



**Alameda County Employees' Retirement Association
BOARD OF RETIREMENT**

**ACTUARIAL COMMITTEE/BOARD MEETING
NOTICE and AGENDA**

[THIS MEETING WILL BE CONDUCTED VIA TELECONFERENCE [SEE EXECUTIVE ORDER N-29-20 ATTACHED AT THE END OF THIS AGENDA.]

ACERA MISSION:

To provide ACERA members and employers with flexible, cost-effective, participant-oriented benefits through prudent investment management and superior member services.

**Thursday, June 18, 2020
11:00 am**

Zoom Instructions	COMMITTEE MEMBERS	
The public can view the teleconference and comment via audio. To join the teleconference, please click the link below: https://zoom.us/join Meeting ID: 826 0508 3587 Password: 569500 For help joining a Zoom meeting, see: https://support.zoom.us/hc/en-us/articles/201362193	DALE AMARAL, CHAIR	ELECTED SAFETY
	ELIZABETH ROGERS, VICE CHAIR	ELECTED GENERAL
	OPHELIA BASGAL	APPOINTED
	HENRY LEVY	EX-OFFICIO
	LIZ KOPPENHAVER	ELECTED RETIRED

Should a quorum of the Board attend this meeting, this meeting shall be deemed a joint meeting of the Board and Committee.

The order of agenda items is subject to change without notice. Board and Committee agendas and minutes are available online at www.acera.org.

Note regarding public comments: Public comments are limited to four (4) minutes per person in total.

Note regarding accommodations: The Board of Retirement will provide reasonable accommodations for persons with special needs of accessibility who plan to attend Board meetings. Please contact ACERA at (510) 628-3000 to arrange for accommodation.

Any materials required by law to be made available to the public prior to a meeting of the Board of Retirement can be inspected at 475-14th Street, Suite 1000 during normal business hours.

ACTUARIAL COMMITTEE/BOARD MEETING

NOTICE and AGENDA, Page 2 of 2 – Thursday, June 18, 2020

Call to Order: 11:00 am

Public Input

Action Items: Matters for Discussion and Possible Motion by the Committee

None

Information Items: These items are not presented for Committee action but consist of status updates and cyclical reports

1. Presentation and discussion of the stochastic modeling study of the Actuarial Standard of Practice No 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions (ASOP No. 51).

- Margo Allen
- Andy Yeung, Segal Consulting

Trustee Input

Future Discussion Items

Presentation and discussion of the Triennial Experience for years 2017 - 2019 and discuss economic and non-economic assumptions

Establishment of Next Meeting Date

September 17, 2020 at 11:00 am

Adjournment



MEMORANDUM TO THE ACTUARIAL COMMITTEE

DATE: June 19, 2020

TO: Members of the Actuarial Committee

FROM: Margo Allen, Fiscal Services Officer

SUBJECT: Actuarial Standard of Practice No 51 (ASOP No. 51), Risk Assessment, Including Review of Funded Status of the Pension Plan as of December 31, 2019

Executive Summary

On June 19, 2020, staff and Segal Consulting (Segal) will present the results of a deterministic sensitivity test and a stochastic projection, both of which are used to evaluate and address the risk exposure related to ACERA's Actuarial Valuation and Review as of December 31, 2019. In February 2019, staff obtained board approval for Segal to provide risk reports that satisfy disclosure requirements for the (then) new ASOP No. 51, effective for a measurement date on or after November 1, 2018 and for ACERA's December 31, 2018, valuation.

In mid-2018, staff had the opportunity to thoroughly review the various risk assessment methodologies proposed by Segal. Staff agreed with Segal that a deterministic scenario test would adequately address ACERA's December 31, 2018, valuation risk exposure, and that a deterministic sensitivity test and a stochastic projection would adequately address ACERA's December 31, 2019, valuation risk exposure. The stated recommendations are as follows:

- Deterministic Scenario Test:** Assesses the impact of one possible event, several simultaneous events, or several sequential events, for example, projection modeling of an economic recession that may impact both actual investment returns and employment levels.
Recommended Scenario Test for ACERA: Provide projections for 0%, 7.25% and 14.50% returns for 2019 in December 31, 2018, risk report
- Deterministic Sensitivity Test:** Assesses the impact of a change in actuarial assumption, for example, change the investment return assumption in a future year.
Recommended Sensitivity Test for ACERA: Consider the impact of different long term investment return and/or inflation assumptions in December 31, 2019, risk report, before new assumptions are approved in triennial experience study for the December 31, 2020, valuation.
- Stochastic Projection:** Considers the impact of employer contribution rates and Supplemental Retiree Benefit Reserve (SRBR) sufficiency periods under different market returns in December 31, 2019, risk report, and provides information on impact of the 50/50 allocation of future excess earnings to the SRBR (for disclosure purposes) in next triennial experience study.

Attachment:

ACERA Risk Assessment, Including Review of Funded Status of the Pension Plan as of December 31, 2019



Alameda County Employees' Retirement Association

Risk Assessment

**Including Review of Funded Status of the
Pension Plan as of December 31, 2019**

May 27, 2020

Andy Yeung, ASA, MAAA, FCA, EA

Eva Yum, FSA, MAAA, EA

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Section 1: Introduction and Executive Summary

Introduction

The purpose of this report is to assist the Board of Retirement,¹ participating employers and members and other stakeholders to better understand and assess the risk profile of the Association, as well as the particular risks inherent in using a fixed set of actuarial assumptions in preparing the results in our December 31, 2019 funding valuation for the Pension Plan (“the Plan”) of the Alameda County Employees’ Retirement Association (“ACERA”).

The results included in our December 31, 2019 funding valuation report for the Pension Plan were prepared based on a fixed set of economic and non-economic actuarial assumptions under the premise that future experience of ACERA would be consistent with those assumptions. While those assumptions are generally reviewed every three years (with the assumptions from the last triennial experience study adopted by the Board of Retirement for use starting with the December 31, 2017 valuation), there is a risk that emerging results may differ significantly as actual experience is fluid and will not completely track current assumptions.

It is important to note that this risk assessment is based on plan assets as of December 31, 2019. Due to the COVID-19 pandemic, market conditions have changed significantly since the valuation date. The Plan’s actuarial status does not reflect short-term fluctuations of the market, but rather is based on the market values on the last day of the Plan Year. While it is impossible to determine how the market will perform over the next several months, and how that will affect the results of next year’s valuation, the single year investment return scenario test included within this report provides an illustration of the impact of short term market fluctuations on the plan. Additionally, Segal is available to prepare other projections of selected potential outcome scenarios upon request.

Actuarial Standard of Practice on Risk Assessment

The Actuarial Standards Board approved the Actuarial Standard of Practice No. 51 (ASOP 51) regarding risk assessment when performing a funding valuation and it was effective with ACERA’s December 31, 2018 actuarial valuation for benefits provided by the Pension Plan. ASOP 51 requires actuaries to identify and assess risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” Examples of key risks listed that are particularly relevant to ACERA are asset/liability mismatch risk, investment risk, and longevity and other demographic risks. ASOP 51 also requires an actuary to consider if there is any ongoing contribution risk to the plan; however, it does not require the

¹ This risk report has been prepared at the request of the Board of Retirement to assist in administering the Plan. This risk report may not otherwise be copied or reproduced in any form without the consent of the Board of Retirement and may only be provided to other parties in its entirety, unless expressly authorized by Segal. The measurements shown in this risk report may not be applicable for other purposes.

actuary to evaluate the particular ability or willingness of contributing entities to make contributions when due, nor does it require the actuary to assess the likelihood or consequences of future changes in applicable law.

The actuary's initial assessment can be strictly a qualitative discussion about potential adverse experience and the possible effect on future results, but it may also include quantitative numerical demonstrations where informative. The actuary is also encouraged to consider a recommendation as to whether a more detailed risk assessment would be significantly beneficial for the intended user in order to examine particular financial risks. When making that recommendation, the actuary will take into account such factors as the plan's design, risk profile, maturity, size, funded status, asset allocation, cash flow, possible insolvency and current market conditions. This report incorporates a more detailed risk assessment as agreed upon with ACERA.

The Standard also requires disclosure of plan maturity measures and other historical information that are significant to understanding the risks associated with the Pension Plan and this information is included in this report. Besides information for the Pension Plan, we have included as part of the Plan design under Article 5.5 of the Statute the amount of "excess earnings" allocated from the Association's total investment portfolio to the Supplemental Retiree Benefit Reserve (SRBR) and the change in the sufficiency periods for benefits paid out of the SRBR. Based on our understanding of the statute which authorizes the SRBR, the investment return assumption used in the funding valuation has been developed without considering the impact of any future excess earnings allocation to the SRBR. However, for informational purposes, we have included in this report the same disclosure of such allocation that we have previously included in our funding valuation report.

Plan Risk Assessment

In Section 2, we start by discussing some of the historical factors that have caused changes in ACERA's funded status and employer contribution rates. It is important to understand how the combination of decisions and experience has led to the current financial status of the plan.

We follow this with a discussion of the most significant risk factors going forward. Even though we have not included a numerical analysis of all the risk factors, based on our discussions with ACERA we have illustrated the impact on the funded status and employer contribution rates using relevant economic scenario tests. These tests illustrate the effect of future investment returns on the portfolio coming in differently from the current 7.25% annual investment return assumption used in the December 31, 2019 valuation. We have also included a projection of future results based on a stochastic modeling of future investment returns. The stochastic modeling is useful for assessing the distribution of future results based on random variations in actual investment returns each year, and introduces a relative likelihood to the range of potential outcomes. As Segal will be conducting a triennial experience study of the economic and non-economic actuarial assumptions before the next valuation as of December 31, 2020, based on our discussions with ACERA, we have included for illustrative purposes only, the impact on the funded status and the employer and employee contribution

rates if the Board were to lower both the inflation and investment return assumptions as part of our sensitivity tests of the two most important economic assumptions.

ASOP 51 also requires disclosure of plan maturity measures and other historical information that are significant to understanding the risks associated with the Pension Plan and this information is included in this report.

Executive Summary

Historical Funded Status and Employer Contribution Rates

The following table provides a summary of financial changes to the Plan over the last 10 valuations. The unfunded actuarial accrued liability (UAAL)² and contribution rates³ increased primarily as a result of strengthening the actuarial assumptions used in preparing the valuations and unfavorable investment experience that were offset to some degree by favorable non-investment experience.

Valuation Date	Market Value Basis		Valuation Value Basis		Total (Aggregate) Employer Contribution Rate (% of Payroll)
	Funded Status	UAAL	Funded Status	UAAL	
December 31, 2010	74.9%	\$1,547.6 M	77.5%	\$1,386.6 M	20.8%
December 31, 2019	79.4%	\$2,020.1 M	77.6%	\$2,195.0 M	28.6%

Supplemental Retiree Benefit Reserve

In the 10 valuations from December 31, 2009 to 2018,⁴ the assets available in the SRBR have increased from about \$665 million to about \$922 million. During this 10-year period, about \$262 million in excess earnings were allocated to the SRBR and it was estimated that the assets in the SRBR would be sufficient to pay OPEB SRBR benefits for about 17 years (around 2026) and non-OPEB SRBR benefits for about 22 years (around 2031) in the December 31, 2009 valuation and OPEB SRBR benefits for about 22 years (around 2040) and non-OPEB SRBR benefits for about 18 years (around 2036) in the December 31, 2018 valuation.⁵

² For instance, the UAAL increased by \$460 million and \$396 million in the December 31, 2014 and December 31, 2017 valuations, respectively, as a result of the last two experience studies.

³ For instance, the increase in the employer's total rate (normal cost plus UAAL) was 3.44% of payroll and 3.49% of payroll in the December 31, 2014 and December 31, 2017 valuation, respectively, as a result of the last two experience studies

⁴ We have not included the results from the December 31, 2019 SRBR valuation as the results from that valuation will not be available until later in 2020.

⁵ During the past 10 years, the Board took several actions to preserve the sufficiency period to pay benefits from the SRBR. For instance, the Board eliminated the Active Death Equity Benefit and froze the maximum Monthly Medical Allowance for several years.

Future Funded Status and Employer Contribution Rates

In this report, we highlight key factors besides assumption changes that may affect the financial profile of the Plan going forward. As investment experience in the past 10 years has had a significant impact on the funded status and employer contribution rates, we have also provided deterministic projections (using select scenarios for illustration) under hypothetical favorable and unfavorable future market experience so that the impact of market performance can be better understood.

The total (aggregate) employer contribution rate for the plan is 28.6% of total payroll in the December 31, 2019 valuation. Using a deterministic projection, this report shows the effect of either favorable (14.50%) or unfavorable (0.00%) hypothetical market returns for 2020 on key valuation results. In particular, the changes in the total employer contribution rate (relative to the December 31, 2019 valuation aggregate employer contribution rate of 28.6%) in the December 31, 2020 valuation and in the December 31, 2025 valuation (when all the investment gains or losses are fully recognized at the end of the five-year asset smoothing period) are as shown in the following table:

Contribution Rate Change	2020 Single Plan-Year Investment Return		
	14.50%	7.25% (Baseline)	0.00%
December 31, 2020	-0.4% of payroll	-0.2% of payroll	0.0% of payroll
December 31, 2025	-4.1% of payroll	-2.0% of payroll	1.0% of payroll

Under the favorable (14.25%) hypothetical market return scenario for 2020, the Association would be expected to reach full funding by December 31, 2031 and the total employer contribution rate would be comprised of only normal cost contributions, resulting in a larger relative change from the baseline than the unfavorable (0.00%) hypothetical market return scenario. Furthermore, under all three hypothetical market return scenarios for 2020, the Association would be expected to reach full funding within 15 years and the total employer contribution rate would be expected to approach about 10% of payroll.⁶ This means that the Board's funding policy is very effective in achieving the general policy goal of achieving the long-term full funding of the costs of the benefits paid by ACERA.

Using a stochastic projection that models market return over the next 20 years by using expected return, standard deviation and other information about ACERA's asset portfolio, there is a 50% chance that the employer contribution rates would be between 10% and 37% of payroll at the end of 10 years and between 10% and 26% of payroll at the end of 20 years. Furthermore, there is a 34% chance ACERA would be fully funded at the end of 10 years and 49% chance ACERA would be fully funded at the end of 20 years. The probability that the sufficiency period for the OPEB SRBR would be over

⁶ Assuming no further assumption changes, method changes or experience that differs significantly from assumptions.

15 years is 65% at the end of 10 years and 70% at the end of 20 years. The probability that the sufficiency period for the non-OPEB SRBR would be over 15 years is 33% at the end of 10 years and 30% at the end of 20 years.

Using the results from the December 31, 2019 valuation, we have studied the combined impact of a 0.25% reduction in both the 3.00% inflation assumption and the 7.25% investment return assumption if those assumptions were used in that valuation for the Pension Plan.

A 0.25% reduction in both the inflation assumption to 2.75% and the investment return assumption to 7.00% would increase the employer and employee rates by 1.6% and 0.3% of payroll, respectively, and increase the UAAL by \$195 million.

Plan Maturity Measures

During the past 10 valuations, the Association has become more mature as evidenced by an increase in the ratio of members in pay status (retirees and beneficiaries) to active members (as shown in *Section 2, Chart 19 on page 40*) and by an increase in the ratios of plan assets and liabilities to active member payroll (as shown in *Section 2, Chart 20 on page 41* and *Chart 21 on page 42*, respectively). We expect these trends to continue going forward. This is significant for understanding the volatility of both historical and future employer contribution rates because any increase in UAAL due to unfavorable investment and non-investment experience for the relatively larger group of non-active members would have to be amortized and funded over the payroll of the relatively smaller group of only active members. Put another way, as a plan grows more mature, its contribution rate becomes more sensitive to investment volatility and liability changes. As ACERA continues to mature with time, its risk profile will continue to evolve in this way and contributions will grow more sensitive to plan experience.

Section 2: Key Plan Risks on Funded Status, Unfunded Actuarial Accrued Liabilities, and Employer Contribution Rates

Evaluation of Historical Trends

Funded Status and Change in Unfunded Actuarial Accrued Liabilities

One common measure of ACERA's financial status is the funded ratio. This ratio compares the valuation⁷ and market value of assets to the actuarial accrued liabilities (AAL)⁸ of ACERA. The overall level of funding of ACERA has declined as a result of strengthening of the economic and non-economic assumptions especially in the last two triennial experience studies. Those new actuarial assumptions were used starting in the December 31, 2014 and 2017 valuations. The unfavorable investment experience also has an impact. The funded ratios and the unfunded actuarial accrued liabilities⁹ (UAAL) for the past 10 valuations from December 31, 2010 to 2019 measured using both actuarial and market value of assets bases are provided in *Chart 1*.

The factors that caused the changes in the UAAL for the past 10 valuations from December 31, 2010 to 2019 are specified in *Chart 2*. The results in *Chart 2* show that the changes in the investment return assumption from 7.80% to 7.60% in the December 31, 2014 valuation and from 7.60% to 7.25% in the December 31, 2017 valuation. These reductions together with the changes in the mortality tables and other assumptions from the two last triennial experience studies have by far the most impact on the UAAL for ACERA,¹⁰ followed by the unfavorable investment experience during 2010 to 2019.

Chart 2 also shows that the unfavorable investment experience was offset to some extent by favorable non-investment experience. The non-investment experience included smaller salary increases received by active members and smaller cost-of-living-adjustment (COLA) increases received by retirees and beneficiaries than expected under the actuarial

⁷ The valuation value of assets is equal to the market value of assets excluding unrecognized returns from the last few years and any non-valuation reserves. Unrecognized return is equal to the difference between the actual market return and the expected return on the market value, and is recognized over a five-year period.

⁸ For the actives, the actuarial accrued liability is the value of the accumulated normal costs allocated to the years before the valuation date. For the pensioners, beneficiaries and inactive vested members, the actuarial accrued liability is the single-sum present value of the lifetime benefit expected to be paid to those members.

⁹ The amount by which the actuarial accrued liability of the plan exceeds (or is exceeded by) the assets of the plan.

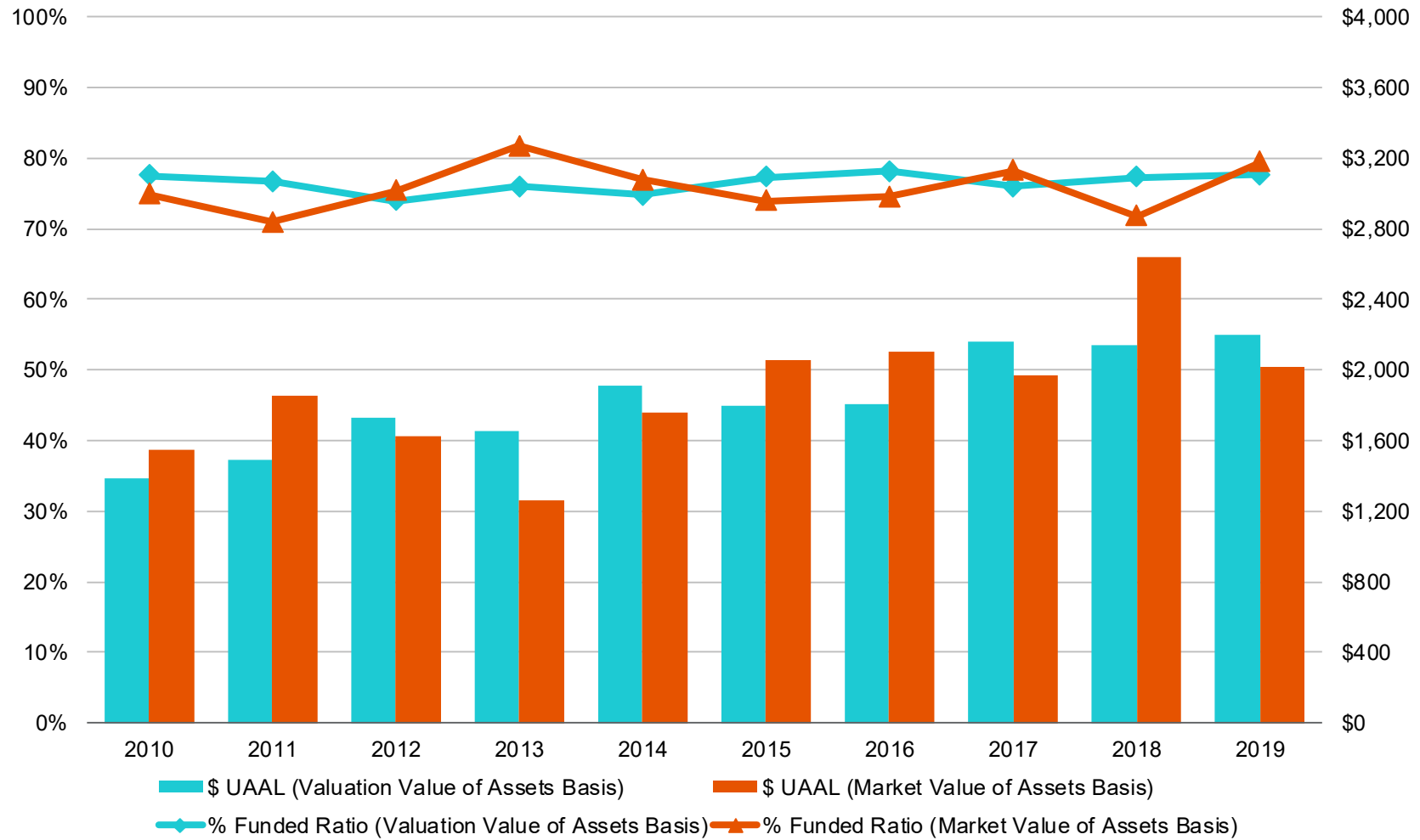
¹⁰ For instance, the UAAL increased by \$460 million and \$396 million in the December 31, 2014 and December 31, 2017 valuations, respectively, as a result of the last two experience studies.

assumptions. The non-investment experience also included the scheduled delay in implementing the contribution rates determined in the annual valuation.

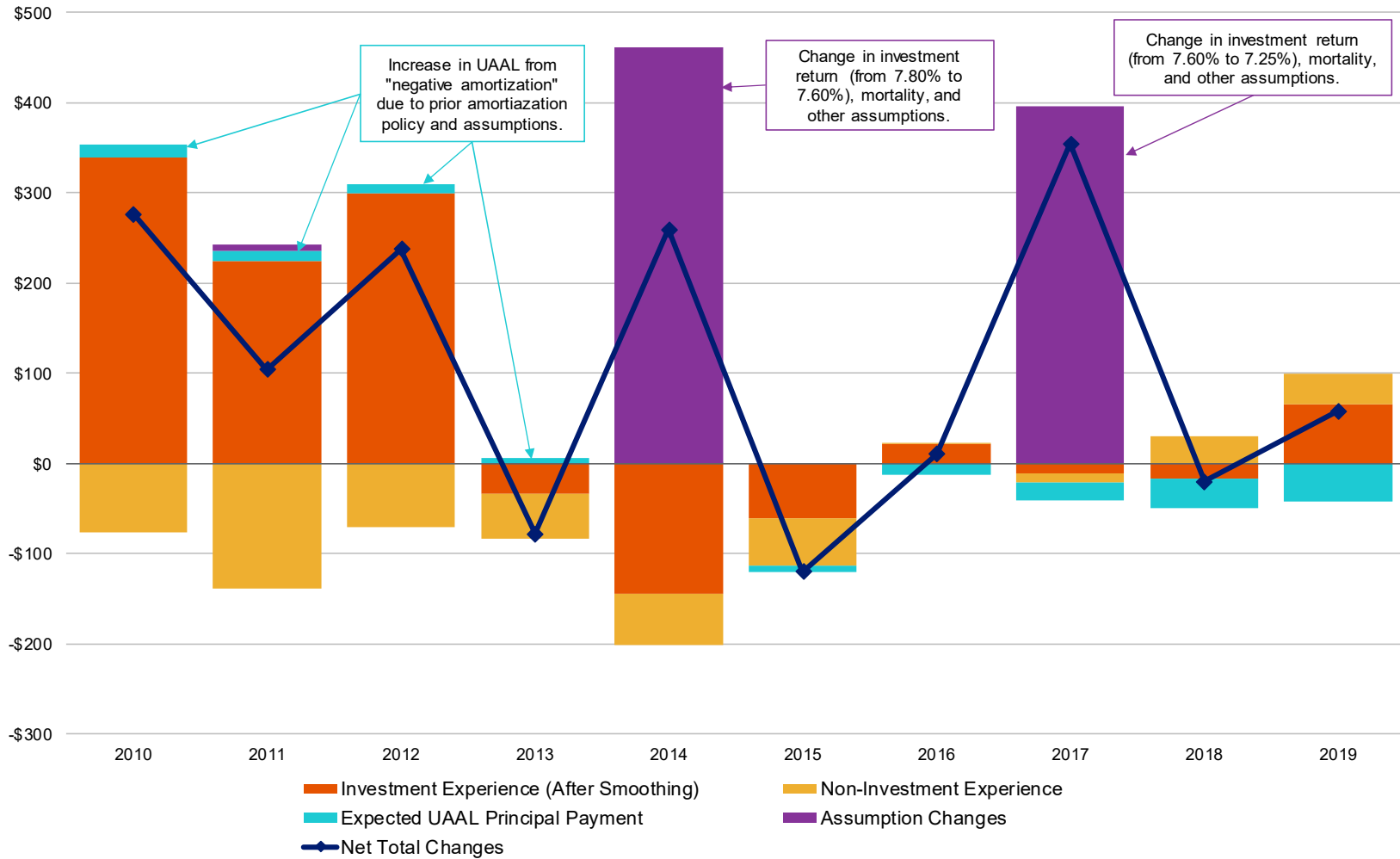
Finally, prior to 2014, *Chart 2* shows some “negative amortization” under the longer amortization periods used in these years. Current amortization policy generally will not entail negative amortization in the future.

It is important to note that ACERA has taken strides in risk management and resulting long-term plan sustainability. This includes strengthening of assumptions, particularly the expected investment rate of return and mortality assumption (generational projection), and adopting a funding policy that eliminates negative amortization and promotes intergenerational equity. Assumptions will continue to be reviewed in future experience studies to reflect the Plan’s experience as well as future expectations. Those changes may result in higher contributions in the short term, but in the medium to longer term avoid both deferring contributions and allowing unmanaged growth in the UAAL. We believe these actions are essential for ACERA’s fiscal health going forward.

Funded Ratio (Percentages) and Dollar UAAL (\$ Millions) in December 31, 2010 to 2019 Valuations



Factors that Changed UAAL in December 31, 2010 to 2019 Valuations (\$ Millions)



Note: The primary source of investment losses starting in the December 31, 2008 valuation is the Great Recession, which was recognized in the valuation value of assets over the five years ending December 31, 2012.

Employer Contribution Rates

The total (normal cost¹¹ plus UAAL payment) employer contribution rates determined in the December 31, 2010 to 2019 valuations are provided in *Chart 3* and the factors that caused the changes in the total aggregate employer rates¹² are provided in *Chart 4*.

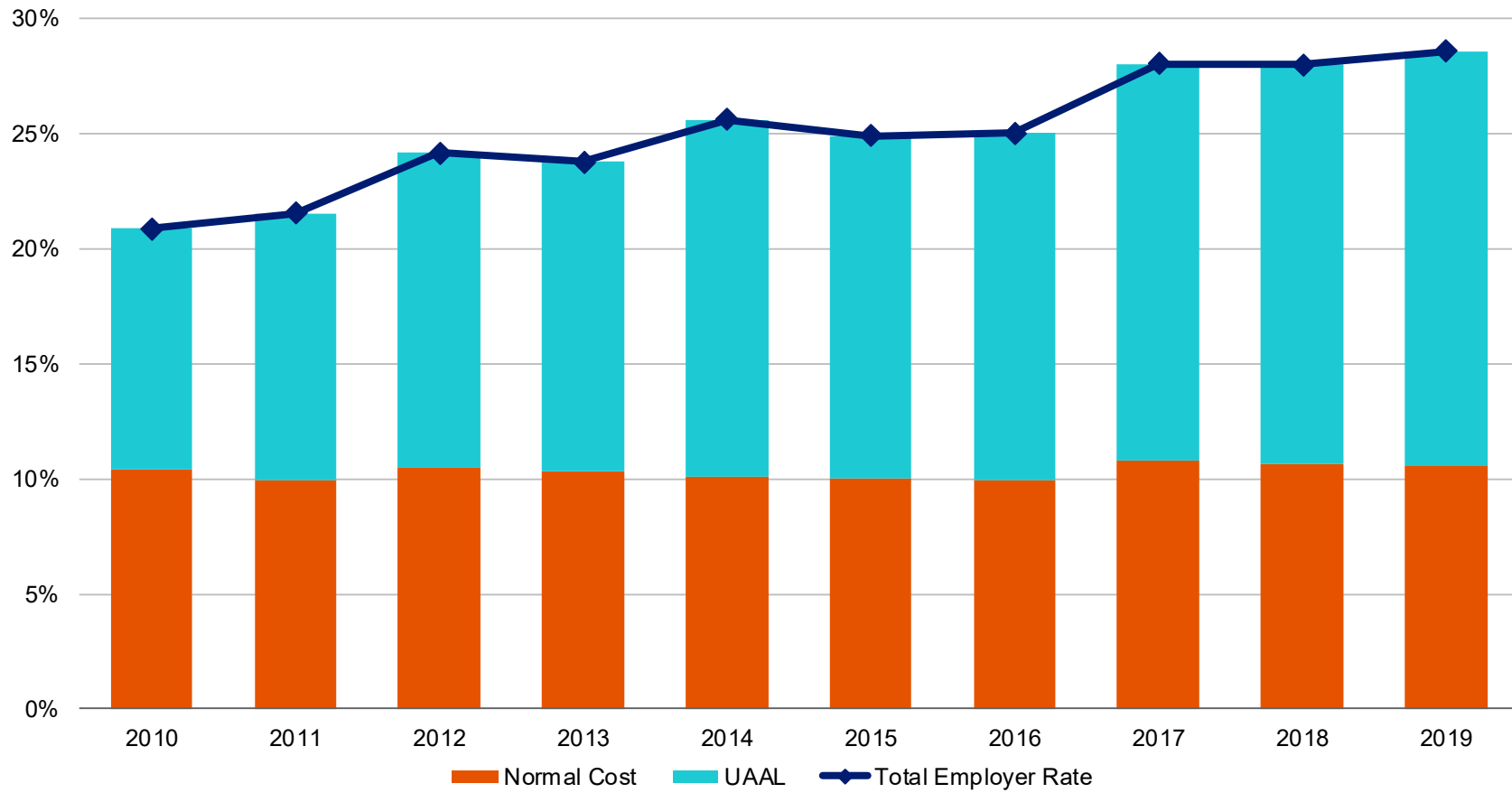
The employer's aggregate normal cost rates in *Chart 3* has stayed relatively flat during the last 10 years. There had been increases in the employer's normal cost rates due to the changes in the actuarial assumptions. However, those increases were offset to some degree by the plan changes under the Public Employees' Pension Reform Act of 2013 (PEPRA) as new members have been enrolled in the lower cost PEPRA benefit tiers starting on January 1, 2013. *Chart 4* shows that the changes in the investment return (from 7.80% to 7.60% in the December 31, 2014 valuation, from 7.60% to 7.25% in the December 31, 2017 valuation), mortality tables and other assumptions from the last two triennial experience studies have by far the most impact on increasing the UAAL contribution rates¹³ for the employers. The next greatest impact was from the investment experience during 2010 to 2019.

¹¹ The normal cost is the amount of contributions required to fund the portion of the level cost of the member's projected retirement benefit that is allocated to the current year of service.

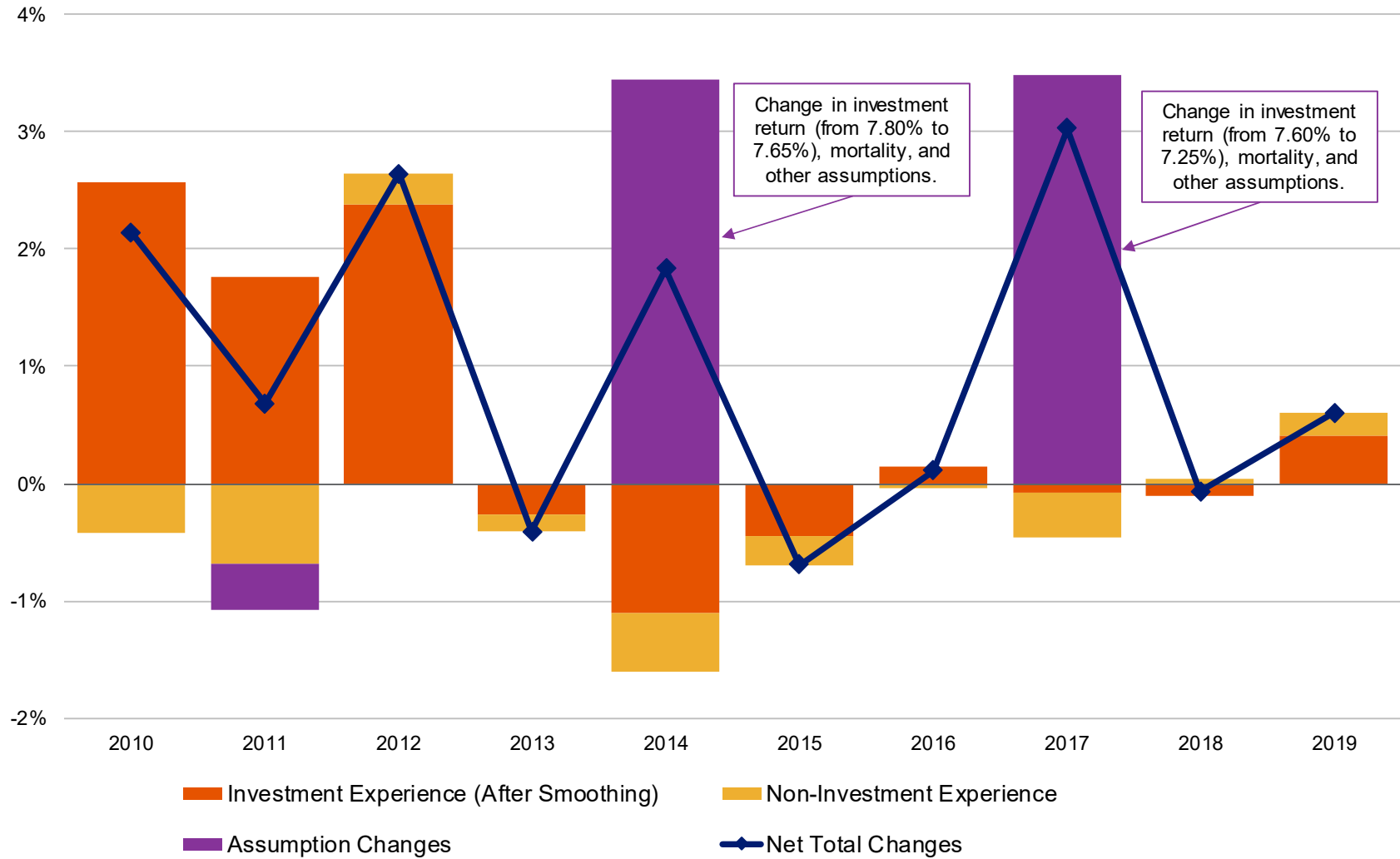
¹² There are separate contribution rates determined in the valuation for the General and Safety membership groups and for the different benefit tiers and employers. The aggregate contribution rates have been calculated based on an average of those rates weighted by the payrolls of the active members reported in those valuations.

¹³ For instance, the increase in the employer's total rate (normal cost plus UAAL) was 3.44% in the December 31, 2014 valuation and 3.49% in the December 31, 2017 valuation, as a result of the last two experience studies.

Employer Contribution Rates in December 31, 2010 to 2019 Valuations
(% of Payroll)



Factors that Affected Employer Contribution Rates in December 31, 2010 to 2019 Valuations (% of Payroll)



Note: The primary source of investment losses starting in the December 31, 2008 valuation is the Great Recession, which was recognized in the valuation value of assets over the five years ending December 31, 2012.

Supplemental Retiree Benefit Reserve

As part of the Plan design, under Article 5.5 of the Statute, excess earnings¹⁴ are allocated from the Association's total investment portfolio to the SRBR. As a result, besides paying benefits from the Pension Plan, ACERA also provides benefits using assets available in the SRBR. In most recent actuarial study for the SRBR as of December 31, 2018,¹⁵ there was about \$922 million in assets available at the Board's discretion to provide non-vested retiree health subsidies¹⁶ (other postemployment benefits or OPEB) and pension benefits¹⁷ (non-OPEB).

In the 10 valuations from December 31, 2009 to 2018, the assets available in the SRBR have increased from about \$665 million to about \$922 million. During this 10-year period, about \$262 million in excess earnings were allocated to the SRBR and it was estimated that the assets in the SRBR would be sufficient to pay OPEB SRBR benefits for about 17 years (around 2026) and non-OPEB SRBR benefits for about 22 years (around 2031) in the December 31, 2009 valuation, and OPEB SRBR benefits for about 22 years (around 2040) and non-OPEB SRBR benefits for about 18 years (around 2036) in the December 31, 2018 valuation.¹⁸

¹⁴ In general under the Board's interest crediting policy, earnings at one-half of the assumed annual valuation rate is credited every 6 months to reserves for the Pension Plan and the SRBR. After accumulating a 1% Contingency Reserve, any remaining earnings (excess earnings) is allocated on a 50/50 basis between the Pension Plan and the SRBR.

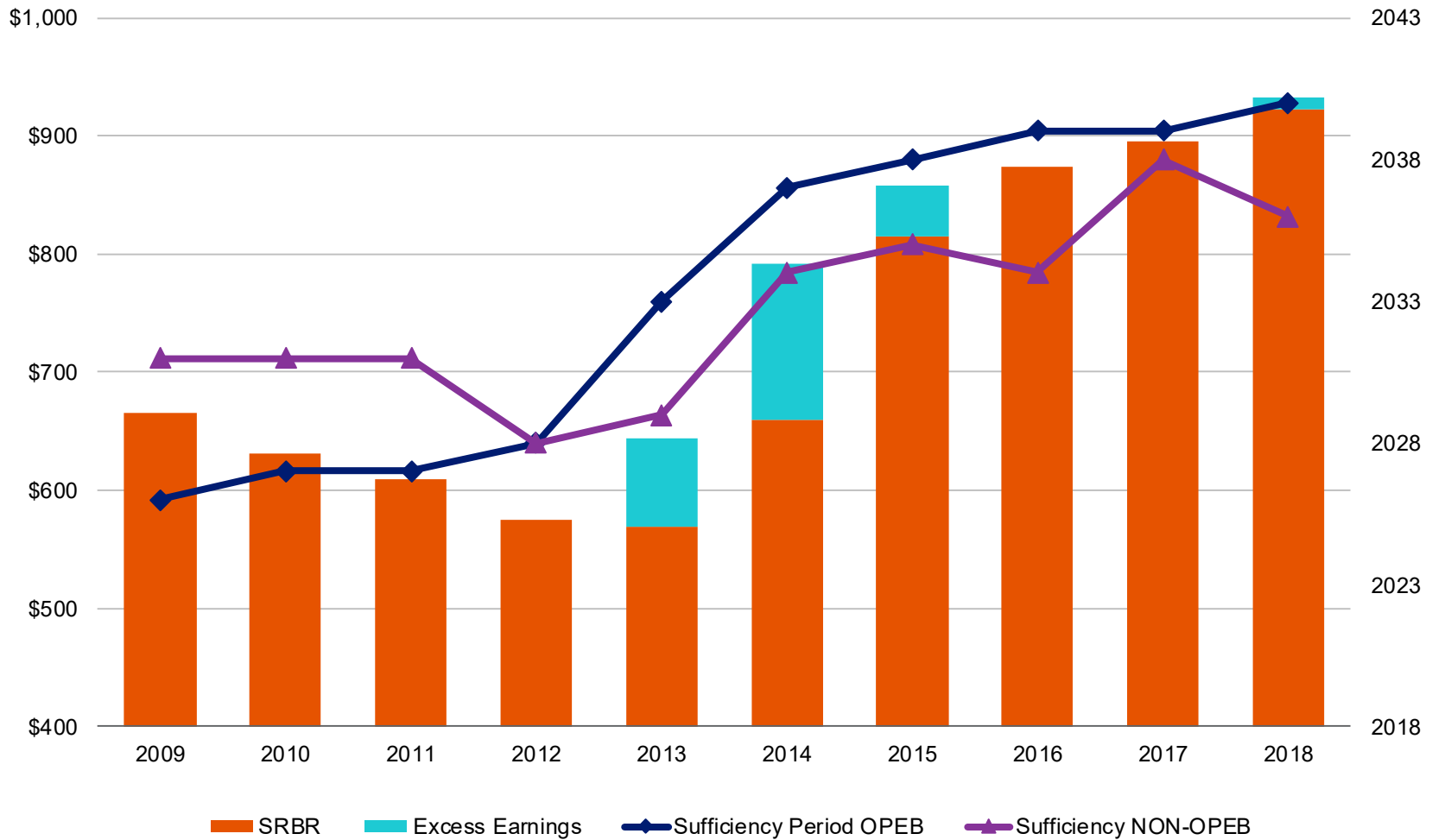
¹⁵ We have not included the results from the December 31, 2019 SRBR valuation as the results from that valuation will not be available until later in 2020.

¹⁶ The non-vested OPEB benefits include the Monthly Medical Allowance, reimbursement for premiums required for dental, vision and enrollment in Medicare Part B program.

¹⁷ The non-vested pension benefits include supplemental COLAs and \$1,000 lump sum retiree death benefits.

¹⁸ During the past 10 years, the Board took several actions to preserve the sufficiency period to pay benefits from the SRBR. For instance, the Board eliminated the Active Death Equity Benefit and froze the maximum Monthly Medical Allowance for several years.

SRBR Assets (\$ million) and Periods Benefits Can be Paid
 In December 31, 2009 to 2018 Valuations



Assessment of Primary Risk Factors Going Forward

As discussed in the Evaluation of Historical Trends section, in the 2010 to 2019 valuations the funded ratios and the employer contribution rates have changed mainly as a result of changes in actuarial assumptions and investment experience.

In general, we anticipate the following risk factors to have an ongoing influence on those financial metrics in our future valuations:

- Asset/liability mismatch risk – the potential that future plan experience does not affect asset and liability values in the same way, causing them to diverge.

The most significant asset/liability mismatch risk to ACERA is investment risk, as defined below. In fact, investment risk has the potential to impact asset/liability mismatch in two ways. The first mismatch is evident in annual valuations for the Pension Plan: when asset values deviate from assumptions, those changes are essentially independent from liability changes. The second mismatch can be caused when systemic asset deviations from assumptions may signal the need for an assumption change, which causes liability values and contribution rates to move in the opposite direction from the experience of the asset values.

Asset/liability mismatch can also be caused by longevity and other demographic assumption risks, which affect liabilities but have no impact on asset levels. These risks are also discussed below.

It may be informative to use the asset volatility and liability volatility ratios and associated contribution rate impacts provided in the following Plan Maturity Measures section when discussing with the employers the effect of unfavorable or favorable actuarial experience on the assets and the liabilities of ACERA.

- Investment risk – the potential that future market returns will be different from the current expected 7.25% annual return assumption.

The investment return assumption is a long-term, deterministic assumption for valuation purposes even though in reality market experience can be quite volatile in any given year. We have included deterministic scenario tests later in this section so that ACERA can better understand the risk associated with earning either more or less than the assumed rate.

Also, the Board has a policy of reviewing the investment return and the other actuarial assumptions generally every three years, with the next triennial experience study (recommending assumptions for the December 31, 2020 actuarial valuations) scheduled to be performed later this year. Based on our discussions with ACERA, we have included for illustrative purposes only, the funded status and the employer and employee contribution rates if the Board were to lower both the inflation and investment return assumptions as part of our sensitivity tests of the two most important economic assumptions.

- Longevity and other demographic risks – the potential that mortality or other demographic experience will be different than expected.

Changes to the mortality tables were the most major change to the non-economic assumptions in the last experience study. As can be observed from *Charts 2 and 4*, there had been relatively small impact on the UAAL and employer contribution rates due to non-investment related experience relative to the assumptions used in the last 10 valuations. However, in the last triennial experience study recommending assumptions for the December 31, 2017 valuation, we alerted the Board that it should consider a new benefit weighted mortality basis when choosing the next mortality table, pending the availability of mortality experience from the Society of Actuaries (SOA) that includes data from public sector retirement plans.¹⁹ In January 2019, the SOA published the public sector mortality tables. While it is premature to estimate the impact of applying those new mortality tables on employer and employee contribution rates until we perform the next triennial experience study recommending assumptions for the December 31, 2020 valuation, the Board should still be aware that there may be some increase in liabilities and contribution rates.

- Plan design considerations – the potential SRBR excess earnings allocations and the impact to investment return for the Pension Plan.

As we have previously disclosed in the funding valuation report, the 7.25% investment return assumption used in the valuation for the Pension Plan has been developed without considering the impact of any future 50/50 excess earnings allocation to the SRBR. This is based on our understanding that Article 5.5 of the Statute, which authorizes the allocation of 50% of excess earnings to the SRBR, does not allow for the use of a different investment return for funding than is used for interest credit. This would appear in effect to preclude the prefunding of the SRBR through the use of an assumption lower than the market earnings assumption of 7.25%

Using a “stochastic” projection approach, we estimated that the 50/50 allocation of future excess earnings would have about the same impact as an “outflow” (i.e., assets not available to fund the benefits in the Pension Plan) that would average approximately 0.6% of assets over time. We note that the amount of deferred and unrecognized investment gains/losses as of the date of the valuation could have an impact on the measurement of the 50/50 allocation of excess earnings. For instance, if we were to take into consideration the \$261 million in deferred investment gains as of December 31, 2019, there will be an increase in the average impact from 0.6% of assets to 0.7%-0.8% of assets over time. However, as the amount of deferred and unrecognized investment gains/losses has fluctuated over time²⁰, we have continued to disregard those deferred and unrecognized investment gains/losses in measuring the 0.6% of assets impact.

For informational purposes only, when we applied the results of our stochastic model to the December 31, 2019 valuation, we have estimated the approximate 0.6% of assets annual outflow would increase the Actuarial Accrued

¹⁹ We note that a similar recommendation to use benefit weighted mortality tables was made by ACERA’s actuarial auditor in 2018.

²⁰ For instance, there were deferred and unrecognized investment losses of \$569 million as of December 31, 2018 and deferred and unrecognized gains of \$261 million as of December 31, 2019.

Liability in that valuation using a 7.25% investment return assumption by \$0.71 billion) and would increase the employer's UAAL contribution rate by about 4%-5% of payroll.

- Contribution risk – the potential that actual future contributions will be different from expected future contributions. ASOP 51 does not require the actuary to evaluate the particular ability or willingness of the plan sponsor or other contributing entity to make contributions to the plan when due. However, it does require the actuary to consider the potential for and impact of actual contributions deviating from expected in the future. ACERA's employers have a well-established practice of making the actuarially determined contribution (ADC) determined in the annual actuarial valuations, based on the Board of Retirement's Actuarial Funding Policy. As a result, in practice ACERA has essentially no contribution risk.

Furthermore, when ADCs determined in accordance with the ACERA Actuarial Funding Policy are made in the future by the employers (and contributions required by the statute are made by the employees), it is anticipated that the Association would have enough assets to provide all future benefits promised to the current members enrolled in the Association, if all of the actuarial assumptions used in the valuation are met.

The ASOP also lists interest rate risk as an example of a potential risk to consider. However, the valuations of your plan's liabilities are not linked directly to market interest rates so the resulting interest rate risk exposure is minimal.

Scenario Tests: Deterministic Projections

Since the funded ratio, UAAL and the employer contribution rates have fluctuated as a result of deviation in investment experience in the last 10 valuations (and that volatility is currently evidenced by the market experience related to COVID-19), we have examined the risk for ACERA associated with earning either higher or lower than the assumed rate of 7.25% in future valuations using projections under a deterministic approach.

To measure such risk, we have included scenario tests to study the change in the UAAL and contribution rates if ACERA were to earn a market return higher or lower than 7.25% in the next year following the December 31, 2019 valuation. In *Charts 6, 7 and 8*, we show the aggregate employer contribution rates, funded ratios, and UAAL respectively assuming that the Association's portfolio market return in 2020 will be as follows: Scenario 1: 14.50%, Scenario 2: 7.25% (baseline) or Scenario 3: 0.00%.

The following table summarizes the resulting contribution changes (relative to the December 31, 2019 valuation aggregate employer contribution rate of 28.6%) in the next valuation (i.e., December 31, 2020) as well as in the December 31, 2025 valuation when all of the investment gains and losses are fully recognized in the (smoothed) valuation value of assets.

Contribution Rate Change	2020 Single Plan-Year Investment Return		
	14.50%	7.25% (Baseline)	0.00%
December 31, 2020	-0.4% of payroll	-0.2% of payroll	0.0% of payroll
December 31, 2025	-4.1% of payroll	-2.0% of payroll	1.0% of payroll

Under the favorable (14.25%) hypothetical market return scenario for 2020, the Association would be expected to completely pay off the unfunded liability and reach full funding by December 31, 2031. At that time the total employer contribution rate would be comprised of only normal cost contributions, resulting in a larger relative change from the baseline than in the unfavorable (0.00%) hypothetical market return scenario. Furthermore, under all three hypothetical market return scenarios for 2020, the Association would be expected to reach full funding within 15 years and the total employer contribution rate would be expected to approach about 10% of payroll.²¹ This means that the Board’s funding policy is very effective in achieving the general policy goal of achieving the long-term full funding of the costs of the benefits paid by ACERA.

While we have not assigned in the deterministic projections a probability on the 2020 market return coming in at these rates, the Board and other stakeholders monitoring ACERA should still be able to interpolate in order to estimate the funded status and employer contribution rates for the December 31, 2020 and next several valuations as the actual investment experience for the 2020 year becomes available throughout the year. Additionally, comparable experience in upcoming future years is likely to have a similar impact on the Association absent any significant plan or assumption changes.

SRBR Sufficiency Projection

We also provided in Charts 9, 10 and 11 the projection of the SRBR assets as well as the sufficiency period under each of the hypothetical market return Scenarios 1, 2 and 3, respectively. Of note is that under Scenario 1 (assuming 14.50% market return in 2020), even with the approximately \$500 million in excess earnings projected to be added to the SRBR through December 31, 2039, the non-OPEB SRBR would only be sufficient to pay benefits through December 31, 2040, four years later than projected in the December 31, 2018 valuation. This is in contrast to the OPEB SRBR, which would be sufficient to pay benefits through December 31, 2052, 12 years later than projected in the December 31, 2018 valuation.

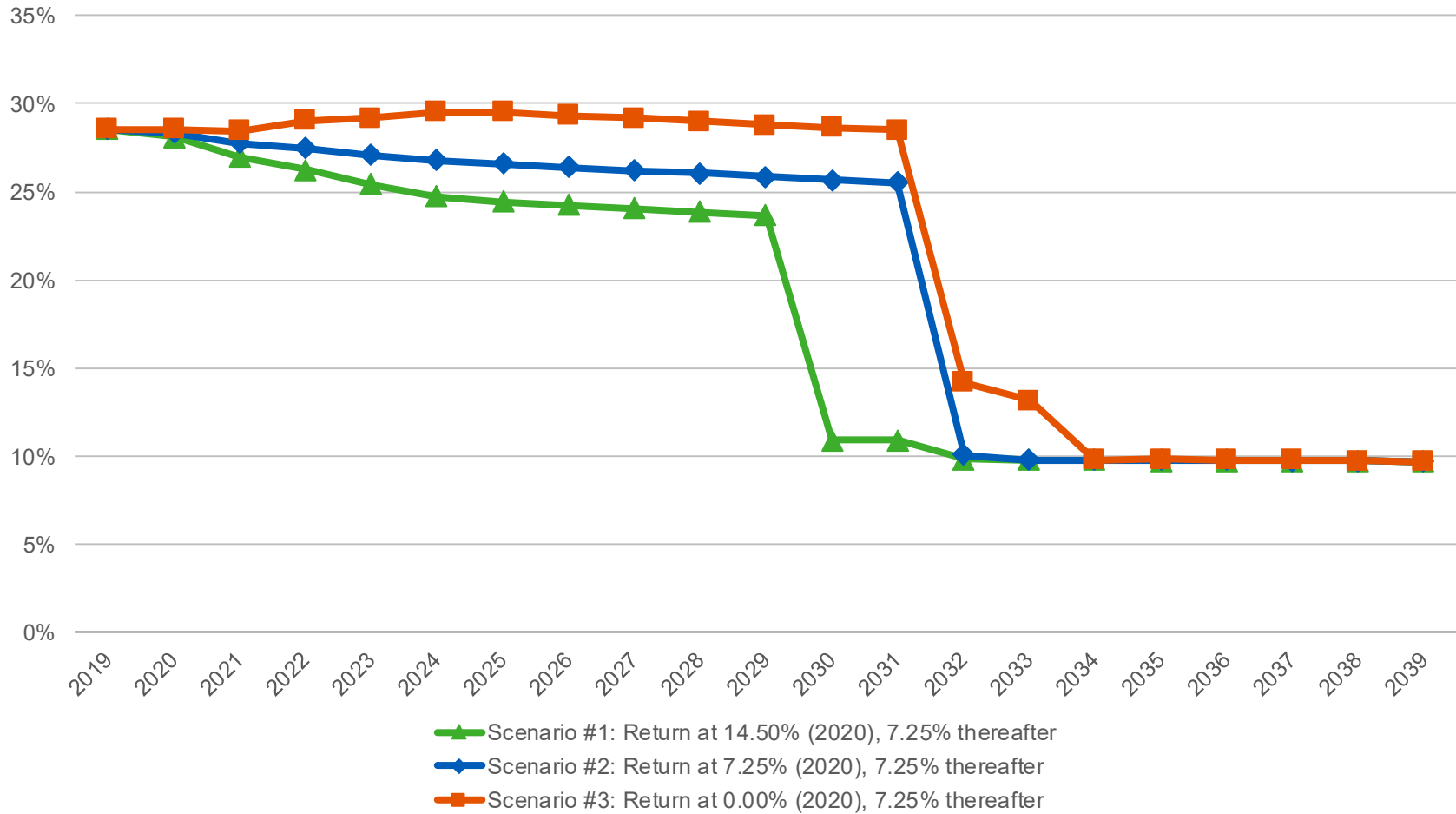
This difference can be explained by two factors. First, the sharp increase in expected non-OPEB SRBR benefits over the 20-year projection period relative to a more modest increase in expected OPEB SRBR benefits over the same period. Second, the allocation of excess earnings between the non-OPEB and OPEB reserves proportional to those reserves. As the benefit levels expected to be paid from the non-OPEB SRBR rise relative to those expected to be paid from the OPEB SRBR, the value of the non-OPEB SRBR will fall relative to the value of the OPEB SRBR, and the share of excess

²¹ Assuming no further assumption changes, method changes or experience that differs significantly from assumptions.

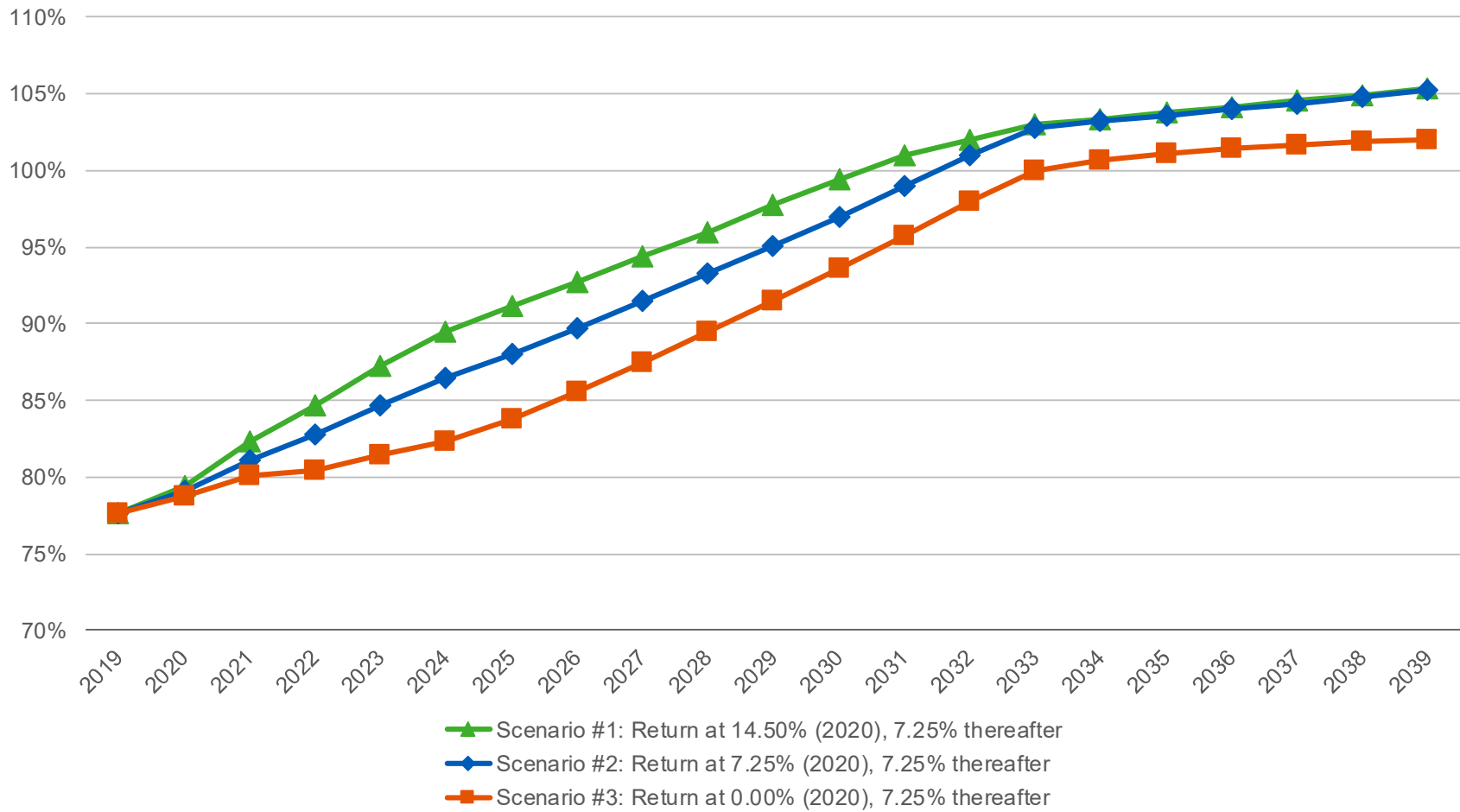
earnings allocated to the non-OPEB SRBR will decrease. Lower expected inflows (from excess earnings) and higher expected outflows result in an inability to pay non-OPEB benefits over the long term.

Absent any action that might be taken by the Board to change benefits or the proportional allocation of excess earnings between the non-OPEB and OPEB reserves, it is unlikely that future excess earnings would be sufficient to fund the non-OPEB SRBR on an ongoing basis.

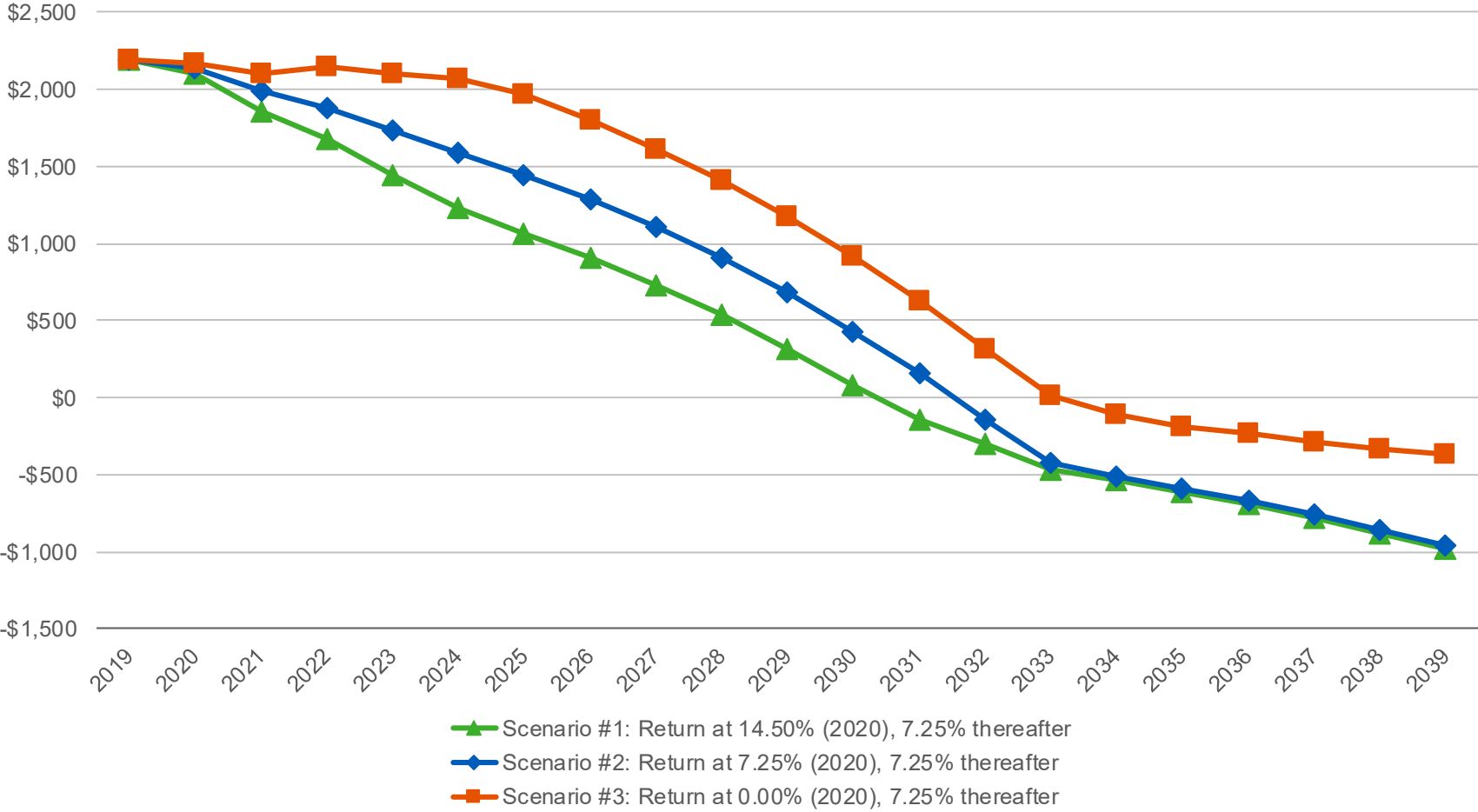
Projected Employer Contribution Rates Under Three Hypothetical Market Return Scenarios for 2020 (% of Payroll)



Projected Funded Ratios (on Valuation Value of Assets Basis) Under Three Hypothetical Market Return Scenarios for 2020



Projected UAAL (on Valuation Value of Assets Basis) Under Three Hypothetical Market Return Scenarios for 2020 (\$ Millions)



Projected SRBR Assets (\$ Millions) Sufficiency Period Under Hypothetical Market Return Scenario #1 (Return at 14.50% for 2020)

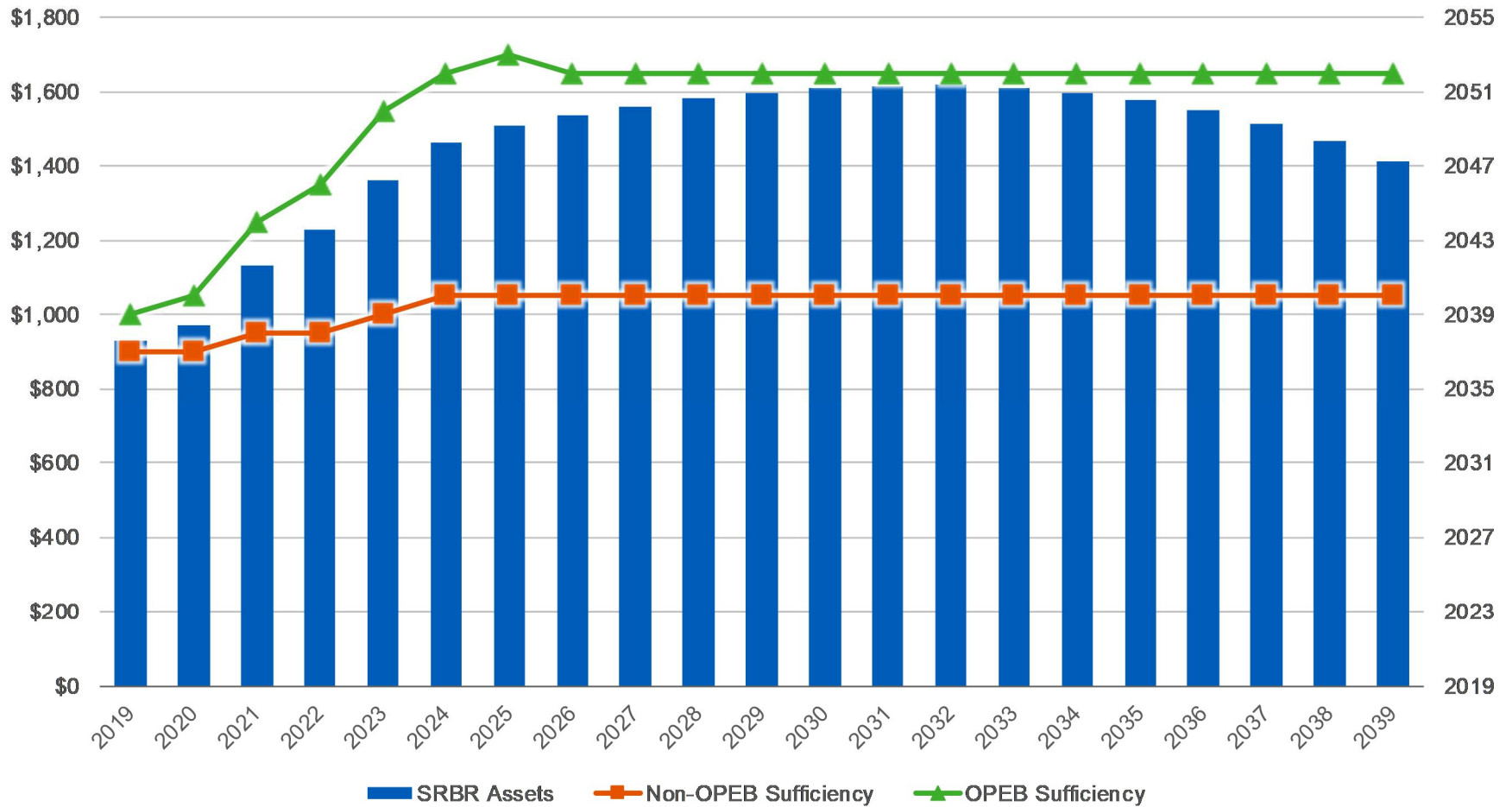
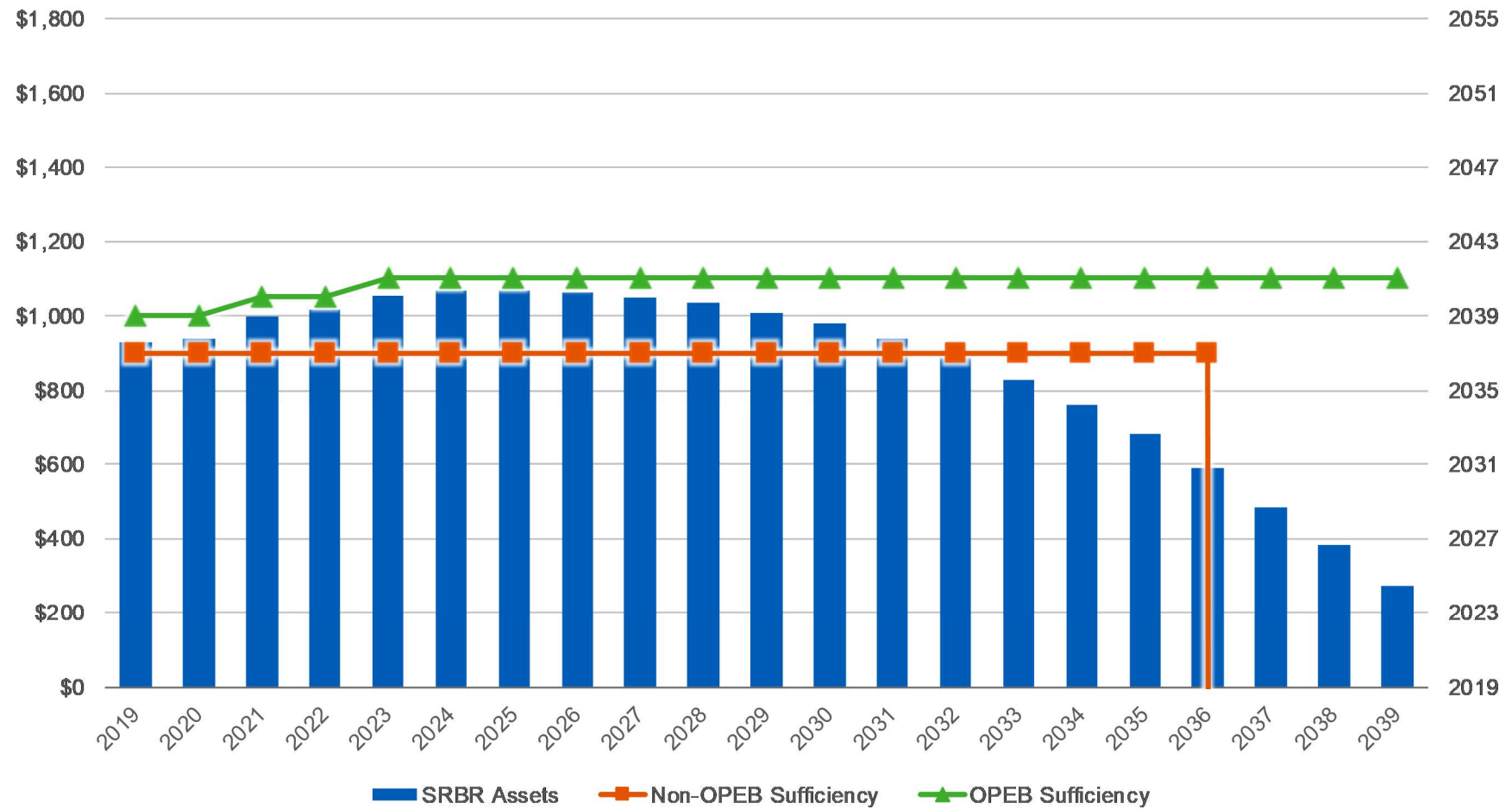
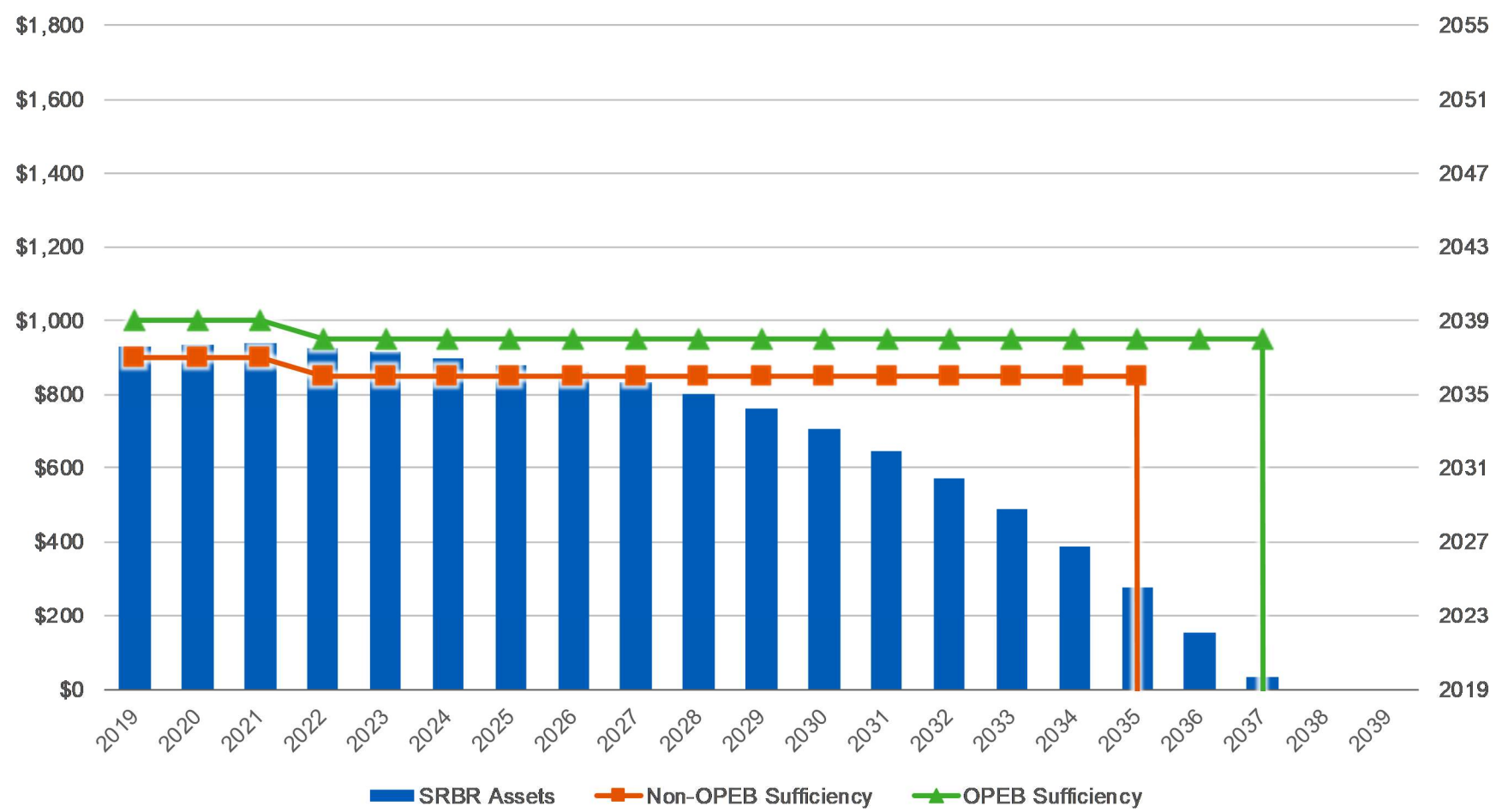


Chart 10

Projected SRBR Assets (\$ Millions) Sufficiency Period Under Hypothetical Market Return Scenario #1 (Return at 7.25% for 2020)



Projected SRBR Assets (\$ Millions) Sufficiency Period Under Hypothetical Market Return Scenario #1 (Return at 0.00% for 2020)



Stochastic Projection

Based on our discussions with ACERA, we have also supplemented the deterministic Scenario Tests by another analysis that shows the range of possible changes in funded status and contribution rates under a statistical distribution of potential market returns for 20 years following the December 31, 2019 valuation. We have accomplished the stochastic modeling of future market returns by using the expected return, standard deviation and other information about ACERA’s asset portfolio as provided in the Appendix of this report, assuming no future assumption or method changes to the plan.

In *Chart 12*, we summarize the cumulative compounded rate of return of ACERA’s investment portfolio over the next 20 years based on performing 10,000 trial outcomes of future market returns. The projected funded ratios for those trials are provided in *Chart 13*. The UAAL and the resultant employer contribution rates are provided in *Charts 14* and *15*, respectively.

At the end of 20 years, there is a 50% chance²² that the annual return of ACERA’s investment portfolio would average between 5.5% and 9.3%, the funded ratio would be between 81% and 125% and the corresponding UAAL would be between \$3.4 billion and a surplus (or a negative UAAL) of \$4.6 billion.

The funded ratio is about 78% in the December 31, 2019 valuation. There is a 34% chance ACERA would be fully funded at the end of 10 years and a 49% chance ACERA would be fully funded at the end of 20 years. The probabilities that the funded ratio would fall below 50%, 60% or 70% at any point in the next 20 years are as follows:

	Funded Ratio		
	Below 50%	Below 60%	Below 70%
Probability	3%	13%	31%

At the end of 10 years (i.e., at the December 31, 2029 valuation), there is a 50% chance that the employer contribution rates would be between 10% and 37% of payroll. At the end of 20 years (i.e., the December 31, 2039 valuation), there is a 50% chance that the employer contribution rates would be between 10% and 26% of payroll. 10% of payroll is about the level of the employer normal cost rate. Note that we have not offset the normal cost by any available actuarial surplus.²³

²² This is based on the 25th to the 75th percentile results.

²³ Under PEPR, the System has an actuarial surplus when the funded ratio is at or over 120% and certain other conditions are met. For the purposes of these projections, we have assumed that those other conditions have not been met and therefore we did not amortize such actuarial surplus over a rolling (non-decreasing) 30-year period as described under the Board’s funding policy.

The total employer contribution rate is about 29% payroll in the December 31, 2019 valuation. The probabilities that the total employer contribution rate would increase at least by 5%, 10% or 15% of payroll at any point in the next 20 years are as follows:

<u>Total Employer Rate Increases by at least</u>			
	5% of Payroll (to 34% of Payroll)	10% of Payroll (to 39% of Payroll)	15% of Payroll (to 44% of Payroll)
Probability	47%	32%	20%

Finally, the probabilities that the total employer contribution rate would spike by 3%, 5% or 7% of payroll in any single year during the next 20 years are as follows:

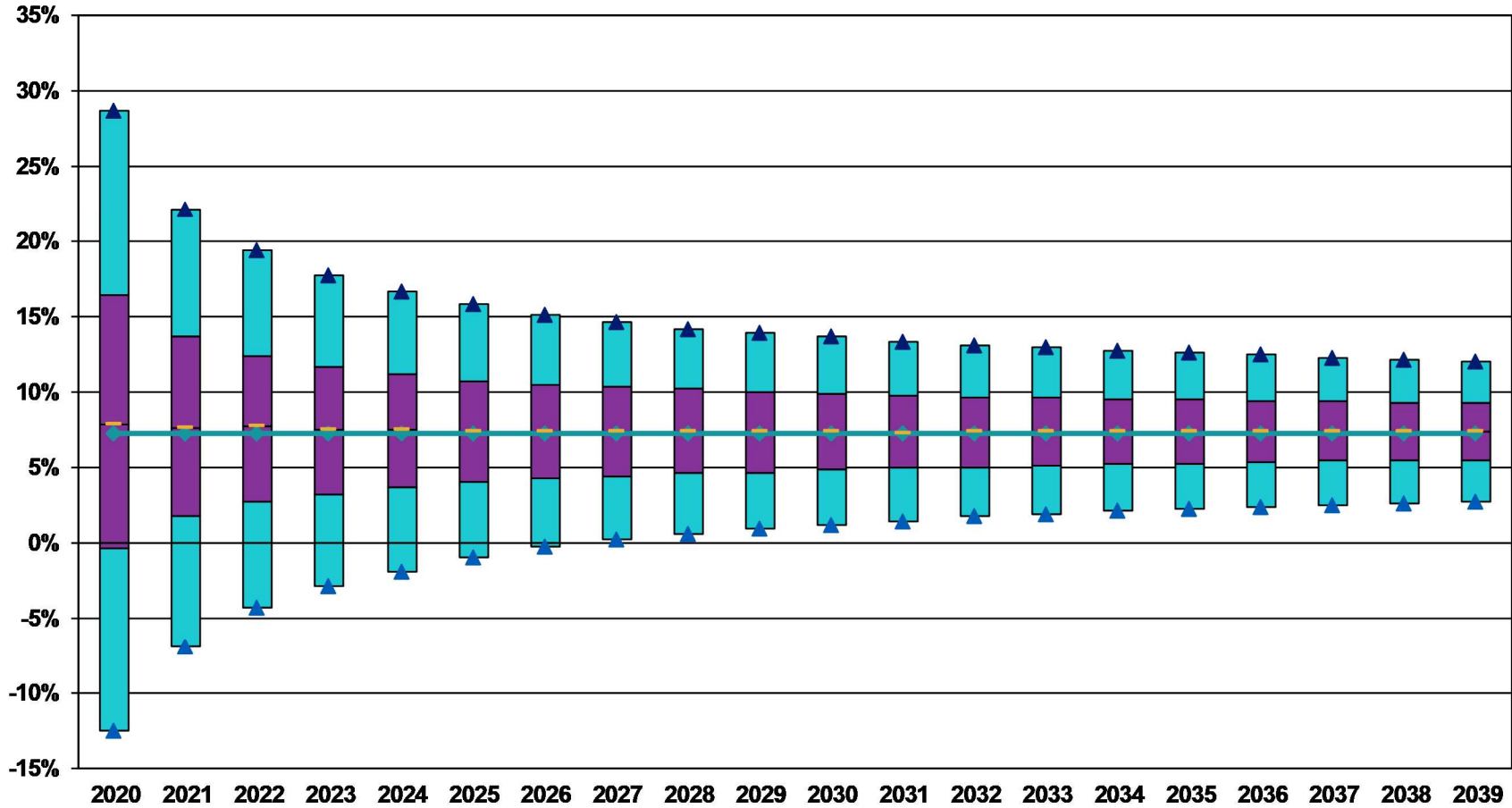
<u>Total Employer Rate Spikes in a Single Year by at least</u>			
	3% of Payroll	5% of Payroll	7% of Payroll
Probability	8%	2%	1%

SRBR Sufficiency Projection

In *Chart 16*, we summarize the projected SRBR reserves over the next 20 years based on performing 10,000 trial outcomes of future market returns. In *Charts 17* and *18*, the sufficiency years for the OPEB and non-OPEB SRBR, respectively, are provided.

The probability that the sufficiency period for the OPEB SRBR would be over 15 years is 65% at the end of 10 years and 70% at the end of 20 years. The probability that the sufficiency period for the non-OPEB SRBR would be over 15 years is 33% at the end of 10 years and 30% at the end of 20 years. As the non-OPEB component of the SRBR assets is expected to be depleted before the OPEB component of the SRBR assets, the Board may need to consider transferring some assets from the OPEB component to the non-OPEB component in the next 5 to 10 years. When reviewing the results at the end of 20 years, it could be observed that the Board’s current SRBR Policy would remain effective in controlling costs to pay medical subsidies and other benefits and achieving ACERA’s long term goal of sustaining future benefit payments for at least 15 years following the date of the future valuations. However, at the end of 20 years, unlike most of the projection scenarios for the benefits paid from the Pension Plan that would be expected to become fully funded, the benefits paid from the SRBR would remain less than fully funded.

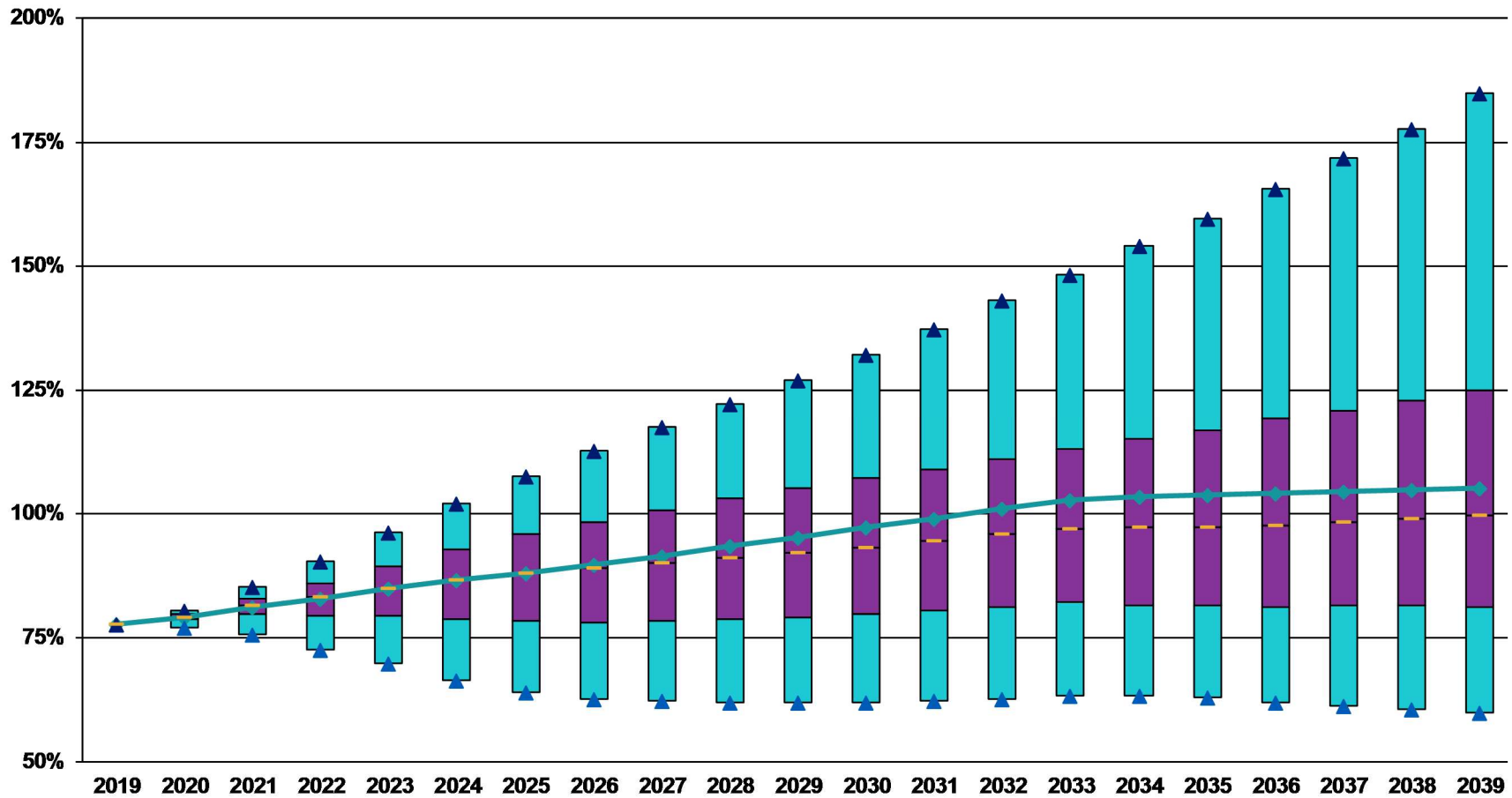
Projected Cumulative Investment Return for Plan Years Ending December 31



	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
▲ 95th	28.7%	22.2%	19.5%	17.7%	16.7%	15.8%	15.1%	14.7%	14.3%	13.9%	13.7%	13.4%	13.2%	13.0%	12.8%	12.7%	12.5%	12.3%	12.2%	12.1%
— 75th	16.4%	13.7%	12.5%	11.7%	11.2%	10.8%	10.5%	10.4%	10.2%	10.1%	9.9%	9.8%	9.7%	9.7%	9.6%	9.6%	9.5%	9.4%	9.4%	9.3%
— 50th	7.9%	7.7%	7.7%	7.5%	7.5%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
— 25th	-0.3%	1.8%	2.8%	3.3%	3.7%	4.0%	4.3%	4.5%	4.7%	4.7%	4.9%	5.0%	5.1%	5.2%	5.2%	5.3%	5.4%	5.5%	5.5%	5.5%
▲ 5th	-12.4%	-6.9%	-4.3%	-2.9%	-1.8%	-1.0%	-0.2%	0.3%	0.6%	1.0%	1.2%	1.5%	1.8%	2.0%	2.2%	2.3%	2.4%	2.6%	2.7%	2.8%
◆	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%	7.25%

◆ Current investment return assumption

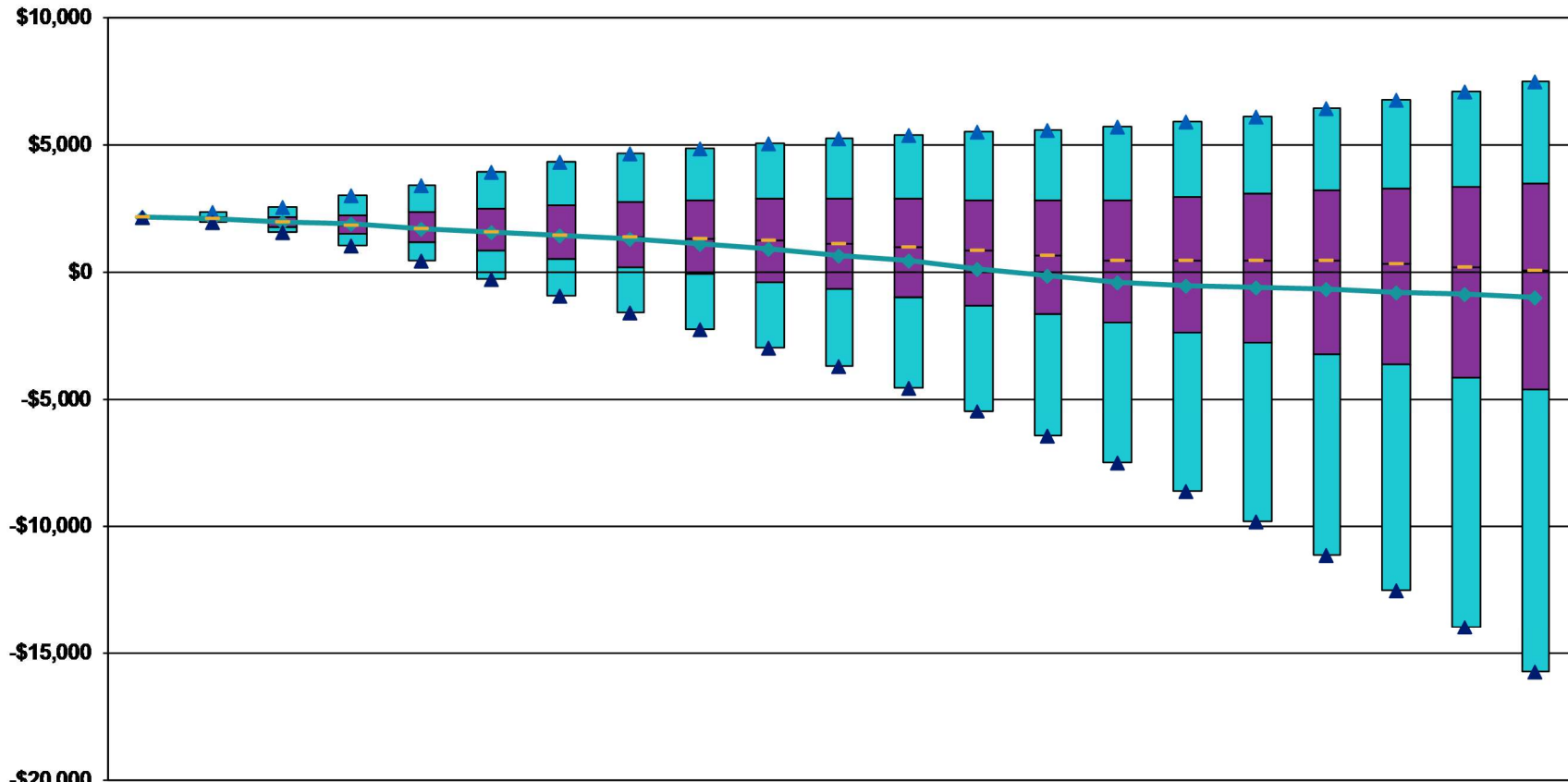
Projected Funded Ratios (on Valuation Value of Assets Basis) as of December 31,



	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
▲ 95th	77.6%	80.4%	85.3%	90.2%	96.1%	102.1%	107.4%	112.5%	117.5%	122.1%	127.0%	132.0%	137.3%	143.0%	148.2%	153.8%	159.4%	165.5%	171.7%	177.7%	184.9%
— 75th	77.6%	79.6%	82.9%	85.9%	89.4%	92.7%	95.6%	98.3%	100.6%	102.9%	104.9%	107.0%	108.8%	110.8%	113.0%	114.8%	116.6%	118.9%	120.9%	122.9%	124.8%
— 50th	77.6%	79.0%	81.2%	83.0%	84.9%	86.6%	88.0%	89.0%	90.0%	90.9%	91.9%	93.2%	94.2%	95.7%	97.0%	97.2%	97.2%	97.3%	98.0%	98.8%	99.6%
— 25th	77.6%	78.5%	79.6%	79.4%	79.2%	78.7%	78.3%	78.1%	78.3%	78.5%	78.9%	79.6%	80.5%	81.1%	81.9%	81.5%	81.3%	81.0%	81.3%	81.3%	81.2%
▲ 5th	77.6%	77.0%	75.6%	72.5%	69.7%	66.5%	64.0%	62.5%	62.1%	61.9%	61.8%	61.7%	62.2%	62.7%	63.3%	63.1%	62.7%	61.9%	61.1%	60.5%	59.7%
◆	77.6%	79.0%	81.1%	82.8%	84.7%	86.4%	88.1%	89.7%	91.5%	93.2%	95.1%	97.0%	98.9%	101.0%	102.8%	103.2%	103.6%	104.0%	104.4%	104.8%	105.2%

◆ Baseline deterministic projection with current assumptions

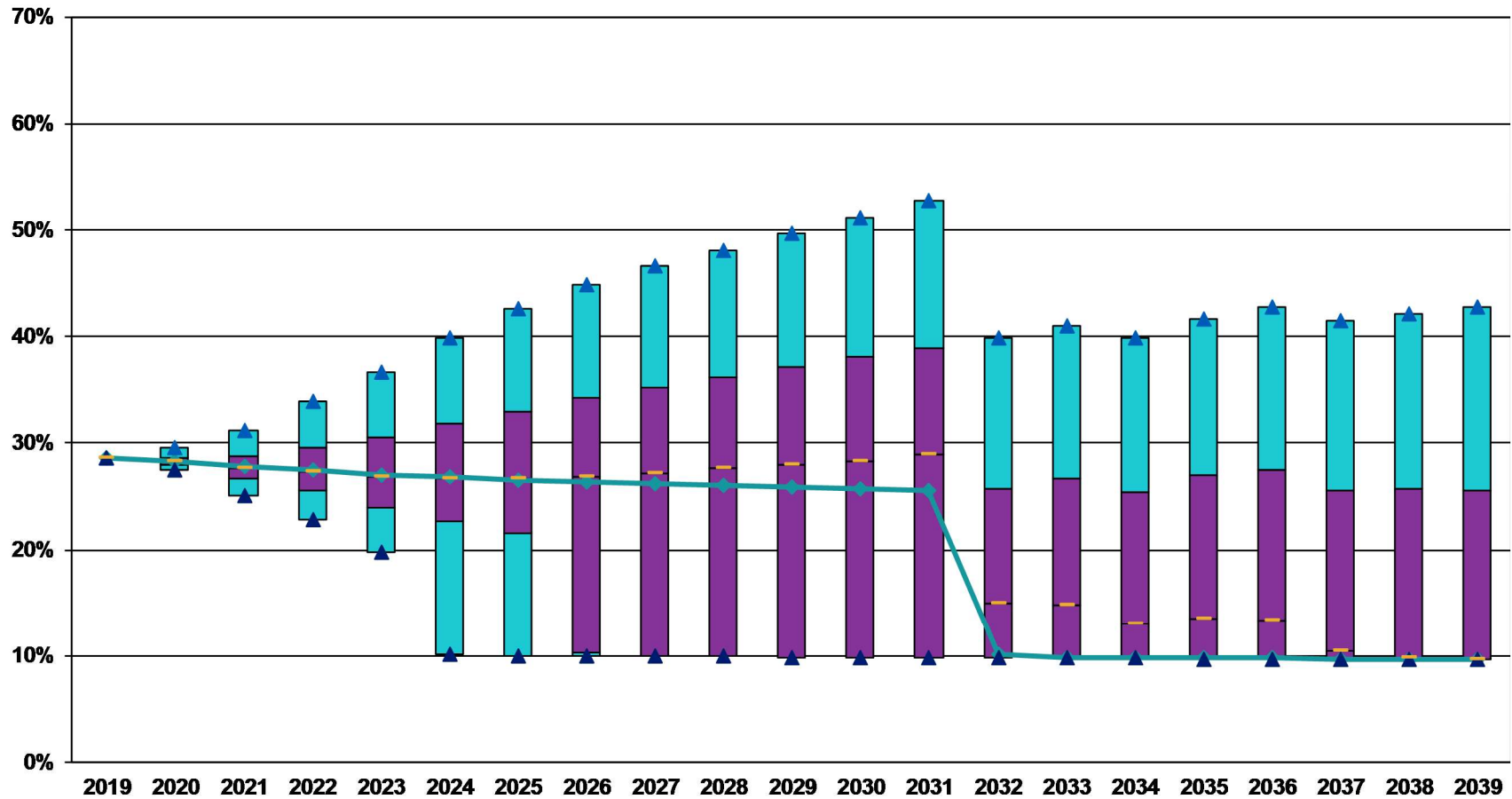
Projected UAAL (on Valuation Value of Assets Basis) as of December 31,
(\$ Millions)



	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
▲ 95th	2,195	1,989	1,549	1,071	443	-242	-897	-1,565	-2,254	-2,950	-3,715	-4,541	-5,454	-6,487	-7,480	-8,609	-9,782	-11,108	-12,530	-13,986	-15,758
— 75th	2,195	2,077	1,801	1,539	1,197	850	530	218	-73	-385	-675	-986	-1,292	-1,632	-2,011	-2,370	-2,740	-3,207	-3,648	-4,132	-4,596
— 50th	2,195	2,130	1,979	1,855	1,704	1,567	1,450	1,377	1,289	1,216	1,108	969	843	648	471	448	465	450	344	213	74
— 25th	2,195	2,184	2,152	2,246	2,347	2,486	2,624	2,736	2,797	2,864	2,899	2,893	2,854	2,851	2,807	2,966	3,083	3,216	3,274	3,361	3,494
▲ 5th	2,195	2,337	2,568	3,001	3,423	3,922	4,360	4,693	4,888	5,081	5,254	5,425	5,527	5,620	5,691	5,894	6,136	6,457	6,790	7,109	7,485
◆	2,195	2,130	1,990	1,878	1,731	1,591	1,445	1,283	1,101	900	676	429	156	-144	-429	-516	-592	-675	-763	-859	-961

◆ Baseline deterministic projection with current assumptions

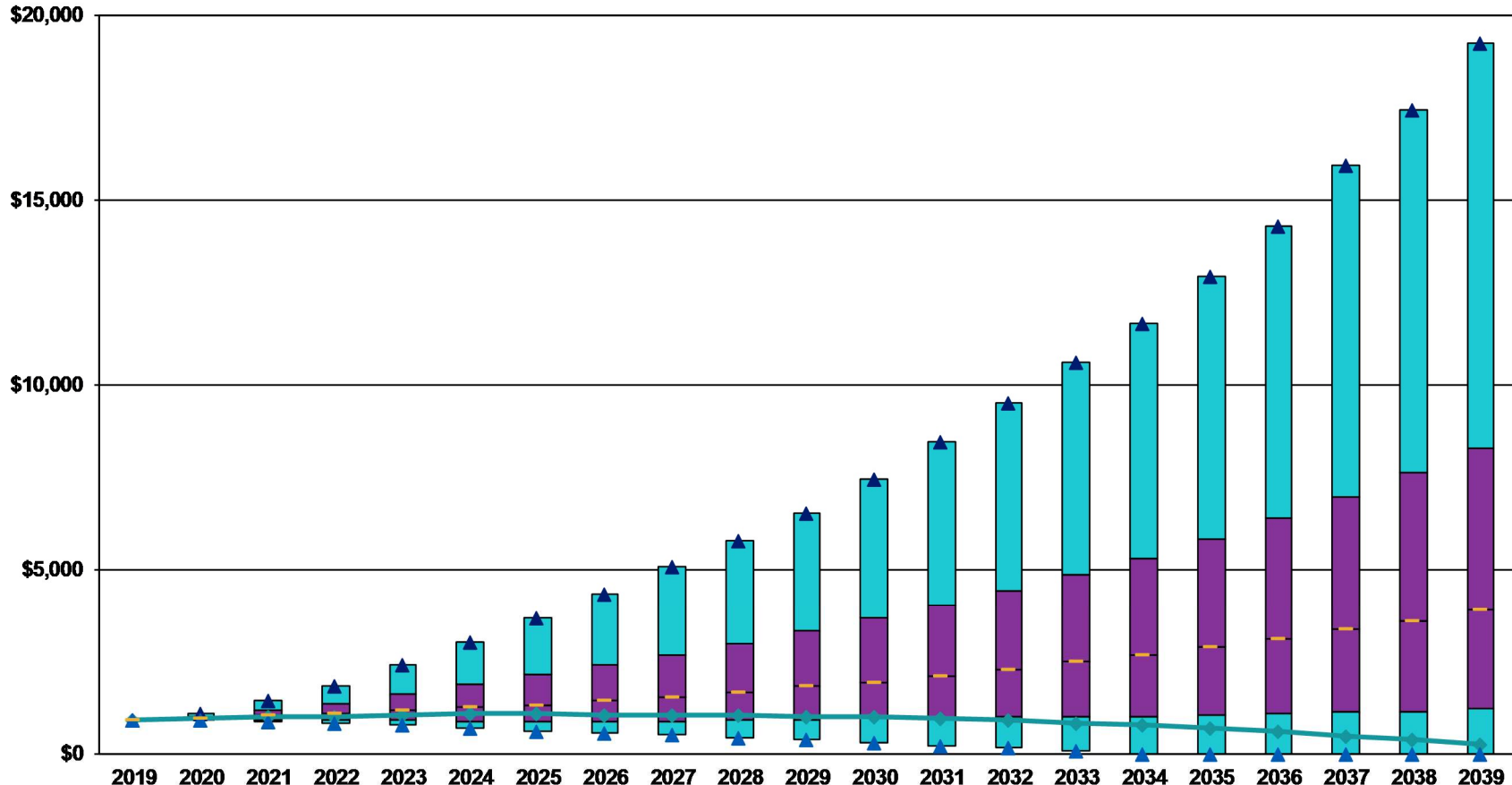
Projected Employer Contribution Rates as of December 31,



▲ 95th	28.6%	27.5%	25.2%	22.8%	19.7%	10.1%	10.0%	10.0%	10.0%	9.9%	9.9%	9.9%	9.8%	9.8%	9.8%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%
— 75th	28.6%	28.0%	26.7%	25.5%	24.0%	22.6%	21.5%	10.3%	10.0%	9.9%	9.9%	9.9%	9.8%	9.8%	9.8%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%
— 50th	28.6%	28.3%	27.7%	27.3%	26.9%	26.7%	26.6%	26.9%	27.2%	27.6%	28.0%	28.3%	28.9%	15.0%	14.8%	13.0%	13.5%	13.4%	10.5%	9.8%	9.7%
— 25th	28.6%	28.7%	28.7%	29.6%	30.6%	31.8%	33.0%	34.3%	35.2%	36.2%	37.2%	38.2%	38.9%	25.8%	26.7%	25.5%	27.0%	27.5%	25.6%	25.7%	25.6%
▲ 5th	28.6%	29.6%	31.2%	34.0%	36.7%	39.9%	42.6%	44.9%	46.6%	48.1%	49.7%	51.2%	52.7%	39.9%	41.0%	39.9%	41.6%	42.8%	41.4%	42.1%	42.8%
◆	28.6%	28.3%	27.8%	27.5%	27.1%	26.8%	26.6%	26.4%	26.2%	26.0%	25.9%	25.7%	25.5%	10.1%	9.8%	9.8%	9.8%	9.8%	9.7%	9.7%	9.7%

◆ Baseline deterministic projection with current assumptions

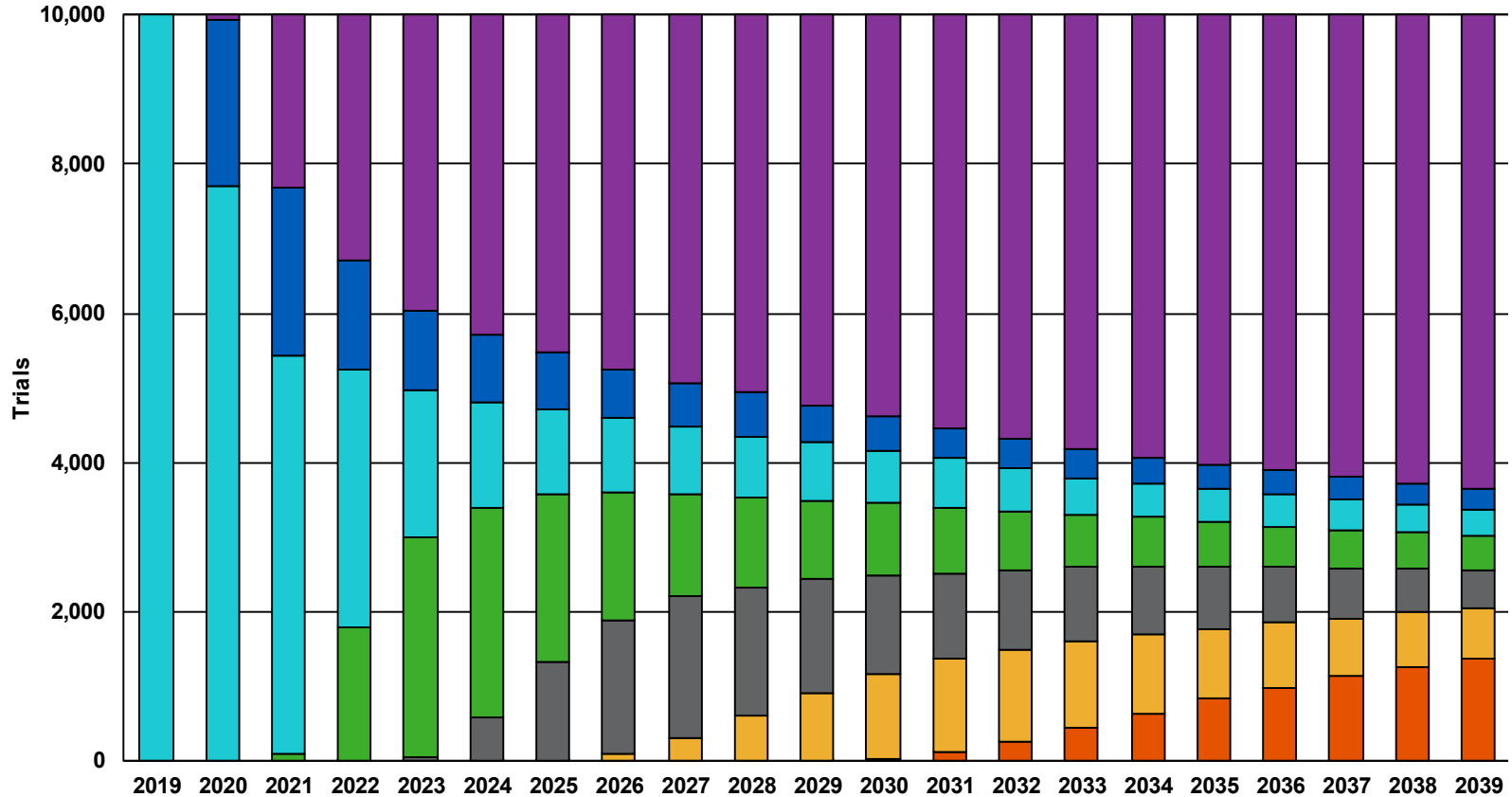
Projected Supplemental Retiree Benefit Reserve as of December 31,
(\$ Millions)



▲ 95th	929	1,079	1,442	1,840	2,398	3,025	3,672	4,332	5,072	5,781	6,514	7,447	8,460	9,498	10,606	11,684	12,925	14,299	15,975	17,465	19,265
— 75th	929	991	1,193	1,371	1,625	1,879	2,129	2,384	2,665	2,969	3,319	3,682	4,025	4,426	4,843	5,298	5,827	6,401	6,952	7,619	8,287
— 50th	929	938	1,025	1,081	1,159	1,243	1,326	1,427	1,547	1,664	1,815	1,941	2,117	2,292	2,489	2,683	2,877	3,110	3,350	3,600	3,883
— 25th	929	931	933	918	906	883	873	871	886	899	916	939	966	983	992	1,018	1,057	1,091	1,122	1,152	1,209
▲ 5th	929	913	883	827	768	692	625	562	503	437	371	299	222	148	74	1	0	0	0	0	0
◆	929	938	999	1,015	1,053	1,066	1,066	1,061	1,050	1,034	1,010	979	939	890	830	761	680	588	481	382	270

◆ Baseline deterministic projection with current assumptions

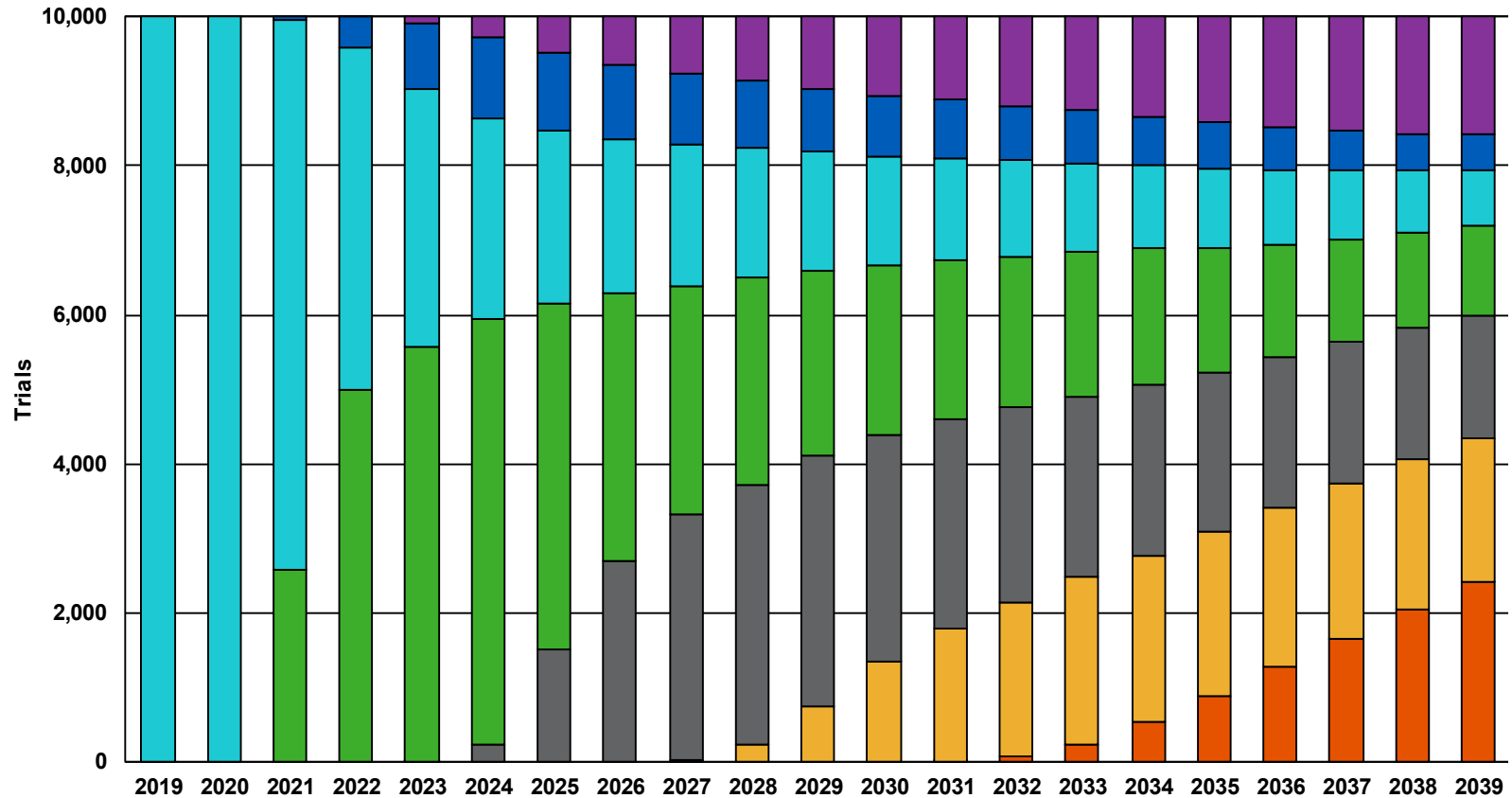
OPEB SRBR Projected Sufficiency as of December 31,



- Over 25 Years
- 21 - 25 Years
- 16 - 20 Years
- 11 - 15 Years
- 6 - 10 Years
- 1 - 5 Years
- Less than 1 Year

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Over 25 Years	0%	1%	23%	33%	40%	43%	45%	48%	49%	51%	52%	54%	55%	57%	58%	59%	60%	61%	62%	63%	64%
21 - 25 Years	0%	22%	23%	15%	11%	9%	8%	6%	6%	6%	5%	5%	4%	4%	4%	4%	3%	3%	3%	3%	3%
16 - 20 Years	100%	77%	53%	35%	20%	14%	11%	10%	9%	8%	8%	7%	7%	6%	5%	4%	4%	4%	4%	4%	3%
11 - 15 Years	0%	0%	1%	18%	29%	28%	22%	17%	14%	12%	10%	10%	9%	8%	7%	7%	6%	5%	5%	5%	5%
6 - 10 Years	0%	0%	0%	0%	1%	6%	13%	18%	19%	17%	15%	13%	11%	11%	10%	9%	8%	8%	7%	6%	5%
1 - 5 Years	0%	0%	0%	0%	0%	0%	0%	1%	3%	6%	9%	11%	13%	12%	12%	11%	9%	9%	8%	7%	7%
Less than 1 Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	4%	6%	8%	10%	11%	13%	14%

Non-OPEB SRBR Projected Sufficiency as of December 31,



- Over 25 Years
- 21 - 25 Years
- 16 - 20 Years
- 11 - 15 Years
- 6 - 10 Years
- 1 - 5 Years
- Less than 1 Year

0%	0%	0%	0%	1%	3%	5%	6%	8%	9%	10%	11%	11%	12%	13%	13%	14%	15%	15%	16%	16%
0%	0%	1%	4%	9%	11%	10%	10%	10%	9%	8%	8%	8%	7%	7%	6%	6%	6%	5%	5%	5%
100%	100%	74%	46%	35%	27%	23%	21%	19%	17%	16%	15%	14%	13%	12%	11%	11%	10%	9%	8%	7%
0%	0%	26%	50%	56%	57%	46%	36%	31%	28%	25%	23%	21%	20%	19%	18%	17%	15%	14%	13%	12%
0%	0%	0%	0%	0%	2%	15%	27%	33%	35%	34%	30%	28%	26%	24%	23%	21%	20%	19%	18%	16%
0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	7%	13%	18%	21%	23%	22%	22%	21%	21%	20%	19%
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	5%	9%	13%	16%	20%	24%

Sensitivity Tests

The Board has a policy of reviewing the investment return and the other actuarial assumptions every three years, with the next triennial experience study (recommending assumptions for the December 31, 2020 actuarial valuation) scheduled to be performed in 2020. Even though the economic assumptions included in our sensitivity analysis might not correspond to the final investment return and inflation assumptions²⁴ that we would recommend to the Board at the next triennial experience study, the results from this analysis could still provide the stakeholders some insight of the approximate financial impact of such changes in assumptions.

The following table summarizes the resulting impact of a 0.25% reduction in the inflation assumption with no offsetting 0.25% increase in real return.

<u>Increase/Decrease from Baseline Results in the December 31, 2019 Valuation due to Change in Inflation or Investment Return Assumption</u>			
Inflation/Investment Assumptions	3.00% / 7.25% (baseline)	2.75% / 7.00%	Increase/Decrease
Employee Contribution Rate	9.3% of payroll	9.6% of payroll	+0.3% of payroll
Employer Contribution Rate	28.6% of payroll	30.2% of payroll	+1.6% of payroll
UAAL	\$2,195 million	2,390 million	+\$195 million
Funded Ratio	77.6%	76.1%	-1.5%

²⁴ The inflation assumption impacts the active salary increase assumption, retiree COLAs, and growth in the System's future payroll used to develop the UAAL rate.

Plan Maturity Measures that Affect Primary Risks

The annual actuarial valuation considers the number and demographic characteristics of covered members, including active members and non-active members (inactive vested, retirees and beneficiaries). In the past 10 valuations from December 31, 2010 to 2019, ACERA has become more mature, indicated by the continued increase in the ratio of non-active to active members covered by the Association as shown in *Chart 19*. The Chart also shows the ratio of members in pay status (retirees and beneficiaries) to active members. This ratio excludes the inactive vested members who have relatively smaller liabilities. The increase in the ratios is significant because any increase in UAAL due to unfavorable future investment and non-investment experience for a plan with a relatively larger group of non-active members would have to be amortized and funded using the payroll of a relatively smaller group of active members.

Besides the ratio of members in pay status to active members, another indicator of a more mature plan is relatively large amounts of assets and/or liabilities compared to active member payroll, which leads to increasing volatility in the level of required contributions. The **Asset Volatility Ratio (AVR)**, which is equal to the market value of assets divided by total payroll, provides an indication of contribution sensitivity to changes in the current level of assets and is detailed in *Chart 20*. The **Liability Volatility Ratio (LVR)**, which is equal to the actuarial accrued liability divided by payroll, provides an indication of the contribution sensitivity to changes in the current level of liability and is detailed in *Chart 21*. Over time, the AVR should approach the LVR because when a plan is fully funded the assets will equal the liabilities. As such, the LVR also indicates the long-term contribution sensitivity to the asset volatility, as the plan approaches full funding.

In particular, ACERA's AVR was 6.9 as of December 31, 2019. This means that a 1% asset gain or loss in 2020 (relative to the assumed investment return) would amount to 6.9% of one year's payroll. Similarly, ACERA's LVR was 8.7 as of December 31, 2019, so a 1% liability gain or loss in 2020 would amount to 8.7% of one year's payroll.²⁵ Based on ACERA's policy to amortize actuarial experience over a period of 20 years, there would be a 0.5% of payroll decrease or increase in the required contribution rate for each 1% asset gain or loss, respectively, and a 0.6% of payroll decrease or increase in the required contribution rate for each 1% liability gain or loss, respectively.

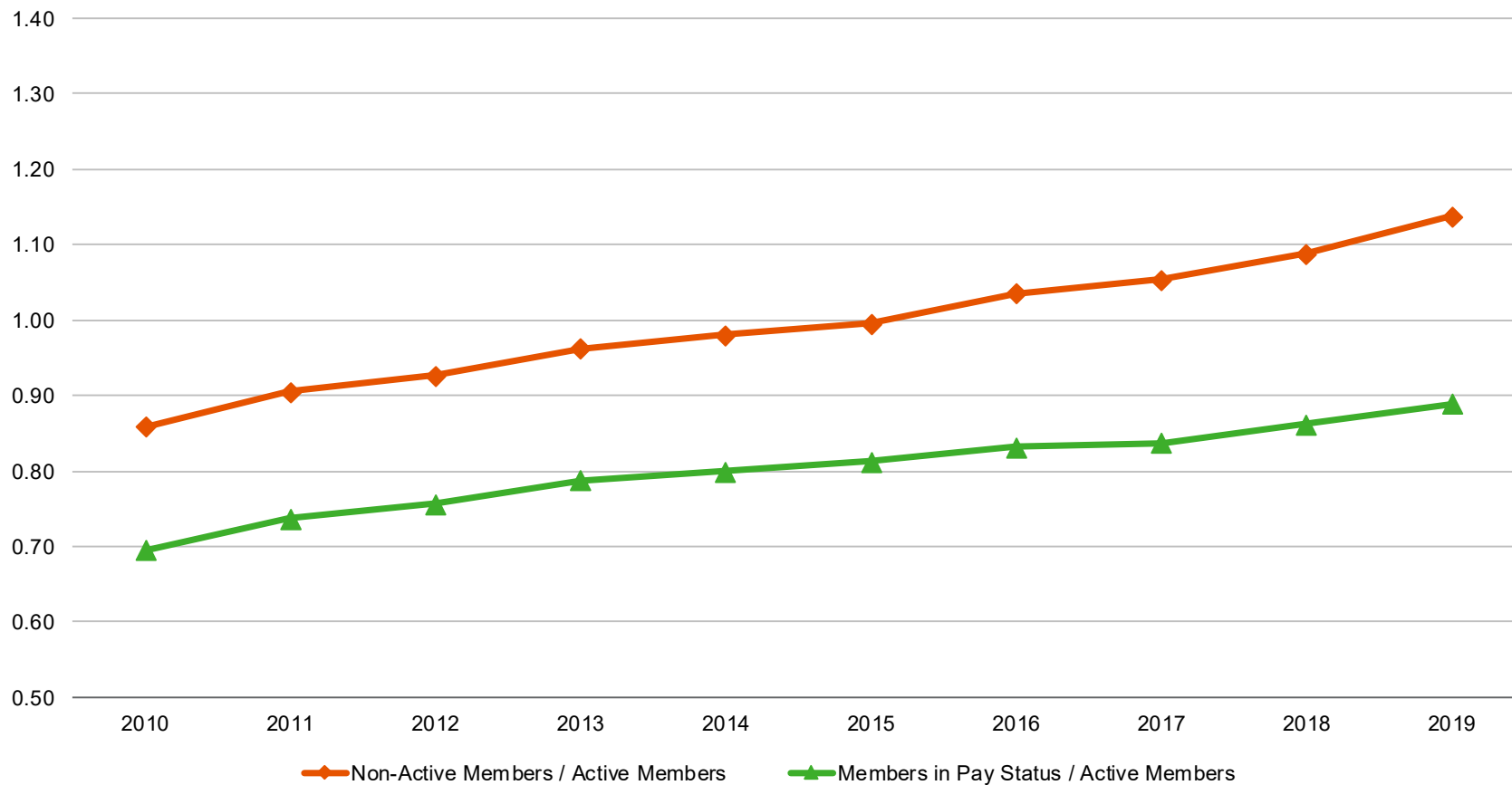
It is also informative to note that the AVR and LVR ratios for ACERA's Safety and General (LARPD) groups are higher than for the General (non-LARPD) groups. This means that both investment volatility and assumption changes will have a greater impact on the contribution rates of Safety and General (LARPD) groups than General (non-LARPD) groups. This is illustrated in the following table:

²⁵ The 6.9 and 8.7 are the AVR and LVR, respectively, for the entire Association. There are considerable differences in those ratios for the General and Safety membership groups.

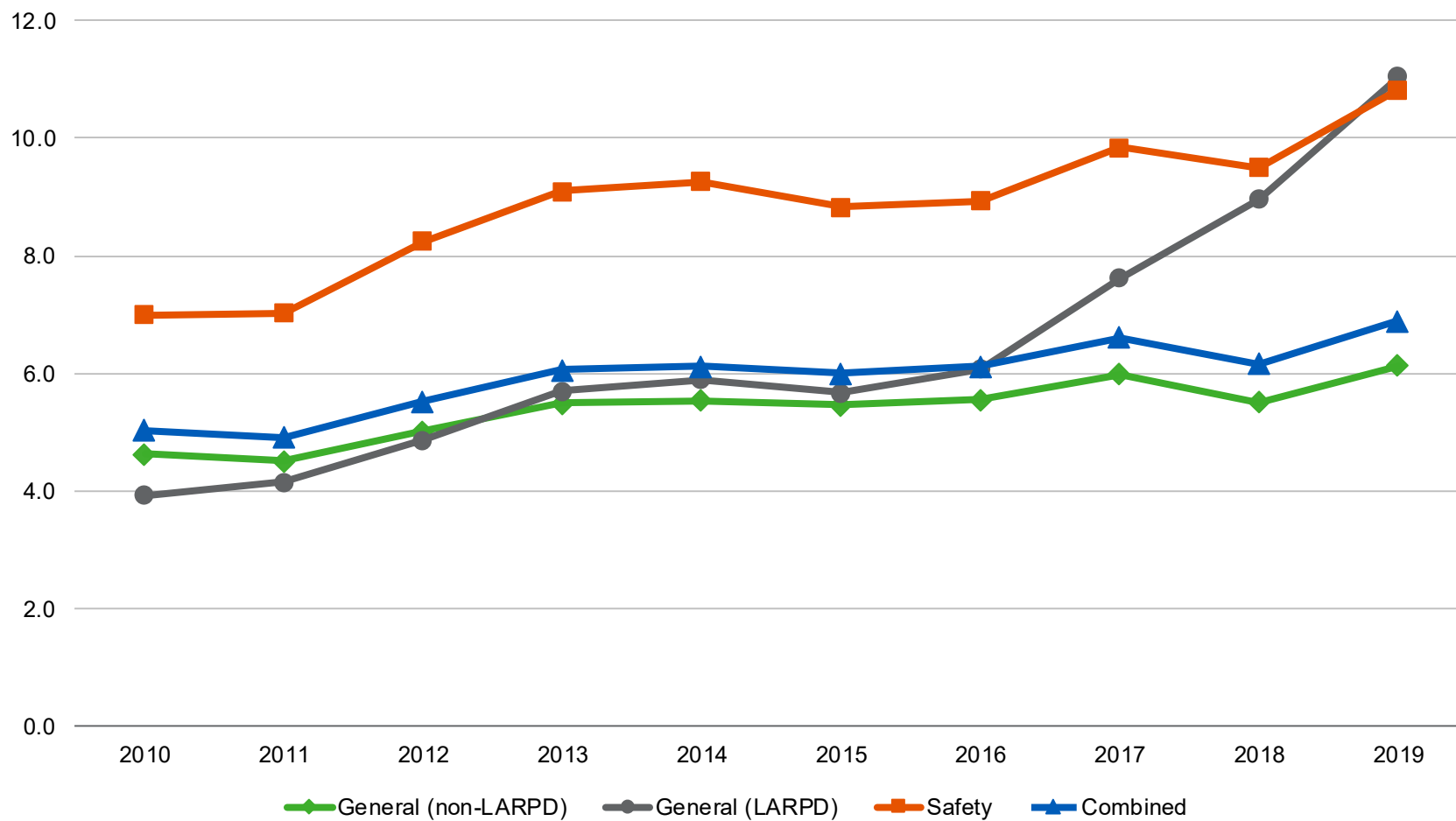
December 31, 2019

Employee Group	AVR	10% Loss Compares to	LVR	10% Change Compares to
General (non-LARPD)	6.1	61% of payroll	7.4	74% of payroll
General (LARPD)	11.1	111% of payroll	14.1	141% of payroll
Safety	10.8	108% of payroll	15.4	154% of payroll
Combined	6.9	69% of payroll	8.7	87% of payroll

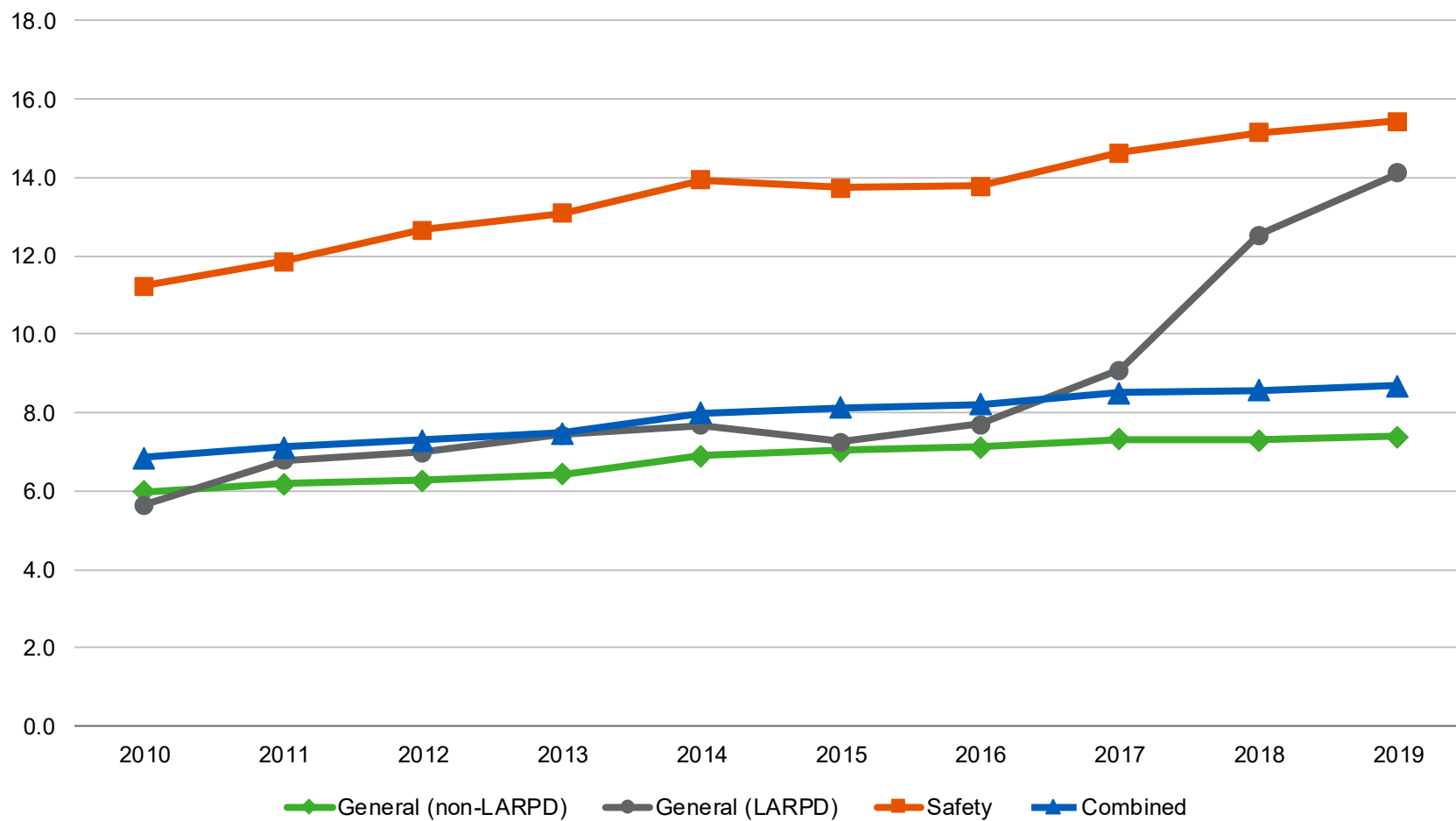
Ratios of Members in Pay-Status (Retirees and Beneficiaries) to Active Members & Non-Active Members (Inactive Vested, Retirees and Beneficiaries) to Active Members in December 31, 2010 to 2019 Valuations



Asset Volatility Ratios in December 31, 2010 to 2019 Valuations



Liability Volatility Ratios in December 31, 2010 to 2019 Valuations



Appendix: Actuarial Assumptions & Methods, Actuarial Certification, and Detailed Scenario Test Results

Actuarial Assumptions & Methods

Unless otherwise noted, the results included in this report have been prepared based on the assumptions and methods used in preparing the December 31, 2019 valuation.

Deterministic Projection

In addition, we have prepared the deterministic projection using the following assumptions and methods applied in the December 31, 2019 actuarial valuation:

- Non-economic assumptions will remain unchanged.
- Retirement benefit formulas will remain unchanged.
- 1937 Act and PEPRA statutes will remain unchanged.
- UAAL amortization method will remain unchanged (i.e., 20-year layers and level percent of pay).
- Economic assumptions will remain unchanged, including the annual 7.25% investment earnings and 3.50% active payroll growth assumptions.
- Deferred investment gains and losses will be recognized over a five-year period.
- All other actuarial assumptions used in the December 31, 2019 actuarial valuation will be realized.

Stochastic Projection

Besides the assumptions and methods discussed above for the deterministic projection, the following additional assumptions or parameters are used in projecting ACERA's investment portfolio over the next 20 years based on performing 10,000 trial outcomes of future market returns.

Target Asset Allocation

The target asset allocation is based on that provided by ACERA at the last triennial experience study and used by Segal to set the investment return assumption of 7.25% that was applied in the December 31, 2017, 2018 and 2019 valuations. That target asset allocation is as follows:

Asset Class	Target Allocation
Domestic Large Cap Equity	22.40%
Domestic Small Cap Equity	5.60%
Developed International Equity	19.50%
Emerging Markets Equity	6.50%
U.S. Core Fixed Income	11.25%
High Yield Bonds	1.50%
International Bonds	2.25%
TIPS	2.00%
Real Estate	8.00%
Commodities	3.00%
Hedge Funds	9.00%
Private Equity	9.00%
Total	100.00%

Simulation of Future Returns

In preparing the 10,000 trial outcomes of future market returns, we performed simulations using assumptions regarding the 20-year arithmetic returns, standard deviations and correlation matrix that were found in the 2019 survey prepared by Horizon Actuarial Services.²⁶ We used the assumptions that were closest to the asset classes found in ACERA's investment portfolio.

²⁶ That survey included responses from 34 investment advisors, including ACERA's investment advisor at Verus.

A summary of the 20-year arithmetic returns,^{27,28} standard deviations and correlation matrix for each of the different asset classes used in the modeling is as follows:

Horizon Actuarial 2019 Survey of Capital Market Assumptions															
Average Survey Assumptions															
Asset Class	20-Year Horizon		Standard	Correlation Matrix											
	Arith.	Geom.	Deviation	1	2	3	4	5	6	7	8	9	10	11	12
1 Domestic Large Cap Equity	8.34%	7.05%	16.17%	1.00											
2 Domestic Small Cap Equity	9.52%	7.54%	20.15%	0.86	1.00										
3 Developed International Equity	9.30%	7.70%	18.23%	0.83	0.74	1.00									
4 Emerging Markets Equity	11.67%	8.67%	24.73%	0.72	0.67	0.78	1.00								
5 U.S. Core Fixed Income	4.46%	4.30%	5.47%	0.15	0.07	0.17	0.17	1.00							
6 High Yield Bonds	6.38%	5.82%	10.06%	0.60	0.58	0.61	0.61	0.41	1.00						
7 International Bonds	3.81%	3.43%	7.61%	0.20	0.12	0.32	0.29	0.53	0.23	1.00					
8 TIPS	3.69%	3.49%	6.11%	0.04	0.01	0.08	0.14	0.68	0.27	0.45	1.00				
9 Real Estate	7.94%	6.82%	15.03%	0.48	0.49	0.46	0.41	0.16	0.42	0.15	0.15	1.00			
10 Hedge Funds	6.61%	6.18%	8.38%	0.64	0.62	0.64	0.62	0.18	0.53	0.19	0.13	0.36	1.00		
11 Commodities	6.29%	4.68%	17.66%	0.31	0.30	0.38	0.42	0.10	0.32	0.22	0.22	0.27	0.38	1.00	
12 Private Equity	12.82%	10.10%	22.05%	0.75	0.70	0.70	0.63	0.05	0.50	0.11	0.00	0.43	0.58	0.32	1.00
Inflation	2.29%	2.29%	1.73%												

Expected returns over a 10-year horizon include all 34 survey participants.

Expected returns over a 20-year horizon are based a subset of 16 survey participants who provided long-term assumptions.

Other Considerations

The results presented in this report are intended to provide insight into key plan risks that can inform financial preparation and future decision making. However, we emphasize that deterministic projections, by their nature, are not a guarantee of future results. The modeling projections are intended to serve as illustrations of future financial outcomes that are based on the information available to us at the time the modeling is undertaken and completed, and the agreed-upon assumptions and methodologies described herein. Emerging results may differ significantly if the actual experience proves to be different from these assumptions or if alternative methodologies are used. Actual experience may differ due to such variables as demographic experience, the economy, stock market performance and the regulatory environment.

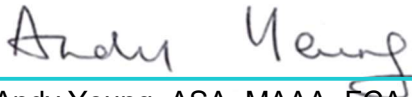
²⁷ Note that only 16 investment advisors provided long-term (e.g. 20-year) capital market assumptions in the survey.

²⁸ These returns are gross of inflation and before any adjustment for administrative and investment expenses. The annual inflation assumption based on the Horizon Survey was 2.29%, which was adjusted to 3.00% based on the ACERA's current inflation assumption. The annual adjustment for administrative and investment expenses was 0.90%.

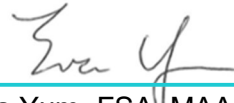
Actuarial Certification

The actuarial calculations in this report were completed under the supervision of Eva Yum, FSA, MAAA, Enrolled Actuary.

The actuarial opinions expressed in this report were prepared by Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary and Eva Yum, FSA, MAAA, Enrolled Actuary. We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.



Andy Yeung, ASA, MAAA, FCA, EA
Vice President and Actuary



Eva Yum, FSA, MAAA, EA
Senior Actuary