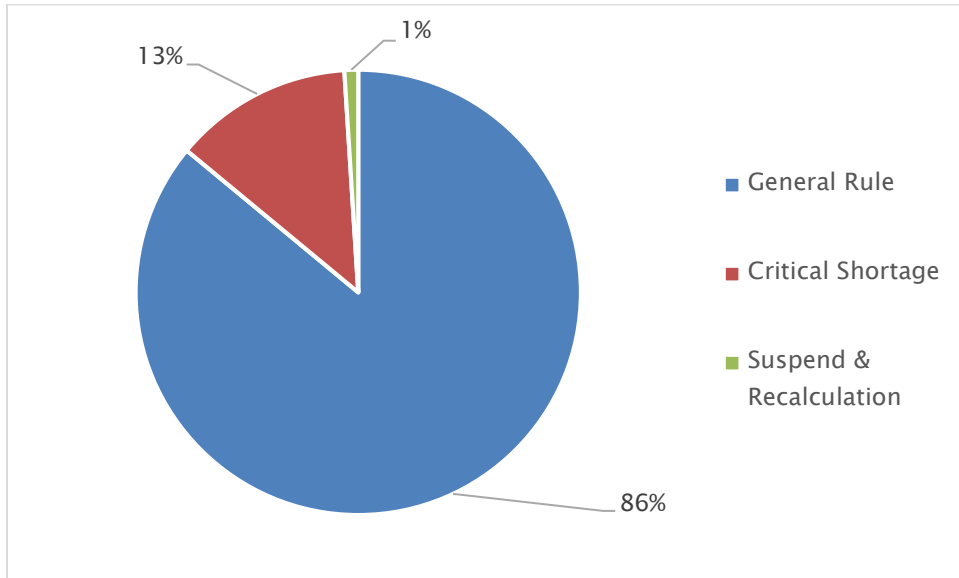
Average Age	64
Average Salary	\$25,900
Total Salaries	\$8,935,878
No. Employers w/retirees	139



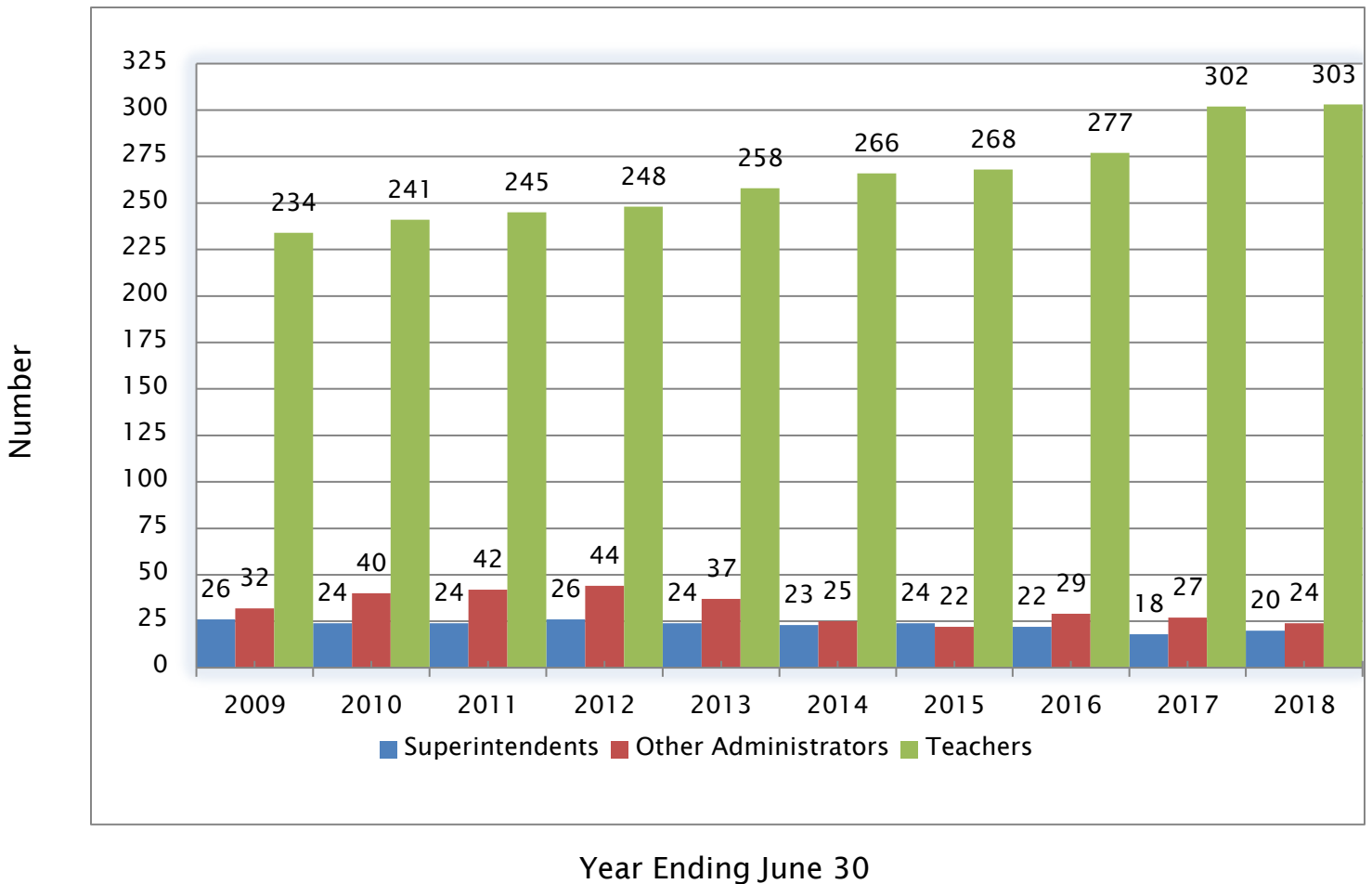
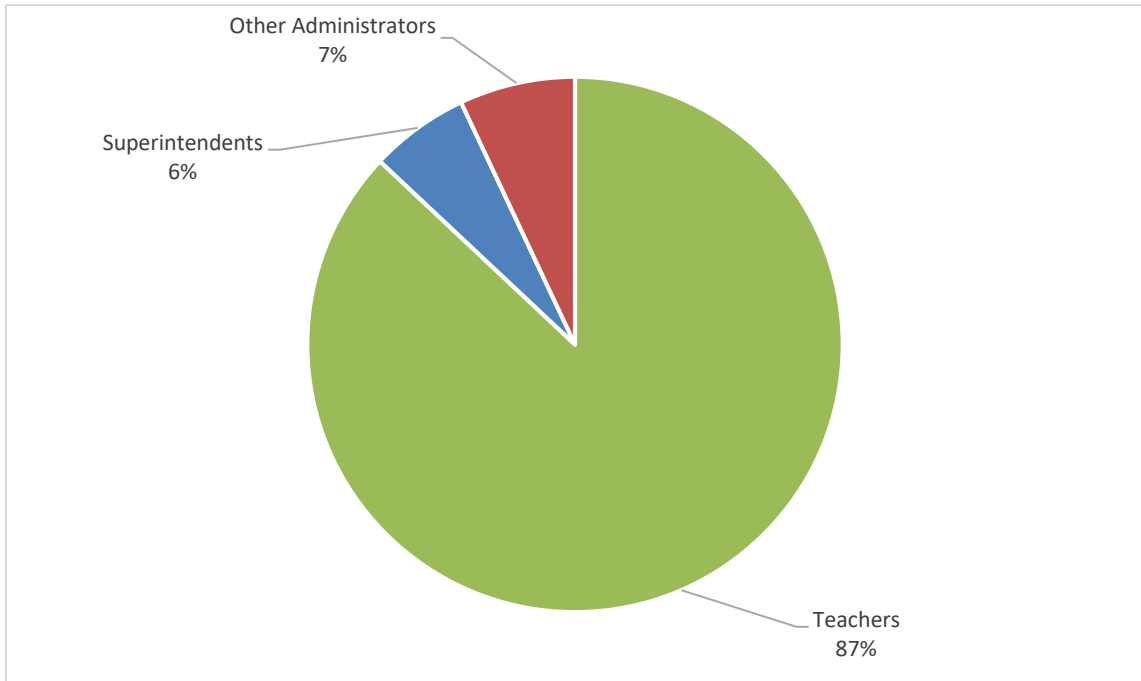
TFFR RE-EMPLOYED RETIREES 10 YRS. ENDING 6-30-18



TFFR RE-EMPLOYED RETIREES BY OPTION 2017-18



TFFR RE-EMPLOYED RETIREES BY JOB TYPE 2017-18



TFFR REEMPLOYED RETIREES

BY SUBJECT/POSITION

2017-18

<u>Subject or Position</u>	Re-Employed Retirees		
	Full Time CSA/SR	Part Time Gen Rule	Total
Art	0	5	5
Business	3	9	12
Counseling	0	14	14
Elementary Ed	9	16	25
English/Reading	4	13	17
Extra-Curricular	0	32	32
FACS	1	5	6
Foreign Language	2	6	8
Health/Phy Ed	1	5	6
Library/Media	1	4	5
Math	3	5	8
Mentors, Strategists, Prof. Dev.	2	18	20
Music	2	11	13
Science	3	11	14
Social Studies/History	1	5	6
Special Ed/Title/LD/Speech *	10	48	58
Summer School/Driver's Ed	0	18	18
Tech Coordination/Tech Ed	1	3	4
Voc Ed/Adult Ed	1	20	21
Other Teachers	1	10	11
Total Retired Teachers	45	258	303
Superintendent	2	18	20
Principle/Asst. Supt.	0	9	9
Director/Coordinator	0	15	15
Total Retired Administrators	2	42	44
Total Reemployed Retirees	47	300	347

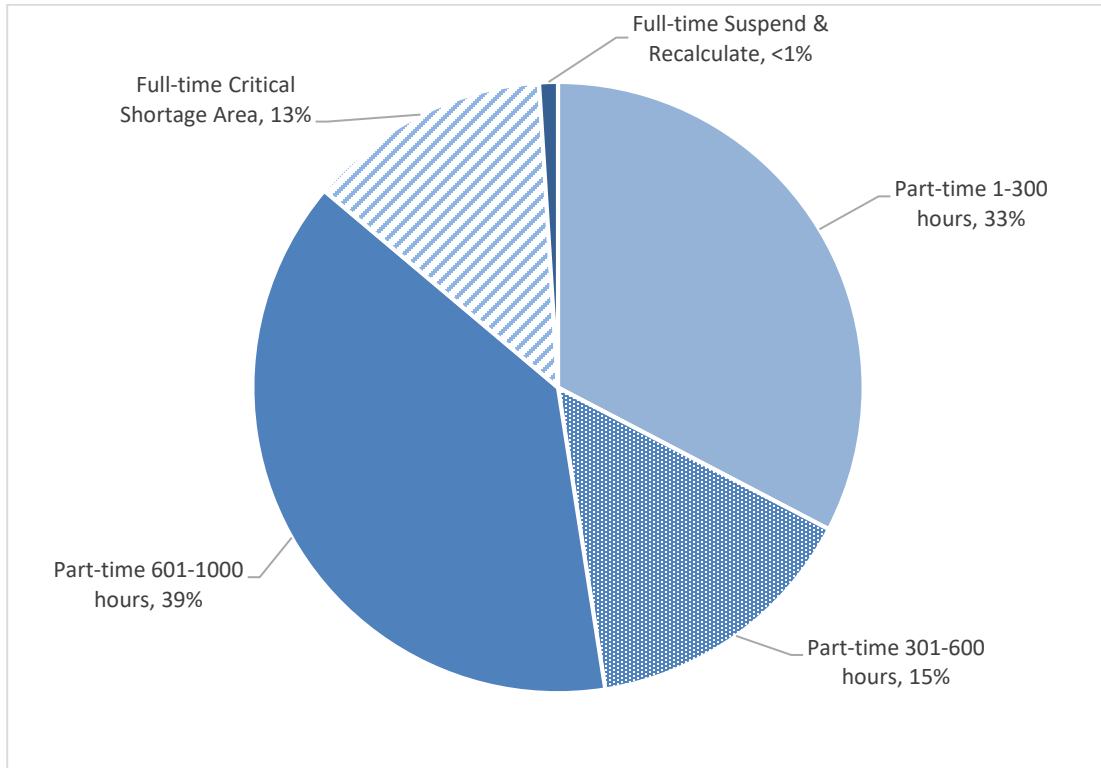
(8 teaching in 2 school districts)

*Special Ed	
LD	4
Speech Path/Ther	5
Spec Ed	29
Title	17
Vision Impair	3

CSA = Critical Shortage Area

SR = Suspend & Recalc

TFFR RE-EMPLOYED RETIREES BY HOURS CONTRACTED 2017-18



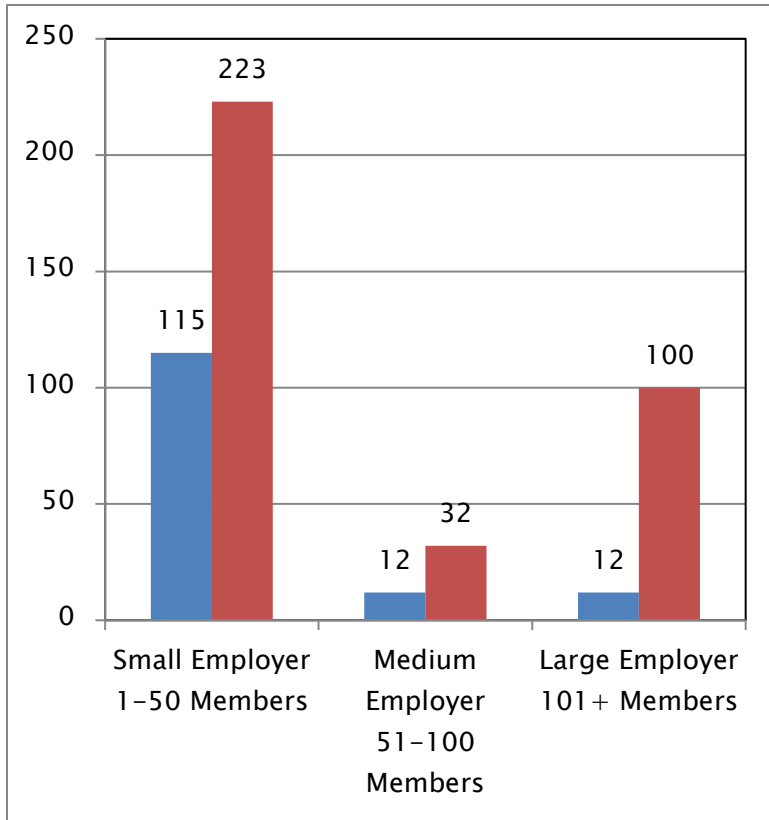
<u>Hours Contracted</u>	<u>Re-employed Retirees</u>	
	Number	Percent
Part Time – General Rule		
1 – 300 hours	115	33
301 – 600 hours	51	15
601 – 1000 hours	134	39
 Full Time		
Critical Shortage Area	45	13
Suspend & Recalculate	<u>2</u>	<u><1</u>
 Total Re-employed Retirees	347	100%
(8 teaching in 2 districts)		

TFFR RE-EMPLOYED RETIREES BY EMPLOYER 2017-2018

School Districts	#	School Districts	#	School Districts	#
Alexander	1	Glenburn	2	Midkota	5
Anamoose	1	Goodrich	3	Midway	3
Apple Creek Elementary		Grafton		Milnor	1
Ashley		Grand Forks	15	Minnewauken	3
Bakker Elementary		Grenora		Minot	9
Barnes County North	1	Griggs County Central	2	Minto	1
Beach	1	Halliday	1	Mohall-Lansford-Sherwood	
Belcourt	2	Hankinson		Montpelier	
Belfield	3	Harvey	1	Mott-Regent	1
Beulah	3	Hatton Eielson	1	Mt. Pleasant	1
Billings County School	3	Hazelton-Moffit		Munich	3
Bismarck	17	Hazen	2	Napoleon	2
Bottineau	3	Hebron	3	Naughton Rural	1
Bowbells		Hettinger	1	Nedrose	2
Bowman	2	Hillsboro	1	Nesson	
Burke Central		Hope	1	New England	4
Carrington	1	Horse Creek Elementary		New Rockford-Sheyenne	1
Cavalier	2	Jamestown	3	New Salem-Almont	2
Center-Stanton		Kenmare		New Town	3
Central Cass	1	Kensal	2	Newburg United	
Central Elementary	1	Kidder County School Dist.	2	North Border School	6
Central Valley	1	Killdeer	2	North Sargent	
Dakota Prairie	2	Kindred		North Star-Cando	4
Devils Lake	3	Kulm	1	Northern Cass	1
Dickinson	1	Lakota	2	Northwood	3
Divide County	2	LaMoure	1	Oakes	
Drake		Langdon	2	Oberon Elementary	1
Drayton	3	Larimore	2	Page	1
Dunseith	2	Leeds		Park River	3
Earl Elementary		Lewis and Clark	2	Parshall	1
Edgeley	1	Lidgerwood		Pingree-Buchanan	1
Edmore	2	Linton	1	Powers Lake	2
Eight Mile		Lisbon		Richardton-Taylor	2
Elgin/New Leipzig	1	Litchville-Marion		Richland	
Ellendale		Little Heart Elementary		Rolette	3
Emerado Elementary		Lone Tree Elementary		Roosevelt-Carson	
Enderlin Area School	1	Maddock	1	Rugby	1
Fairmount	1	Mandan	4	Sargent Central	
Fargo	19	Mandaree	2	Sawyer	
Fessenden-Bowdon	1	Manning Elementary		Scranton	
Finley-Sharon	2	Manvel Elementary	2	Selfridge	2
Flasher		Maple Valley	2	Solen-Canonball	
Fordville Lankin	1	Mapleton Elementary		South Heart	3
Fort Ransom Elementary		Marmarth Elementary	1	South Prairie	
Fort Totten	5	Max		St. John's School	5
Fort Yates	1	Mayville-Portland CG	3	St. Thomas	5
Gackle-Streeter	2	McClusky	1	Stanley	
Garrison		McKenzie County School Dist			
Glen Ullin	1	Medina	1		
		Menoken Elementary			

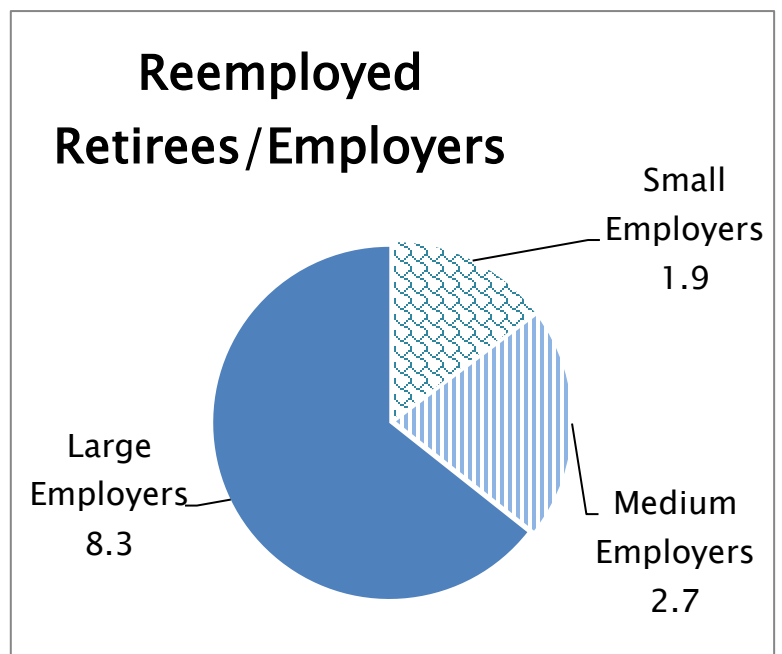
School Districts (cont)	#	Special Education Units		Other	
Starkweather		Burleigh County Special Ed	2	Great NW Education Co-op	
Sterling Elementary	1	East Central Special Ed	6	ND United	
Strasburg	1	GST Educational	1	Rough Rider Ed Services	1
Surrey	1	James River Special Ed		South East Education Co-op	2
Sweet Briar Elementary		Lake Region Special Ed	1		
TGU		Lonetree Special Ed	1		
Thompson		Northern Plains Special Ed			
Tioga		Oliver-Mercer Special Ed			
Turtle Lake-Mercer	1	Peace Garden Special Ed	1		
Twin Buttes Elementary		Pembina Special Ed		Total TFFR Participating Employers	214
Underwood	4	Rural Cass County Special Ed	1		
United		Sheyenne Valley Special Ed	1		
Valley-Edinburg	6	Souris Valley Special Ed			
Valley City	1	South Central Prairie Sp Ed	1	139 Employers Employing TFFR Retirees (65%)	
Velva	3	South Valley Special Ed			
Wahpeton	1	Southwest Special Ed			
Warwick	2	Upper Valley Special Ed	2		
Washburn	3	West River Student Services	2	347 TFFR Retirees Employed (8 retirees working in 2 school districts)	
West Fargo	22	Wil-Mac Special Ed	7		
Westhope	2				
White Shield	3				
Williams Co School Dist					
Williston	4				
Wilton					
Wing		Vocational Centers			
Wishek	3	N Valley Career & Tech Ctr	1		
Wolford	4	Roughrider Area Career/Tech	1		
Wyndmere		SE Region Career & Tech Ctr			
Yellowstone		Sheyenne Valley Area Voc Ctr			
Zeeland	1				
County Superintendents		State Agencies & Institutions			
Logan County		ND Center for Distance Ed	5		
McKenzie County		ND Dept of Public Instruction			
Morton County	1	ND School for the Blind	3		
Nelson County		ND School for the Deaf	1		
Slope County		ND Youth Correctional Center	1		
Ward County					

TFFR RE-EMPLOYED RETIREES BY EMPLOYER SIZE 2017-18



<u>Empl Size</u>	<u>All Empl.</u>	<u>Empl w/ Re-empl Retirees</u>	
Small	184	115	63%
Medium	17	12	71%
Large	<u>13</u>	<u>12</u>	92%
Total	214	139	65%

<u>Employer Size</u>	<u>Re-empl Retirees</u>	
Small	223	63%
Medium	32	9%
Large	<u>100</u>	<u>30%</u>
Total	355	100%



347 Retirees employed by 139 employers
(8 retirees working in 2 districts)

Average All = 2.6 retirees/employer

**RETIREMENT AND INVESTMENT OFFICE
AUDIT SERVICES
2018-2019 1st Quarter Audit Activities Report
July 1, 2018 – September 30, 2018**

The audit objective of Audit Services is twofold: first, to provide comprehensive, practical audit coverage of the Retirement and Investment Office (RIO) programs; second, to assist RIO management and the State Investment Board (SIB) by conducting special reviews or audits.

Audit coverage is based on the July 1, 2018 through June 30, 2019 work plan approved by the SIB Audit Committee. The audit activities undertaken are consistent with the Audit Services charter and goals, and the goals of RIO. To the extent possible, our audits are being carried out in accordance with the International Standards for the Professional Practice of Internal Auditing. Audit effort is being directed to the needs of RIO and the concerns of management and the SIB Audit Committee.

Retirement Program Audit Activities

• **TFFR Employer Audit Program**

We examine employer reporting to the Teachers' Fund for Retirement (TFFR) to determine whether retirement salaries and contributions reported for members of TFFR are in compliance with the definition of salary as it appears in NDCC 15-39.1-04(10). Other reporting procedures reviewed during the audit process are calculation of service hours and eligibility for TFFR membership. A written report is issued after each audit examination is completed. The TFFR Employer Audit Program includes Compliance Audits, and Not in Compliance (NIC) Reviews.

Status of TFFR Employer Audits as of September 30, 2018:

- One (1) employer audits had been completed.
- Two (2) employer audits were in progress.
- Three (3) employer audits were pending but not yet started.

• **Cost Benefit Effective Benefit Payment Audit**

A review of TFFR benefit recipients is completed to determine that they received their retirement benefits in a cost effective and timely manner. Audit Services also verifies the accuracy of benefit payments via the recalculation of benefit payments for the sampling of member accounts. This audit is currently in process.

Administrative and Investment Audit Activities

• **Executive Limitation Audit**

Each year the SIB conducts a customer satisfaction survey. The purpose of this annual survey is to determine how well the SIB, through the staff of the RIO, is meeting the expectations of its clients. This survey is part of the SIB's ongoing effort to be more responsive to the needs of their clients and to continually improve the services that are provided. Audit Services facilitated the survey in July and August 2018 and results were provided to the SIB at their October 26, 2018 meeting.

• **External Audit Support**

Audit Services provided support to our external audit partners, CliftonLarsonAllen (CLA), during the GASB 68 Census Data Audits. Audit Services notified eleven employers of an upcoming GASB 68 Census Data Audit in July 2018. CLA anticipated that GASB 68 Census Data Audit work would conclude in mid-October.

• **Risk Assessment**

A formal agency risk assessment of RIO was completed. A risk assessment is a process to identify potential risks and analyze what could happen if it would occur. The purpose of a risk assessment is to identify risk involved in the activities or systems and provide assurance that risk is being managed by management.

Professional Development/CE/General Education

Audit Services continued its participation with the Institute of Internal Auditors (IIA) Central NoDak Chapter by attending the September monthly meeting about data analytics.

**NORTH DAKOTA RETIREMENT AND INVESTMENT OFFICE
 AUDIT SERVICES DIVISION
 FISCAL YEAR 2018 -2019**

	FY 2018 1st QTR	FY 2018 2nd QTR	FY 2019 3rd QTR	FY 2019 4th QTR	FY 2019 TOTAL
Audit Activities					
Retirement Program Audits:					
TFFR Employer Audit Program					213
<i>Alexander Public School District</i>	88				88
<i>Garrison Public School District</i>	37				37
<i>Lidgerwood Public School District</i>	47				47
<i>Scranton Public School District</i>	27				27
<i>General Employer Audits</i>	8				8
<i>Audit Peer Reviews/TFFR Meeting(s)/Audit Planning/Audit Notifications</i>	6				6
TFFR Cost Effective Benefit Payment Audit	2				2
TFFR File Maintenance Audit(s)					0
Annual Salary Verification Project					0
Audit Continuous Improvement Project - Employer Audit Program - Census Data Audit File	13				13
Agency Administrative and Investment Audits:					
Executive Limitations Audit	7				7
Risk Assessment	206				206
RIO External Auditor Assistance	23				23
Administrative Activities					
Administrative - Staff Mtgs, Time Reports, Email, Records Retention, General Reporting	180				180
Audit Committee/SIB/TFFR Attendance and Preparation	186				186
Professional Development/CE/General Education	1				1
Annual Leave, Sick Leave, and Holidays	209				209
Quarterly Total:	1040	0	0.00	0.00	1040

Total Hours for 2018-2019 4,160

D. Thorsen Total Hours 2018-2019 2,080

S. Sauter Total Hours 2018-2019 2080

MEMORANDUM

TO: TFFR Board
FROM: Fay Kopp
DATE: October 18, 2018
SUBJ: Trustee Educational Conference Reports

NCTR, NEA, Callan, and other organizations provide excellent pension and investment education and networking opportunities with pension trustees, administrators, and industry professionals from all over the country.

To help trustees fulfill fiduciary responsibilities in managing the trust fund, TFFR Board members have attended a number pension and investment related educational conferences in 2018.

- Treas. Schmidt Callan Conference 01/18 San Francisco, CA
- Mike Burton NEA Pension Trustee Forum 06/18 Minneapolis, MN
- Toni Gumeringer NEA Pension Forum (NDU) 06/18 Minneapolis, MN
Callan College 07/18 San Francisco, CA
- Cody Mickelson NCTR Annual Conference 10/18 Washington DC
- Mel Olson NCTR Annual Conference 10/18 Washington DC

Please plan to share information with other trustees.

No enclosure for agenda item #11



NDTFFR Board Reading October 2018

- [Employee Contributions to Public Pension Plans](#) – National Association of State Retirement Administrators (NASRA), October 2018.
- [Selected Approved Changes to State and Local Public Pensions](#) – National Association of State Retirement Administrators (NASRA), July 2018
- [Putting Public Pensions through their Paces](#) – National Conference of State Legislatures (NCSL), June 2018