

January 25, 2018

Local Governmental Employees' Retirement Systems of North Carolina

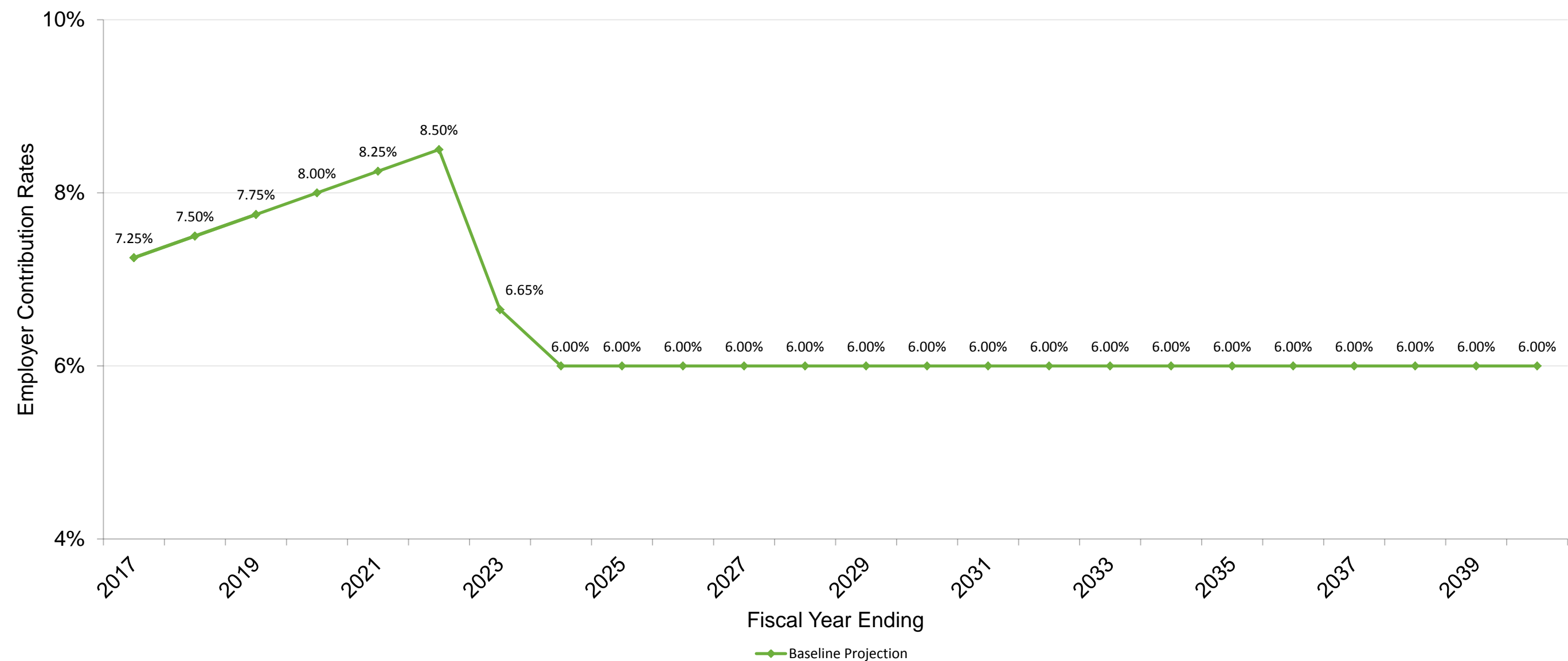
**Actuarially Determined Employer Contribution (ADEC)
Projections for the Local System**

Projections: Employer Contribution Rate and Funded Status

- Projections of employer contribution rates and funded status into the future can be helpful planning tools for stakeholders.
- Projections of future actuarial valuation results on the basis of exact fulfillment of actuarial assumptions are known as deterministic projections.
- Baseline deterministic projection is based on:
 - December 31, 2016 valuation results
 - December 31, 2016 valuation assumptions and methods to project future valuation results, including:
 - Valuation interest rate of 7.20% for all years
 - Assumed investment return of 13.25% for calendar year 2017
 - Investment return of 7.20% on market value of assets for all future years
 - The contribution rate under the Employer Contribution Rate Stabilization Policy is contributed through the fiscal year ending in 2022.
 - The actuarially determined contribution (ADEC) is contributed for fiscal years ending 2023 and beyond.
 - 0% increase in total active member population
 - No cost-of-living adjustments granted
 - Future pay increases based on long-term salary increase assumptions

This presentation includes projections on baseline economic assumptions, as well as various sensitivities that illustrate potential investment returns or interest rates less than the baseline assumptions. The purpose of the sensitivity projections is to illustrate the significance of potential adverse experience. The inclusion of sensitivity projections in this presentation should not be interpreted as a recommendation to change the Board's current assumptions.

Projections: Employer Contribution Rates Baseline – General Employees and Firefighters



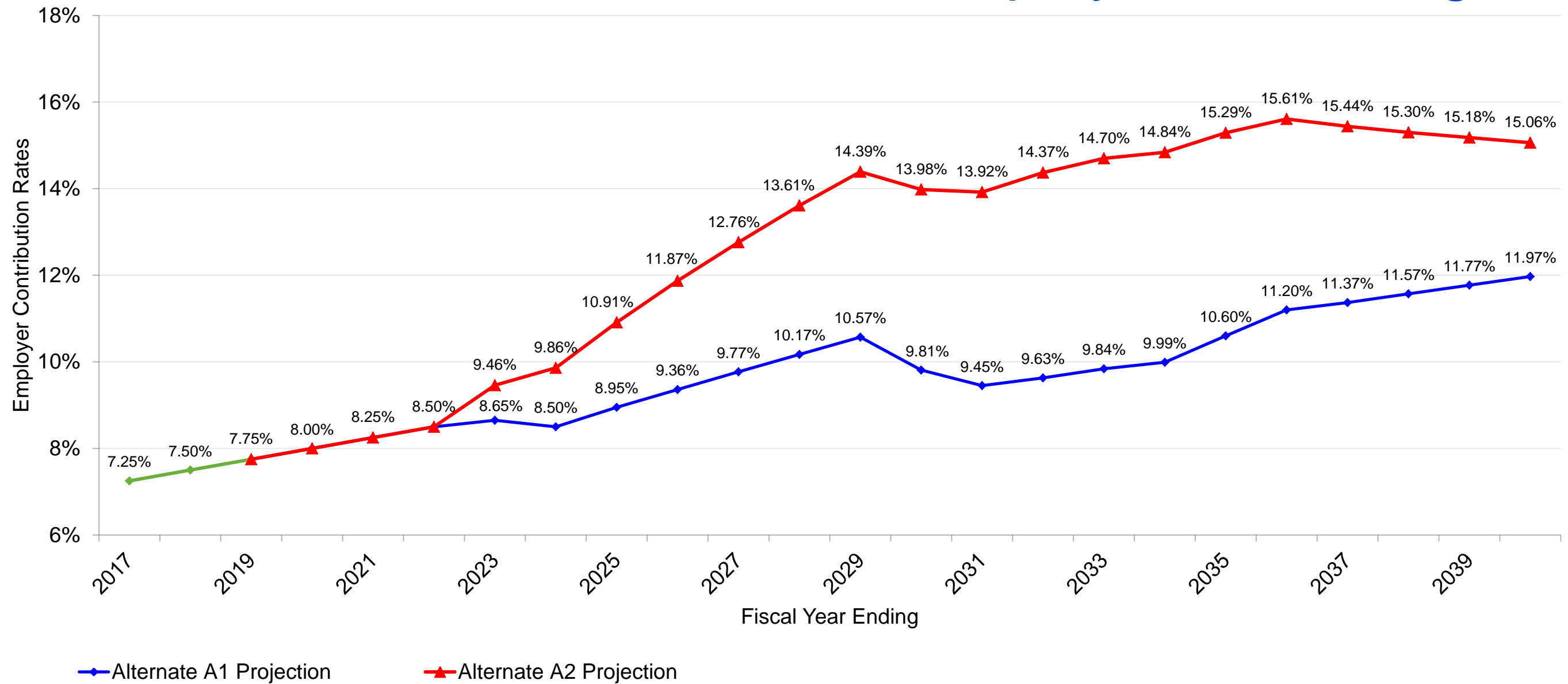
Projections: Funded Ratio Baseline



Projections: Employer Contribution Rate and Funded Status – Alternatives A1 & A2

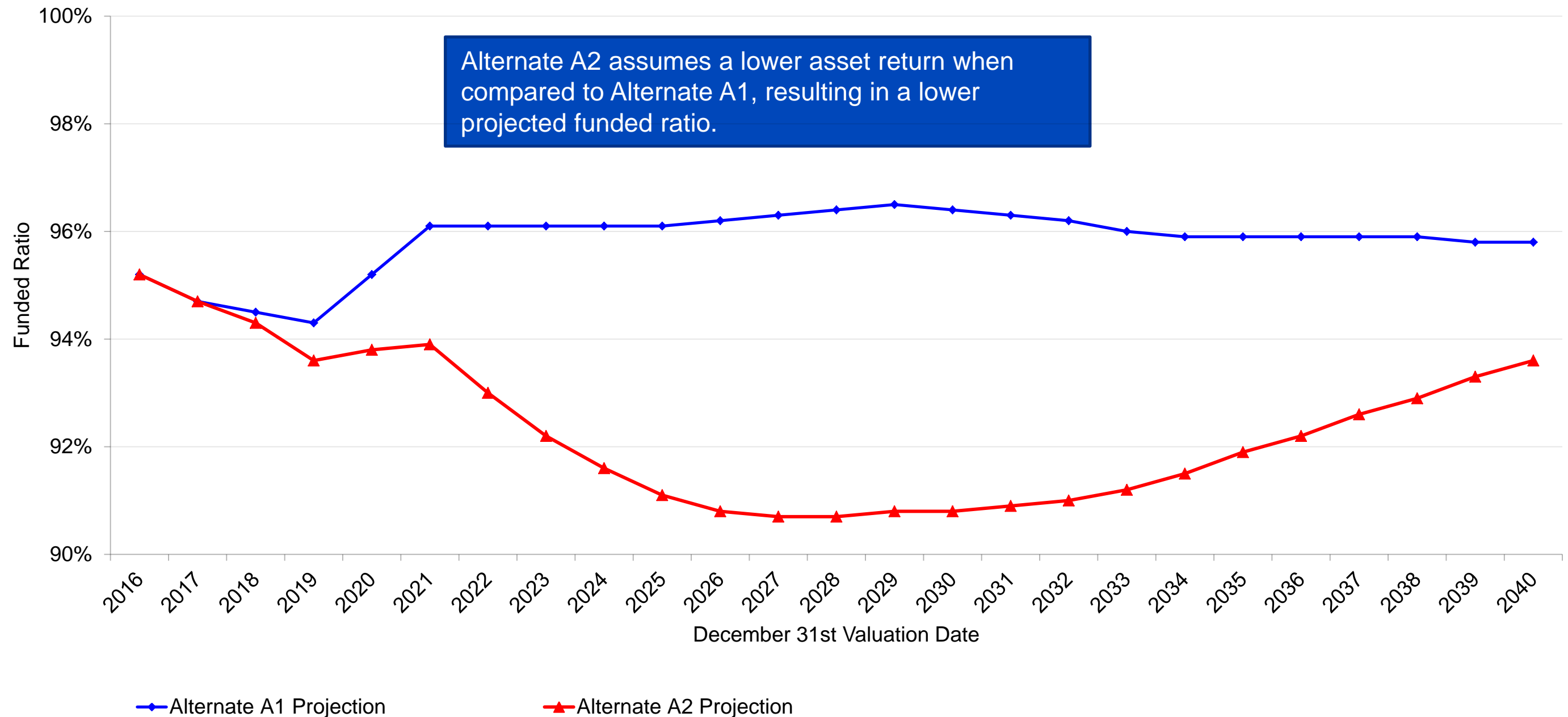
- Alternate A1 deterministic projection based on the same assumptions as the baseline deterministic projection, except:
 - Future valuation interest rates are assumed to be 7.15% for the December 31, 2017 valuation with an annual decline of 5 basis points thereafter until reaching an ultimate rate of 6.00% for the December 31, 2040 and later valuations.
 - Future investment returns (2018 and later) are assumed to be equal to the discount rate from the valuation at the end of the prior year
- Alternate A2 deterministic projection based on the same assumptions as the Alternate A1 deterministic projection, except:
 - All future investment returns are assumed to be equal to 6.00% per year.

Projections: Employer Contribution Rates Alternatives A1 & A2 – General Employees & Firefighters



Alternate A2 assumes a lower asset return when compared to Alternate A1. As a result, the unfunded accrued liability and normal cost will be higher resulting in higher projected contributions.

Projections: Funded Ratio – Alternatives A1 & A2



Projections: Employer Contribution Rate and Funded Status – Alternatives A3 & A4

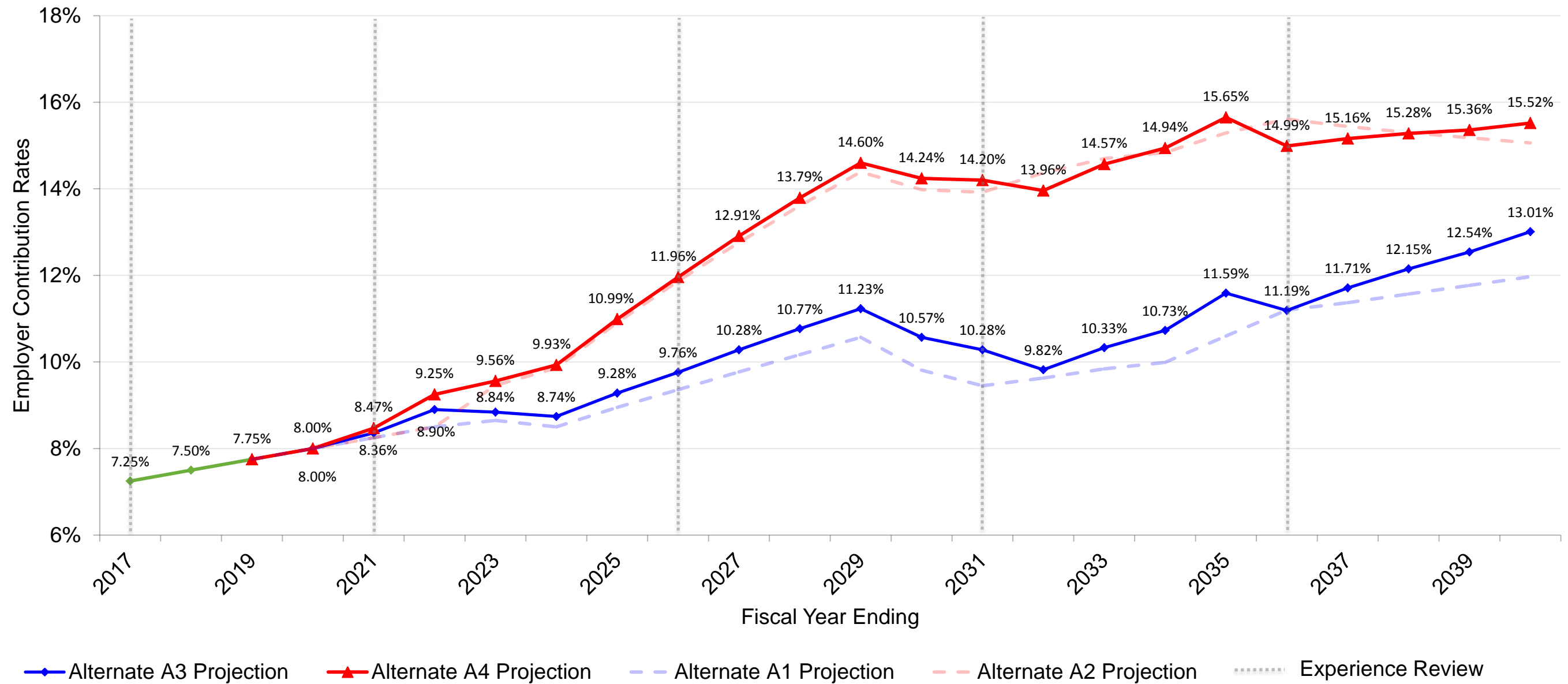
- Alternate A3 deterministic projection based on the same assumptions as the baseline deterministic projection, except:
 - Assumes that the Board elects in 2018 to use a discount rate of 7.00% for the December 31, 2017, valuation and such discount rate remains in place through the December 31, 2020 valuation
 - Assumes that the Board then elects in 2022 to use a discount rate of 6.75% for the December 31, 2021 valuation remaining in place through the December 31, 2025 valuation
 - Continuing with this pattern, assumes that the Board votes in 2027 to use a discount rate of 6.50% for the December 31, 2026 valuation, which remains in place until Board votes in 2032 to use a discount rate of 6.25% for the December 31, 2031 valuation, and finally the Board votes in 2037 to use a discount rate of 6.00% for the December 31, 2036 and later valuations
 - Future investment returns are assumed to be equal to the discount rate from the valuation at the end of the prior year.
 - ADEC for each year is based on a phase-in of the newly adopted discount rate and assumes the ADEC is paid each year.
 - Phase-in period is assumed to be four years for the change to 7.00% discount rate and five years for all other assumed discount rate changes
- Alternate A4 deterministic projection based on the same assumptions as the Alternative A3 deterministic projection, except:
 - All future investment returns are assumed to be equal to 6.00% per year.

Projections: Employer Contribution Rate and Funded Status – Alternatives A3 & A4 (continued)

- Examples to illustrate Alternate A3 and A4 deterministic projections
 - December 31, 2017 valuation ADEC would equal $\frac{3}{4}$ times the ADEC using a 7.20% discount rate plus $\frac{1}{4}$ times the ADEC using a 7.00% discount rate
 - December 31, 2024 valuation ADEC would equal $\frac{1}{5}$ times the ADEC using a 7.00% discount rate plus $\frac{4}{5}$ times the ADEC using a 6.75% discount rate
 - December 31, 2025 valuation ADEC would equal the ADEC using a 6.75% discount rate
- Important concepts to note about A3 and A4:
 - The approach here assumes that the Board makes decisions periodically (four years in the first step followed by every five years thereafter) around the time of each experience review
 - The only commitment the Board makes is to drop the discount rate to the next lowest multiple of 25 basis points until the next experience review
 - In these scenarios, for GASB purposes we would recommend dropping the discount rate to the ultimate rate the Board adopts (for example, the GASB discount rate would be 7.00% for the December 31, 2017, through December 31, 2020, valuations)
 - The phase-in approach is used for funding only and is commonly referred to as direct-rate smoothing
 - Gradual decreases in the assumed interest rate are posited as expansions of a margin for adverse deviation in this assumption and not as anticipated changes in the expected long-term rates of return on various asset classes

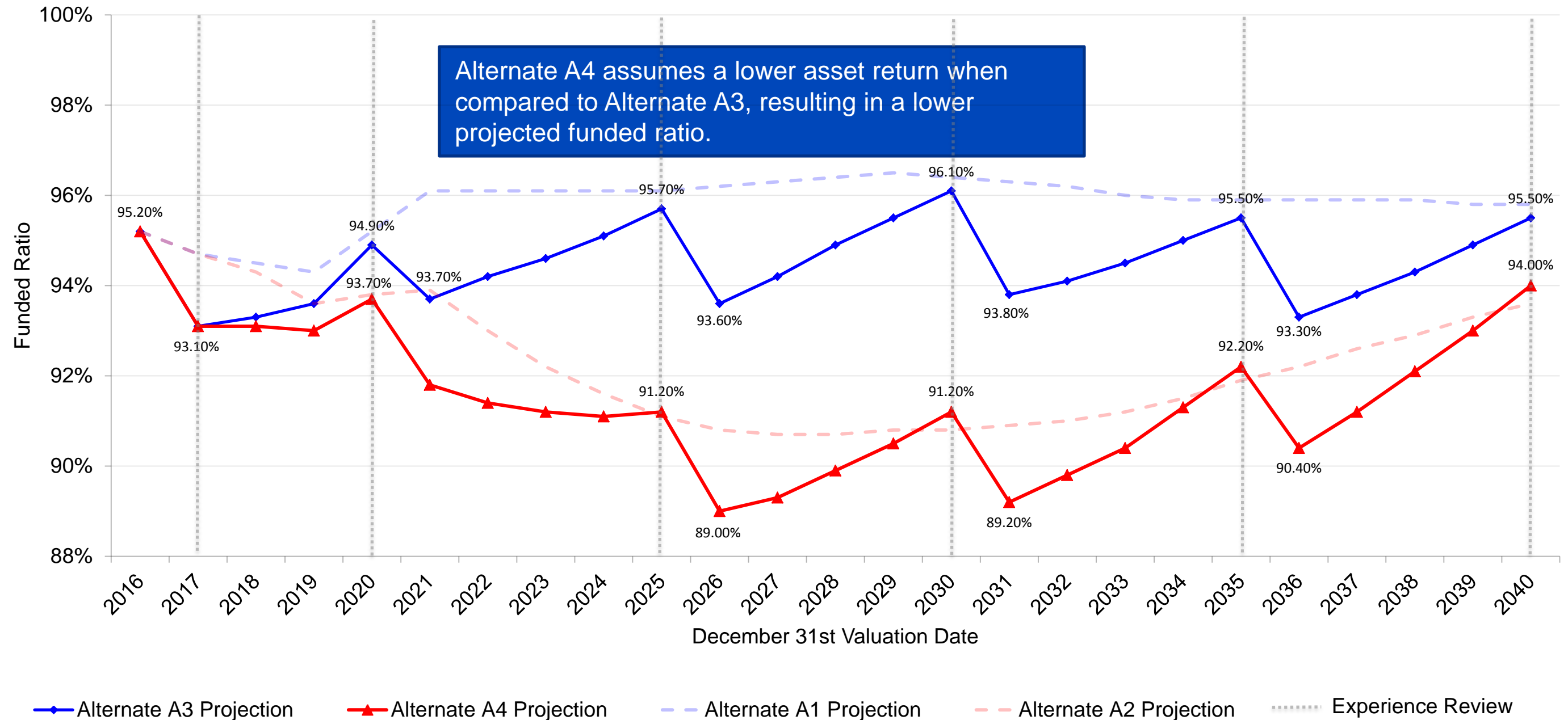
Projections: Employer Contribution Rates

Alternatives A3 & A4 – General Employees & Firefighters



Alternate A4 assumes a lower asset return when compared to Alternate A3. As a result, the unfunded accrued liability and normal cost will be higher resulting in higher projected contributions.

Projections: Funded Ratio Alternatives A3 & A4



Disclaimers

Where presented, references to “funded ratio” and “unfunded accrued liability” typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e. purchase annuities) for a portion or all of its liabilities.

Also, note that all of these projections are based upon the current actuarial assumptions used in the 2016 valuation. Future experience studies are likely to lead to revised assumptions over the projection period and these results do not reflect any of those possible changes.

Disclaimers (continued)

The inclusion of sensitivity projections in this presentation should not be interpreted as a recommendation to change the Board's assumption. However, if the assumptions underlying these sensitivity projections were to materialize, then the use of an ultimate interest rate as low as 6% might lead to other possible changes to be considered:

- For scenarios such as A1 and A2, it might be appropriate to reduce the valuation rate immediately to 6% if that is truly the expected long range rate of return for the purposes of complying with all of the pertinent Actuarial Standards of Practice and this might necessitate a change to 6% for the purposes of determining liabilities to be reported under GASB standards.
- As noted in the presentation, if the Board is going to make a decision to reduce the rate anticipated at selected times in the future based upon then available information, it might be appropriate to adopt that rate for the basic liability determinations applicable under GASB at the time the decision is made.
- If the reduction to a lower rate is associated with a new perspective regarding capital market (rather than assuming capital market assumptions are unchanged) but the reduction is associated with a modification in the portfolio structure to reduce risk, changes in the inflation assumptions and capital markets may also flow into the determination of future salary increase rates.
- Lastly, the projections herein are based upon the parameters regarding the anticipated rates, the timing of any decisions and reports prepared in future years may differ from these depending upon what decisions are made, as well as when they are made.

Certification

These results were prepared under the direction of Michael Ribble and David Driscoll, who meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about them.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and 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.

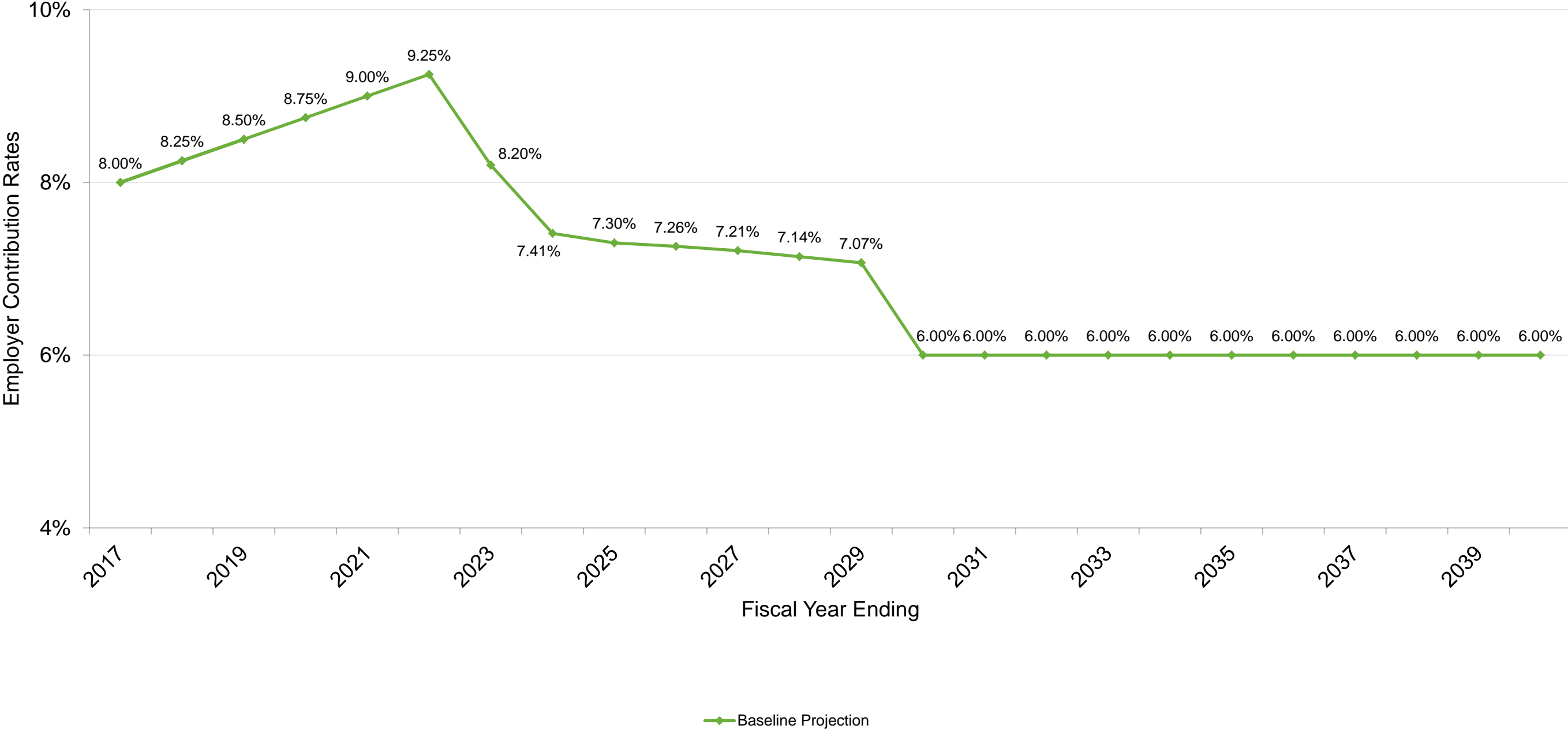
Except where otherwise indicated, an analysis of the potential range of such future differences is beyond the scope of this report.

Michael Ribble, FSA, EA, MAAA
Principal, Consulting Actuary

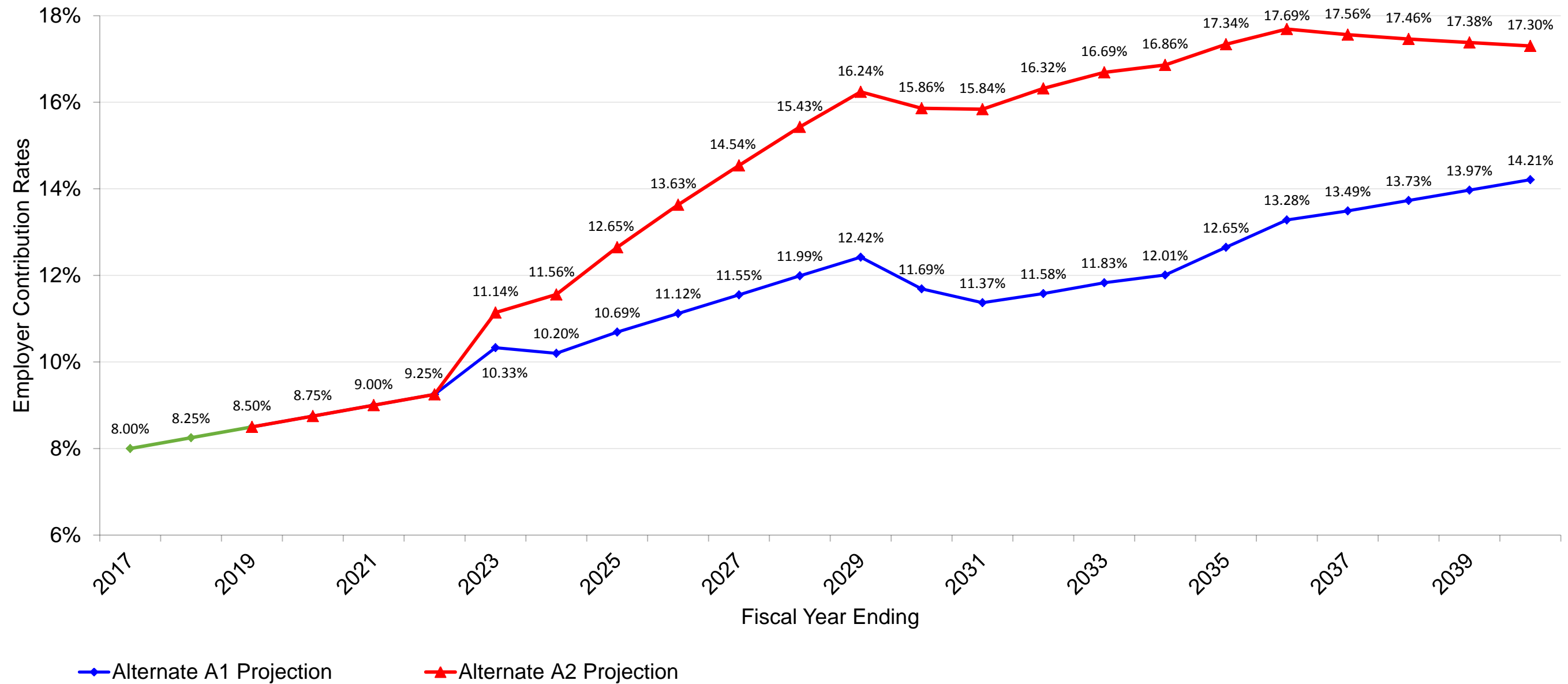
David Driscoll, FSA, EA, MAAA, FCA
Principal, Consulting Actuary

Appendix

Projections: Employer Contribution Rates Baseline – Law Enforcement Officers

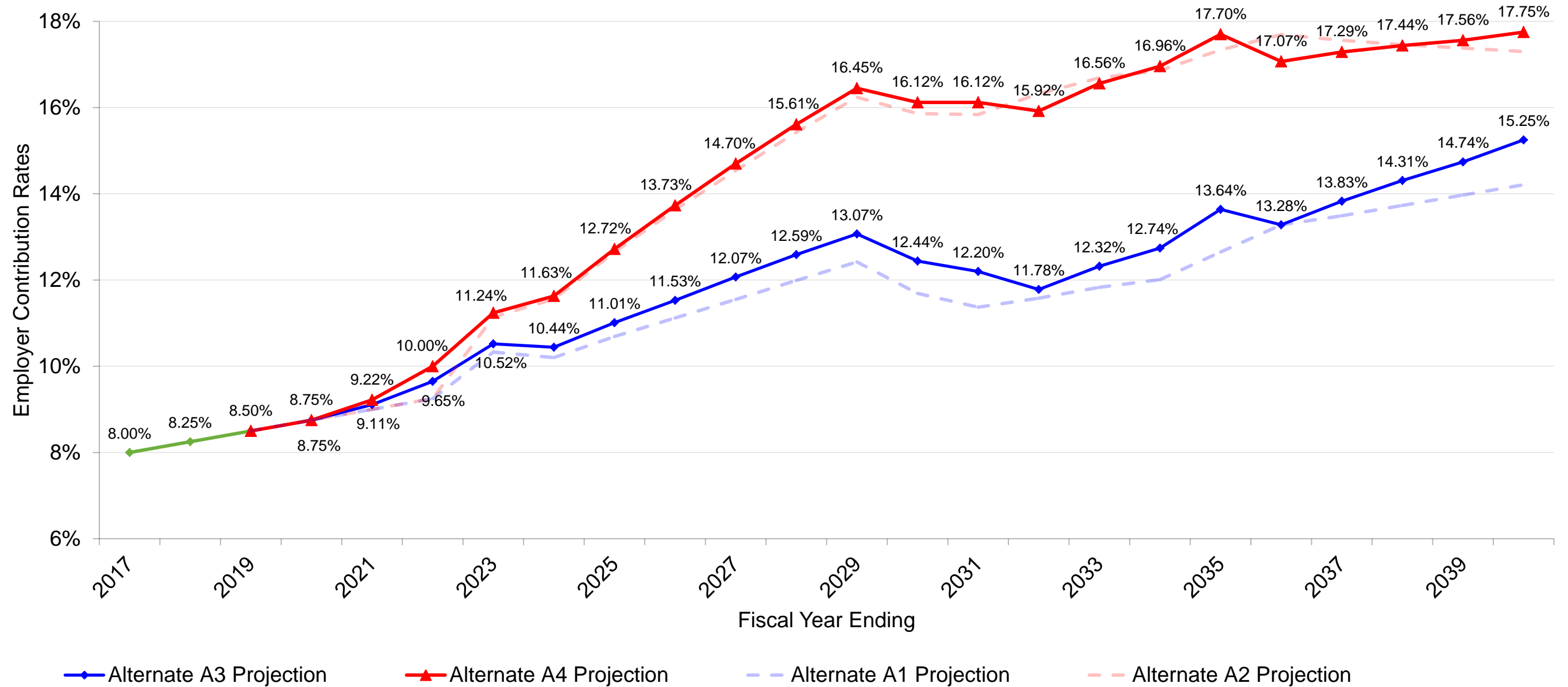


Projections: Employer Contribution Rates Alternatives A1 & A2 – Law Enforcement Officers



Alternate A2 assumes a lower asset return when compared to Alternate A1. As a result, the unfunded accrued liability and normal cost will be higher resulting in higher projected contributions.

Projections: Employer Contribution Rates Alternatives A3 & A4 – Law Enforcement Officers



Alternate A4 assumes a lower asset return when compared to Alternate A3. As a result, the unfunded accrued liability and normal cost will be higher resulting in higher projected contributions.

Fiscal Year Contribution Projection Baseline Scenario

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2019	7.75%	8.50%	498,000,000	379,000,000	1,517,000,000
6/30/2020	8.00%	8.75%	525,000,000	387,000,000	1,597,000,000
6/30/2021	8.25%	9.00%	555,000,000	397,000,000	1,679,000,000
6/30/2022	8.50%	9.25%	585,000,000	407,000,000	1,762,000,000
6/30/2023	6.65%	8.20%	481,000,000	417,000,000	1,849,000,000
6/30/2024	6.00%	7.41%	446,000,000	428,000,000	1,939,000,000
6/30/2025	6.00%	7.30%	456,000,000	439,000,000	2,032,000,000
6/30/2026	6.00%	7.26%	468,000,000	451,000,000	2,126,000,000
6/30/2027	6.00%	7.21%	480,000,000	463,000,000	2,220,000,000
6/30/2028	6.00%	7.14%	492,000,000	476,000,000	2,315,000,000
6/30/2029	6.00%	7.07%	505,000,000	489,000,000	2,411,000,000
6/30/2030	6.00%	6.00%	504,000,000	504,000,000	2,507,000,000
6/30/2031	6.00%	6.00%	518,000,000	518,000,000	2,603,000,000
6/30/2032	6.00%	6.00%	534,000,000	534,000,000	2,699,000,000
6/30/2033	6.00%	6.00%	551,000,000	551,000,000	2,794,000,000

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2034	6.00%	6.00%	568,000,000	568,000,000	2,889,000,000
6/30/2035	6.00%	6.00%	585,000,000	585,000,000	2,986,000,000
6/30/2036	6.00%	6.00%	604,000,000	604,000,000	3,084,000,000
6/30/2037	6.00%	6.00%	624,000,000	624,000,000	3,181,000,000
6/30/2038	6.00%	6.00%	643,000,000	643,000,000	3,273,000,000
6/30/2039	6.00%	6.00%	664,000,000	664,000,000	3,361,000,000
6/30/2040	6.00%	6.00%	685,000,000	685,000,000	3,447,000,000
6/30/2041	6.00%	6.00%	708,000,000	708,000,000	3,536,000,000
6/30/2042	6.00%	6.00%	731,000,000	731,000,000	3,633,000,000
6/30/2043	6.00%	6.00%	756,000,000	756,000,000	3,733,000,000
6/30/2044	6.00%	6.00%	781,000,000	781,000,000	3,836,000,000
6/30/2045	6.00%	6.00%	807,000,000	807,000,000	3,942,000,000
6/30/2046	6.00%	6.00%	834,000,000	834,000,000	4,055,000,000
6/30/2047	6.00%	6.00%	862,000,000	862,000,000	4,174,000,000

Fiscal Year Contribution Projection

A1 Scenario

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2019	7.75%	8.50%	498,000,000	379,000,000	1,517,000,000
6/30/2020	8.00%	8.75%	525,000,000	387,000,000	1,597,000,000
6/30/2021	8.25%	9.00%	555,000,000	397,000,000	1,679,000,000
6/30/2022	8.50%	9.25%	585,000,000	407,000,000	1,762,000,000
6/30/2023	8.65%	10.33%	622,000,000	417,000,000	1,849,000,000
6/30/2024	8.50%	10.20%	628,000,000	428,000,000	1,939,000,000
6/30/2025	8.95%	10.69%	677,000,000	439,000,000	2,032,000,000
6/30/2026	9.36%	11.12%	726,000,000	451,000,000	2,126,000,000
6/30/2027	9.77%	11.55%	778,000,000	463,000,000	2,220,000,000
6/30/2028	10.17%	11.99%	832,000,000	476,000,000	2,315,000,000
6/30/2029	10.57%	12.42%	889,000,000	489,000,000	2,411,000,000
6/30/2030	9.81%	11.69%	851,000,000	504,000,000	2,507,000,000
6/30/2031	9.45%	11.37%	846,000,000	518,000,000	2,603,000,000
6/30/2032	9.63%	11.58%	888,000,000	534,000,000	2,699,000,000
6/30/2033	9.84%	11.83%	935,000,000	551,000,000	2,794,000,000

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2034	9.99%	12.01%	979,000,000	568,000,000	2,889,000,000
6/30/2035	10.60%	12.65%	1,069,000,000	585,000,000	2,986,000,000
6/30/2036	11.20%	13.28%	1,164,000,000	604,000,000	3,084,000,000
6/30/2037	11.37%	13.49%	1,219,000,000	624,000,000	3,181,000,000
6/30/2038	11.57%	13.73%	1,281,000,000	643,000,000	3,273,000,000
6/30/2039	11.77%	13.97%	1,346,000,000	664,000,000	3,361,000,000
6/30/2040	11.97%	14.21%	1,413,000,000	685,000,000	3,447,000,000
6/30/2041	12.18%	14.44%	1,484,000,000	708,000,000	3,536,000,000
6/30/2042	12.39%	14.69%	1,561,000,000	731,000,000	3,633,000,000
6/30/2043	12.61%	14.95%	1,640,000,000	756,000,000	3,733,000,000
6/30/2044	12.23%	14.56%	1,645,000,000	781,000,000	3,836,000,000
6/30/2045	11.84%	14.17%	1,647,000,000	807,000,000	3,942,000,000
6/30/2046	11.45%	13.78%	1,649,000,000	834,000,000	4,055,000,000
6/30/2047	11.07%	13.40%	1,650,000,000	862,000,000	4,174,000,000

Fiscal Year Contribution Projection

A2 Scenario

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2019	7.75%	8.50%	498,000,000	379,000,000	1,517,000,000
6/30/2020	8.00%	8.75%	525,000,000	387,000,000	1,597,000,000
6/30/2021	8.25%	9.00%	555,000,000	397,000,000	1,679,000,000
6/30/2022	8.50%	9.25%	585,000,000	407,000,000	1,762,000,000
6/30/2023	9.46%	11.14%	679,000,000	417,000,000	1,849,000,000
6/30/2024	9.86%	11.56%	725,000,000	428,000,000	1,939,000,000
6/30/2025	10.91%	12.65%	821,000,000	439,000,000	2,032,000,000
6/30/2026	11.87%	13.63%	915,000,000	451,000,000	2,126,000,000
6/30/2027	12.76%	14.54%	1,009,000,000	463,000,000	2,220,000,000
6/30/2028	13.61%	15.43%	1,105,000,000	476,000,000	2,315,000,000
6/30/2029	14.39%	16.24%	1,201,000,000	489,000,000	2,411,000,000
6/30/2030	13.98%	15.86%	1,201,000,000	504,000,000	2,507,000,000
6/30/2031	13.92%	15.84%	1,232,000,000	518,000,000	2,603,000,000
6/30/2032	14.37%	16.32%	1,310,000,000	534,000,000	2,699,000,000
6/30/2033	14.70%	16.69%	1,382,000,000	551,000,000	2,794,000,000

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2034	14.84%	16.86%	1,438,000,000	568,000,000	2,889,000,000
6/30/2035	15.29%	17.34%	1,528,000,000	585,000,000	2,986,000,000
6/30/2036	15.61%	17.69%	1,608,000,000	604,000,000	3,084,000,000
6/30/2037	15.44%	17.56%	1,643,000,000	624,000,000	3,181,000,000
6/30/2038	15.30%	17.46%	1,681,000,000	643,000,000	3,273,000,000
6/30/2039	15.18%	17.38%	1,723,000,000	664,000,000	3,361,000,000
6/30/2040	15.06%	17.30%	1,766,000,000	685,000,000	3,447,000,000
6/30/2041	14.96%	17.22%	1,813,000,000	708,000,000	3,536,000,000
6/30/2042	14.86%	17.16%	1,861,000,000	731,000,000	3,633,000,000
6/30/2043	14.78%	17.12%	1,913,000,000	756,000,000	3,733,000,000
6/30/2044	14.11%	16.44%	1,889,000,000	781,000,000	3,836,000,000
6/30/2045	13.42%	15.75%	1,860,000,000	807,000,000	3,942,000,000
6/30/2046	12.76%	15.09%	1,831,000,000	834,000,000	4,055,000,000
6/30/2047	12.13%	14.46%	1,803,000,000	862,000,000	4,174,000,000

Fiscal Year Contribution Projection

A3 Scenario

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2019	7.75%	8.50%	498,000,000	379,000,000	1,517,000,000
6/30/2020	8.00%	8.75%	525,000,000	387,000,000	1,597,000,000
6/30/2021	8.36%	9.11%	562,000,000	397,000,000	1,679,000,000
6/30/2022	8.90%	9.65%	613,000,000	407,000,000	1,762,000,000
6/30/2023	8.84%	10.52%	635,000,000	417,000,000	1,849,000,000
6/30/2024	8.74%	10.44%	645,000,000	428,000,000	1,939,000,000
6/30/2025	9.28%	11.01%	702,000,000	439,000,000	2,032,000,000
6/30/2026	9.76%	11.53%	757,000,000	451,000,000	2,126,000,000
6/30/2027	10.28%	12.07%	818,000,000	463,000,000	2,220,000,000
6/30/2028	10.77%	12.59%	879,000,000	476,000,000	2,315,000,000
6/30/2029	11.23%	13.07%	943,000,000	489,000,000	2,411,000,000
6/30/2030	10.57%	12.44%	915,000,000	504,000,000	2,507,000,000
6/30/2031	10.28%	12.20%	918,000,000	518,000,000	2,603,000,000
6/30/2032	9.82%	11.78%	906,000,000	534,000,000	2,699,000,000
6/30/2033	10.33%	12.32%	980,000,000	551,000,000	2,794,000,000

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2034	10.73%	12.74%	1,049,000,000	568,000,000	2,889,000,000
6/30/2035	11.59%	13.64%	1,166,000,000	585,000,000	2,986,000,000
6/30/2036	11.19%	13.28%	1,163,000,000	604,000,000	3,084,000,000
6/30/2037	11.71%	13.83%	1,256,000,000	624,000,000	3,181,000,000
6/30/2038	12.15%	14.31%	1,344,000,000	643,000,000	3,273,000,000
6/30/2039	12.54%	14.74%	1,431,000,000	664,000,000	3,361,000,000
6/30/2040	13.01%	15.25%	1,532,000,000	685,000,000	3,447,000,000
6/30/2041	12.19%	14.45%	1,486,000,000	708,000,000	3,536,000,000
6/30/2042	12.72%	15.02%	1,601,000,000	731,000,000	3,633,000,000
6/30/2043	13.19%	15.53%	1,713,000,000	756,000,000	3,733,000,000
6/30/2044	13.00%	15.33%	1,745,000,000	781,000,000	3,836,000,000
6/30/2045	12.78%	15.11%	1,773,000,000	807,000,000	3,942,000,000
6/30/2046	11.23%	13.56%	1,619,000,000	834,000,000	4,055,000,000
6/30/2047	11.06%	13.39%	1,649,000,000	862,000,000	4,174,000,000

Fiscal Year Contribution Projection

A4 Scenario

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2019	7.75%	8.50%	498,000,000	379,000,000	1,517,000,000
6/30/2020	8.00%	8.75%	525,000,000	387,000,000	1,597,000,000
6/30/2021	8.47%	9.22%	569,000,000	397,000,000	1,679,000,000
6/30/2022	9.25%	10.00%	636,000,000	407,000,000	1,762,000,000
6/30/2023	9.56%	11.24%	685,000,000	417,000,000	1,849,000,000
6/30/2024	9.93%	11.63%	729,000,000	428,000,000	1,939,000,000
6/30/2025	10.99%	12.72%	827,000,000	439,000,000	2,032,000,000
6/30/2026	11.96%	13.73%	922,000,000	451,000,000	2,126,000,000
6/30/2027	12.91%	14.70%	1,021,000,000	463,000,000	2,220,000,000
6/30/2028	13.79%	15.61%	1,120,000,000	476,000,000	2,315,000,000
6/30/2029	14.60%	16.45%	1,218,000,000	489,000,000	2,411,000,000
6/30/2030	14.24%	16.12%	1,223,000,000	504,000,000	2,507,000,000
6/30/2031	14.20%	16.12%	1,256,000,000	518,000,000	2,603,000,000
6/30/2032	13.96%	15.92%	1,273,000,000	534,000,000	2,699,000,000
6/30/2033	14.57%	16.56%	1,370,000,000	551,000,000	2,794,000,000

Fiscal Year Ending	Employer Contribution Rate - General and Firefighters	Employer Contribution Rate - Law Enforcement Officers	Employer Contributions	Member Contributions	Benefit Payments
6/30/2034	14.94%	16.96%	1,447,000,000	568,000,000	2,889,000,000
6/30/2035	15.65%	17.70%	1,563,000,000	585,000,000	2,986,000,000
6/30/2036	14.99%	17.07%	1,546,000,000	604,000,000	3,084,000,000
6/30/2037	15.16%	17.29%	1,614,000,000	624,000,000	3,181,000,000
6/30/2038	15.28%	17.44%	1,678,000,000	643,000,000	3,273,000,000
6/30/2039	15.36%	17.56%	1,742,000,000	664,000,000	3,361,000,000
6/30/2040	15.52%	17.75%	1,818,000,000	685,000,000	3,447,000,000
6/30/2041	14.38%	16.64%	1,744,000,000	708,000,000	3,536,000,000
6/30/2042	14.60%	16.90%	1,830,000,000	731,000,000	3,633,000,000
6/30/2043	14.77%	17.11%	1,912,000,000	756,000,000	3,733,000,000
6/30/2044	14.29%	16.62%	1,914,000,000	781,000,000	3,836,000,000
6/30/2045	13.81%	16.14%	1,913,000,000	807,000,000	3,942,000,000
6/30/2046	12.03%	14.36%	1,729,000,000	834,000,000	4,055,000,000
6/30/2047	11.65%	13.98%	1,734,000,000	862,000,000	4,174,000,000

Asset and Liability Projection Baseline Scenario

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2016	64,246,524,000	67,376,892,000	74,547,855,000	7,170,963,000	90.4%
12/31/2017	70,229,773,000	69,306,676,000	76,453,183,000	7,146,507,000	90.7%
12/31/2018	72,899,470,000	71,738,061,000	78,477,931,000	6,739,870,000	91.4%
12/31/2019	75,806,350,000	74,406,628,000	80,546,658,000	6,140,030,000	92.4%
12/31/2020	78,904,006,000	78,140,976,000	82,673,741,000	4,532,765,000	94.5%
12/31/2021	82,209,166,000	82,209,166,000	84,848,508,000	2,639,342,000	96.9%
12/31/2022	85,524,786,000	85,524,786,000	87,083,570,000	1,558,784,000	98.2%
12/31/2023	88,544,802,000	88,544,802,000	89,365,765,000	820,963,000	99.1%
12/31/2024	91,376,701,000	91,376,701,000	91,694,511,000	317,810,000	99.7%
12/31/2025	94,194,367,000	94,194,367,000	94,086,189,000	(108,178,000)	100.1%
12/31/2026	97,012,231,000	97,012,231,000	96,525,792,000	(486,439,000)	100.5%
12/31/2027	99,909,434,000	99,909,434,000	99,015,842,000	(893,592,000)	100.9%
12/31/2028	102,909,194,000	102,909,194,000	101,572,846,000	(1,336,348,000)	101.3%
12/31/2029	105,931,079,000	105,931,079,000	104,181,182,000	(1,749,897,000)	101.7%
12/31/2030	108,961,289,000	108,961,289,000	106,860,961,000	(2,100,328,000)	102.0%
12/31/2031	112,079,465,000	112,079,465,000	109,598,600,000	(2,480,865,000)	102.3%

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2032	115,294,152,000	115,294,152,000	112,401,345,000	(2,892,807,000)	102.6%
12/31/2033	118,617,248,000	118,617,248,000	115,278,459,000	(3,338,789,000)	102.9%
12/31/2034	122,063,803,000	122,063,803,000	118,261,714,000	(3,802,089,000)	103.2%
12/31/2035	125,649,867,000	125,649,867,000	121,346,320,000	(4,303,547,000)	103.5%
12/31/2036	129,386,615,000	129,386,615,000	124,540,665,000	(4,845,950,000)	103.9%
12/31/2037	133,304,743,000	133,304,743,000	127,874,496,000	(5,430,247,000)	104.2%
12/31/2038	137,447,282,000	137,447,282,000	131,409,074,000	(6,038,208,000)	104.6%
12/31/2039	141,843,645,000	141,843,645,000	135,124,487,000	(6,719,158,000)	105.0%
12/31/2040	146,513,687,000	146,513,687,000	139,085,452,000	(7,428,235,000)	105.3%
12/31/2041	151,461,609,000	151,461,609,000	143,267,185,000	(8,194,424,000)	105.7%
12/31/2042	156,695,079,000	156,695,079,000	147,647,651,000	(9,047,428,000)	106.1%
12/31/2043	162,223,285,000	162,223,285,000	152,282,356,000	(9,940,929,000)	106.5%
12/31/2044	168,063,054,000	168,063,054,000	157,158,971,000	(10,904,083,000)	106.9%
12/31/2045	174,234,208,000	174,234,208,000	162,293,365,000	(11,940,843,000)	107.4%
12/31/2046	180,736,603,000	180,736,603,000	167,676,453,000	(13,060,150,000)	107.8%

Asset and Liability Projection

A1 Scenario

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2016	64,246,524,000	67,376,892,000	74,547,855,000	7,170,963,000	90.4%
12/31/2017	70,229,773,000	69,306,676,000	76,860,945,000	7,554,269,000	90.2%
12/31/2018	72,864,931,000	71,703,522,000	79,332,388,000	7,628,866,000	90.4%
12/31/2019	75,706,909,000	74,307,187,000	81,864,836,000	7,557,649,000	90.8%
12/31/2020	78,713,506,000	77,950,475,000	84,485,798,000	6,535,323,000	92.3%
12/31/2021	81,894,321,000	81,894,321,000	87,186,222,000	5,291,901,000	93.9%
12/31/2022	85,194,697,000	85,194,697,000	89,953,967,000	4,759,270,000	94.7%
12/31/2023	88,370,257,000	88,370,257,000	92,816,650,000	4,446,393,000	95.2%
12/31/2024	91,439,603,000	91,439,603,000	95,762,924,000	4,323,321,000	95.5%
12/31/2025	94,568,163,000	94,568,163,000	98,797,209,000	4,229,046,000	95.7%
12/31/2026	97,769,238,000	97,769,238,000	101,920,660,000	4,151,422,000	95.9%
12/31/2027	101,126,639,000	101,126,639,000	105,138,797,000	4,012,158,000	96.2%
12/31/2028	104,670,192,000	104,670,192,000	108,472,072,000	3,801,880,000	96.5%
12/31/2029	108,210,728,000	108,210,728,000	111,890,700,000	3,679,972,000	96.7%
12/31/2030	111,583,634,000	111,583,634,000	115,417,702,000	3,834,068,000	96.7%
12/31/2031	114,929,820,000	114,929,820,000	119,078,443,000	4,148,623,000	96.5%

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2032	118,366,230,000	118,366,230,000	122,848,173,000	4,481,943,000	96.4%
12/31/2033	121,907,478,000	121,907,478,000	126,759,343,000	4,851,865,000	96.2%
12/31/2034	125,631,093,000	125,631,093,000	130,850,660,000	5,219,567,000	96.0%
12/31/2035	129,628,475,000	129,628,475,000	135,100,639,000	5,472,164,000	95.9%
12/31/2036	133,869,746,000	133,869,746,000	139,544,184,000	5,674,438,000	95.9%
12/31/2037	138,330,079,000	138,330,079,000	144,241,311,000	5,911,232,000	95.9%
12/31/2038	143,051,607,000	143,051,607,000	149,191,760,000	6,140,153,000	95.9%
12/31/2039	148,064,114,000	148,064,114,000	154,424,651,000	6,360,537,000	95.9%
12/31/2040	153,390,262,000	153,390,262,000	160,015,584,000	6,625,322,000	95.9%
12/31/2041	159,035,613,000	159,035,613,000	164,909,724,000	5,874,111,000	96.4%
12/31/2042	165,087,412,000	165,087,412,000	170,061,144,000	4,973,732,000	97.1%
12/31/2043	171,469,130,000	171,469,130,000	175,475,355,000	4,006,225,000	97.7%
12/31/2044	178,092,165,000	178,092,165,000	181,165,885,000	3,073,720,000	98.3%
12/31/2045	184,957,069,000	184,957,069,000	187,149,411,000	2,192,342,000	98.8%
12/31/2046	192,050,370,000	192,050,370,000	193,449,017,000	1,398,647,000	99.3%

Asset and Liability Projection

A2 Scenario

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2016	64,246,524,000	67,376,892,000	74,547,855,000	7,170,963,000	90.4%
12/31/2017	70,229,773,000	69,306,676,000	76,860,945,000	7,554,269,000	90.2%
12/31/2018	72,070,536,000	71,544,643,000	79,332,388,000	7,787,745,000	90.2%
12/31/2019	74,075,719,000	73,776,949,000	81,864,836,000	8,087,887,000	90.1%
12/31/2020	76,212,672,000	76,848,461,000	84,485,798,000	7,637,337,000	91.0%
12/31/2021	78,516,994,000	80,048,542,000	87,186,222,000	7,137,680,000	91.8%
12/31/2022	80,964,101,000	82,465,639,000	89,953,967,000	7,488,328,000	91.7%
12/31/2023	83,339,921,000	84,809,123,000	92,816,650,000	8,007,527,000	91.4%
12/31/2024	85,693,011,000	87,126,095,000	95,762,924,000	8,636,829,000	91.0%
12/31/2025	88,205,260,000	89,598,233,000	98,797,209,000	9,198,976,000	90.7%
12/31/2026	90,895,403,000	92,244,809,000	101,920,660,000	9,675,851,000	90.5%
12/31/2027	93,850,723,000	95,153,812,000	105,138,797,000	9,984,985,000	90.5%
12/31/2028	97,103,505,000	98,358,086,000	108,472,072,000	10,113,986,000	90.7%
12/31/2029	100,469,960,000	101,673,365,000	111,890,700,000	10,217,335,000	90.9%
12/31/2030	103,791,222,000	104,939,348,000	115,417,702,000	10,478,354,000	90.9%
12/31/2031	107,216,295,000	108,303,921,000	119,078,443,000	10,774,522,000	91.0%

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2032	110,855,576,000	111,877,200,000	122,848,173,000	10,970,973,000	91.1%
12/31/2033	114,700,059,000	115,650,192,000	126,759,343,000	11,109,151,000	91.2%
12/31/2034	118,802,217,000	119,675,361,000	130,850,660,000	11,175,299,000	91.5%
12/31/2035	123,232,010,000	124,022,491,000	135,100,639,000	11,078,148,000	91.8%
12/31/2036	127,935,031,000	128,636,654,000	139,544,184,000	10,907,530,000	92.2%
12/31/2037	132,878,396,000	133,484,194,000	144,241,311,000	10,757,117,000	92.5%
12/31/2038	138,105,292,000	138,607,498,000	149,191,760,000	10,584,262,000	92.9%
12/31/2039	143,646,941,000	144,037,000,000	154,424,651,000	10,387,651,000	93.3%
12/31/2040	149,533,067,000	149,801,630,000	160,015,584,000	10,213,954,000	93.6%
12/31/2041	155,773,047,000	155,909,916,000	164,909,724,000	8,999,808,000	94.5%
12/31/2042	162,378,931,000	162,434,750,000	170,061,144,000	7,626,394,000	95.5%
12/31/2043	169,267,641,000	169,281,873,000	175,475,355,000	6,193,482,000	96.5%
12/31/2044	176,347,746,000	176,347,746,000	181,165,885,000	4,818,139,000	97.3%
12/31/2045	183,617,835,000	183,617,835,000	187,149,411,000	3,531,576,000	98.1%
12/31/2046	191,060,293,000	191,060,293,000	193,449,017,000	2,388,724,000	98.8%

Asset and Liability Projection

A3 Scenario

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2016	64,246,524,000	67,376,892,000	74,547,855,000	7,170,963,000	90.4%
12/31/2017	70,229,773,000	69,306,676,000	78,130,298,000	8,823,622,000	88.7%
12/31/2018	72,761,315,000	71,599,905,000	80,198,873,000	8,598,968,000	89.3%
12/31/2019	75,525,335,000	74,125,613,000	82,312,485,000	8,186,872,000	90.1%
12/31/2020	78,489,176,000	77,726,145,000	84,485,798,000	6,759,653,000	92.0%
12/31/2021	81,671,883,000	81,671,883,000	89,114,951,000	7,443,068,000	91.6%
12/31/2022	84,825,745,000	84,825,745,000	91,449,312,000	6,623,567,000	92.8%
12/31/2023	87,895,021,000	87,895,021,000	93,847,479,000	5,952,458,000	93.7%
12/31/2024	90,908,419,000	90,908,419,000	96,296,016,000	5,387,597,000	94.4%
12/31/2025	94,041,952,000	94,041,952,000	98,797,209,000	4,755,257,000	95.2%
12/31/2026	97,313,984,000	97,313,984,000	104,227,158,000	6,913,174,000	93.4%
12/31/2027	100,577,374,000	100,577,374,000	106,913,924,000	6,336,550,000	94.1%
12/31/2028	104,082,460,000	104,082,460,000	109,692,612,000	5,610,152,000	94.9%
12/31/2029	107,650,051,000	107,650,051,000	112,514,568,000	4,864,517,000	95.7%
12/31/2030	111,126,384,000	111,126,384,000	115,417,702,000	4,291,318,000	96.3%
12/31/2031	114,569,846,000	114,569,846,000	121,833,880,000	7,264,034,000	94.0%

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2032	117,844,375,000	117,844,375,000	124,984,370,000	7,139,995,000	94.3%
12/31/2033	121,337,203,000	121,337,203,000	128,245,929,000	6,908,726,000	94.6%
12/31/2034	125,134,152,000	125,134,152,000	131,613,053,000	6,478,901,000	95.1%
12/31/2035	129,174,735,000	129,174,735,000	135,100,639,000	5,925,904,000	95.6%
12/31/2036	133,429,929,000	133,429,929,000	142,917,457,000	9,487,528,000	93.4%
12/31/2037	137,724,487,000	137,724,487,000	146,836,299,000	9,111,812,000	93.8%
12/31/2038	142,396,519,000	142,396,519,000	150,987,643,000	8,591,124,000	94.3%
12/31/2039	147,494,211,000	147,494,211,000	155,374,237,000	7,880,026,000	94.9%
12/31/2040	152,869,573,000	152,869,573,000	160,015,584,000	7,146,011,000	95.5%
12/31/2041	158,532,094,000	158,532,094,000	164,909,724,000	6,377,630,000	96.1%
12/31/2042	164,698,911,000	164,698,911,000	170,061,144,000	5,362,233,000	96.8%
12/31/2043	171,280,830,000	171,280,830,000	175,475,355,000	4,194,525,000	97.6%
12/31/2044	178,184,056,000	178,184,056,000	181,165,885,000	2,981,829,000	98.4%
12/31/2045	185,183,224,000	185,183,224,000	187,149,411,000	1,966,187,000	98.9%
12/31/2046	192,247,864,000	192,247,864,000	193,449,017,000	1,201,153,000	99.4%

Asset and Liability Projection

A4 Scenario

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2016	64,246,524,000	67,376,892,000	74,547,855,000	7,170,963,000	90.4%
12/31/2017	70,229,773,000	69,306,676,000	78,130,298,000	8,823,622,000	88.7%
12/31/2018	72,070,536,000	71,461,750,000	80,198,873,000	8,737,123,000	89.1%
12/31/2019	74,076,749,000	73,659,057,000	82,312,485,000	8,653,428,000	89.5%
12/31/2020	76,219,944,000	76,742,573,000	84,485,798,000	7,743,225,000	90.8%
12/31/2021	78,536,032,000	79,996,720,000	89,114,951,000	9,118,231,000	89.8%
12/31/2022	81,000,761,000	82,349,906,000	91,449,312,000	9,099,406,000	90.0%
12/31/2023	83,402,471,000	84,676,234,000	93,847,479,000	9,171,245,000	90.2%
12/31/2024	85,791,244,000	87,025,759,000	96,296,016,000	9,270,257,000	90.4%
12/31/2025	88,350,587,000	89,582,984,000	98,797,209,000	9,214,225,000	90.7%
12/31/2026	91,098,890,000	92,368,075,000	104,227,158,000	11,859,083,000	88.6%
12/31/2027	94,125,129,000	95,253,593,000	106,913,924,000	11,660,331,000	89.1%
12/31/2028	97,459,266,000	98,489,154,000	109,692,612,000	11,203,458,000	89.8%
12/31/2029	100,920,195,000	101,894,901,000	112,514,568,000	10,619,667,000	90.6%
12/31/2030	104,350,872,000	105,314,278,000	115,417,702,000	10,103,424,000	91.2%
12/31/2031	107,810,554,000	108,807,060,000	121,833,880,000	13,026,820,000	89.3%

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Accrued Liability	Unfunded Accrued Liability	Funded Ratio
12/31/2032	111,432,961,000	112,250,385,000	124,984,370,000	12,733,985,000	89.8%
12/31/2033	115,323,416,000	116,008,840,000	128,245,929,000	12,237,089,000	90.5%
12/31/2034	119,537,136,000	120,139,689,000	131,613,053,000	11,473,364,000	91.3%
12/31/2035	123,983,214,000	124,553,947,000	135,100,639,000	10,546,692,000	92.2%
12/31/2036	128,604,618,000	129,196,217,000	142,917,457,000	13,721,240,000	90.4%
12/31/2037	133,538,717,000	133,897,859,000	146,836,299,000	12,938,440,000	91.2%
12/31/2038	138,818,623,000	139,000,345,000	150,987,643,000	11,987,298,000	92.1%
12/31/2039	144,489,592,000	144,550,899,000	155,374,237,000	10,823,338,000	93.0%
12/31/2040	150,398,467,000	150,398,467,000	160,015,584,000	9,617,117,000	94.0%
12/31/2041	156,549,261,000	156,549,261,000	164,909,724,000	8,360,463,000	94.9%
12/31/2042	163,154,338,000	163,154,338,000	170,061,144,000	6,906,806,000	95.9%
12/31/2043	170,118,412,000	170,118,412,000	175,475,355,000	5,356,943,000	96.9%
12/31/2044	177,346,383,000	177,346,383,000	181,165,885,000	3,819,502,000	97.9%
12/31/2045	184,615,621,000	184,615,621,000	187,149,411,000	2,533,790,000	98.6%
12/31/2046	191,897,525,000	191,897,525,000	193,449,017,000	1,551,492,000	99.2%

