State of Connecticut
Teachers' Retirement System Viability Commission

Report of the Commission

March 19, 2018

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Governor Malloy and the Chairs and Ranking Members of the Committees of Cognizance:

Pursuant to Section 59 of Public Act 17-2 of the June 2017 Special Session, we submit to you the report of the Teachers' Retirement System Viability Commission.

The Commission is tasked to develop a plan which gives significance to the financial capability of the State, does not include the State's ability to raise revenue through new increased taxes, and considers actions of other state teacher retirement plans to achieve short and long-term sustainability. This report provides three alternative plans. Each plan has the potential to secure the short and long-term sustainability of the Connecticut Teachers' Retirement System as mandated by the public act establishing the Commission.

The Viability Commission is comprised of the elected and appointed members of the Teachers' Retirement Board and a consulting firm selected by the Office of Policy and Management through a competitive request for proposal process. The report of the Commission presents the current funding challenges of the Teachers' Retirement System, discusses three conceptual plans to improve the System's viability and provides analysis which demonstrates each individual plan's potential to achieve short and long-term viability of the System.

Respectfully submitted,

Elaine T. Lowengard

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Section I: Introduction

In accordance with Section 59 of Public Act 17-2 (the Act) of the June 2017 Special Session , the Teachers' Retirement System Viability Commission was established and mandated to develop and implement a plan to maintain the financial viability of the Connecticut Teachers' Retirement System (TRS).

Specifically, the Act tasked the Commission to develop a plan which "shall give significance to the financial capability of the state". Further, the Act provides, "the financial capability of the state shall not include the state's ability to raise revenue through new or increased taxes." Also, the Act requires, "the commission shall hold at least one public hearing and solicit the input of members, as defined in section 10-183b of the general statutes, of the teachers' retirement system in developing such plan." The public hearing of the Commission was held on February 13, 2018. To review the minutes of the hearing or the testimony submitted, the following link is provided: http://www.ct.gov/trb/lib/trb/formsandpubs/publichearing_021318_minutes.pdf

The Commission has defined the viability of the Retirement System as the satisfaction of both the plan's sustainability and affordability. Therefore, a viable retirement system demonstrates the ability to meet all future benefit obligations while requiring contributions which can be maintained at or below affordable levels. These characteristics form the basis of the metrics upon which the Commission considered the analysis of potential plans.

This report provides the research and analysis considered by the Commission, and provides details and comparative analysis of three plans with the potential of securing the short and long-term viability of TRS. Finally, the report provides the key findings of the Viability Commission.

Section II: Outline of the Commission's Process

The process followed by the Commission in developing the viability plans is outlined as follows:

1. **Collection of Information and Research**
   a. Obtained and reviewed information concerning the State's financial capability. Consultations with OPM provided assistance with incorporating the State's financial capability into our model as an assumed constraint. Appendix A provides the forecasted annual amount of the assumed funding constraint used in the analysis.
   b. Collected and reviewed comparative information pertaining to the retirement benefit structure of other state teacher retirement systems with members not covered by Social Security. The relevant information provided in Section III.

2. **Actuarial Analysis of the Current State of TRS**
   a. A stochastic model of the current state of TRS was developed and resulting analysis was prepared including the 50-year projection of the funded status and actuarial determined employer contribution (ADEC) of TRS. A detailed description of the model is found in Appendix B.
   b. Section III of the report also provides the analysis of the modeled current state of TRS.

3. **Discussion and Consideration of Potential Plans**
   a. After the Commission's review of the analysis of the current state of TRS, two plans were recommended for additional analysis. The plans were discussed with sufficient details to prepare the actuarial model and provide relevant analysis for the Commission's consideration. A third plan based on the transfer of a State asset to TRS (presented to the concurrently formed Commission on Fiscal Stability and Economic Development) was added and the additional analysis was prepared. Where an alternative to the primary plan was found to improve the projected results while maintaining the basic attributes of the plan, this report also presents the relevant analysis of these alternatives. Section IV provides the description of each of the three plans and any plan alternatives considered.

4. **Analysis of the Viability Plans**
   a. Based on the actuarial model output, the projected measures of the funded ratio of TRS were used to assess each plan's satisfaction of the future sustainability of TRS. A System which is projected to demonstrate a trend of funding progress can be considered sustainable. The projected measures of the ADEC of TRS and the trend in the ADEC over time was used to assess each plan's satisfaction of the future affordability of TRS. For comparative purposes, a consistent set of metrics based on

the probability of outcomes at specific future years are provided. Section V presents the actuarial analysis of each viability plan and a comparative summary of the projections under the sustainability and affordability metrics. Appendix C provides tables of relevant output of the model for each viability plan and suggested alternatives.

b. Each viability plan has inherent pros and cons, as well as specific considerations for implementation and maintenance. The list of primary pros and cons is also found in Section V.

5. **Key Findings of the Viability Commission**

a. The report concludes with a section providing the Commission's key findings to be found in Section VI.

Section III: Research and Analysis of the Current State of TRS

Considerations of the Benefits Provided by TRS

The actuarial valuations of TRS provides the normal cost rate which is the average cost as a percent of active member's payroll required annually over each individual's expected career to fully fund each individual's expected post-employment pension benefit payments. The normal cost rate can vary due to the demographic attributes of the active members, the statutory benefits, and the assumptions and cost method utilized in the actuarial valuations.

Historically, the System's total normal cost rate has been between 9% and 10% of payroll. In the 2014 valuation, the normal cost rate was 9.73% of pay which member contributions covered 6.00% of pay leaving 3.73% of pay for the State's share of the total normal cost. In the 2016 valuation, with the change to the actuarial assumptions (primarily the decrease of the discount rate to 8.00%), the total normal cost rate increased to approximately 10.60%. After the enactment of SB 1502, the members' contributions offset 7.00% of the normal cost rate leaving 3.60% of pay for the State's share of FY 2018 and 2019 normal cost. Even under an assumed 6.9% discount rate the 2018 total normal cost rate is expected to be 13.51% of pay which is allocated 6.51% of pay for the State and 7.00% of pay from members. The normal cost rate is consistently indicative of a moderate level of benefit accruals provided for members for each year of service.

The challenge to the viability of TRS is primarily driven by the size and amortization of the current unfunded liability. As discussed above, the cost of the benefits for new and future teachers is expected to be fully funded by the contribution of the normal cost in each year. Also, as noted above, even under the reduced discount rate assumption of 6.9%, the current 7.0% member contribution rate covers more than half of the estimated 13.51% total normal cost rate leaving the estimated State's share of 6.51%. Reducing the normal cost rate of new teachers through benefit reductions or implementation of a hybrid design would not impact the amount of the unfunded liability but only reduce the State's share of the new teachers' normal cost. Therefore, since the benefit cost for new teachers is not part of the problem, the Commission does not consider it to be part of the solution.

Members of the Teachers' Retirement System are not covered by Social Security. As such, this comparative review is limited to provisions of retirement systems which, similar to TRS, cover teachers who are not covered by Social Security. In addition to the TRS, the following systems cover teachers who are not covered by Social Security:

- Teacher Retirement System of Texas
- State Teachers Retirement System of Ohio
- Nevada Public Employees Retirement System – Regular Employees
- Massachusetts Teachers' Retirement System
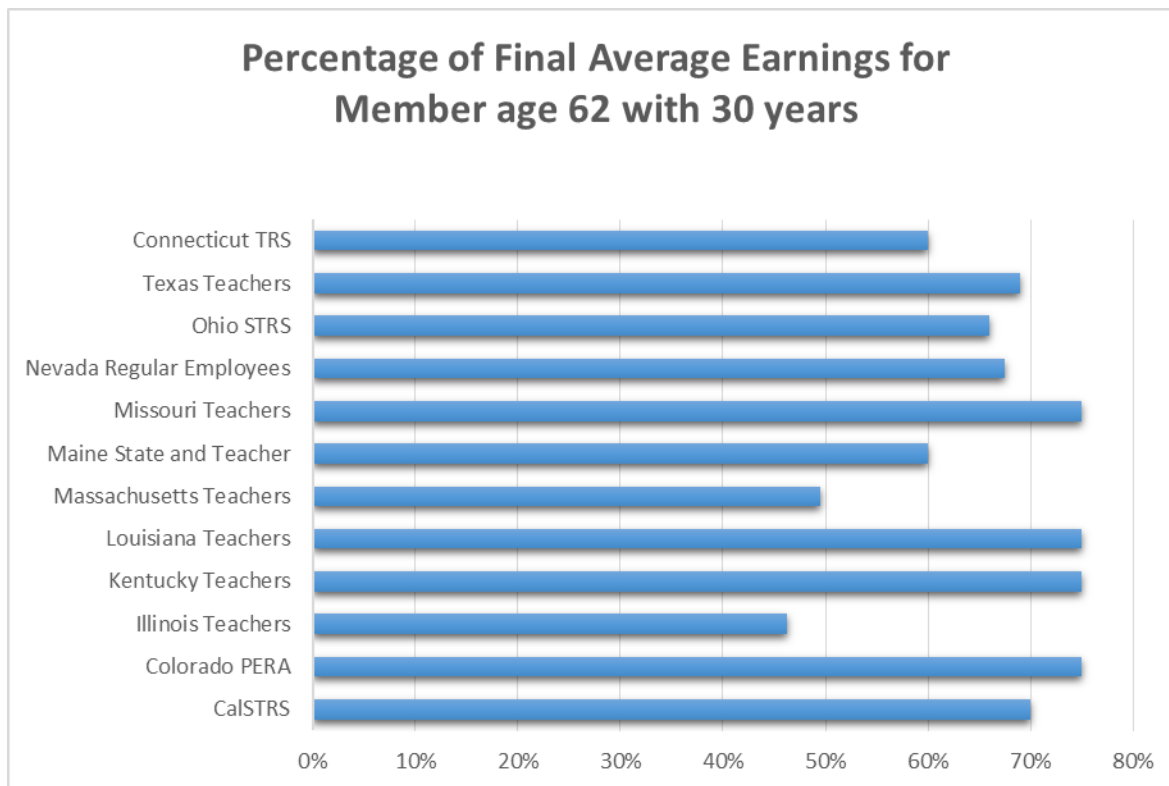- Public School Employee Retirement Systems of Missouri

- Maine Public Employees Retirement System
- Teachers' Retirement System of Louisiana
- Kentucky Teachers' Retirement System
- Teachers' Retirement System of the State of Illinois
- Colorado Public Employees' Retirement Association
- California State Teachers' Retirement System

Federal Revenue Procedure 91-40 stipulates minimum benefit requirements for retirement systems which have opted out of Social Security Coverage. These 11 system must satisfy the minimum benefit requirements under Revenue Procedure 91-40. While other systems *may* satisfy these requirements, these 11 systems above *must* satisfy the requirements. As such, the Commission believes it is reasonable to limit the comparison to these 11 systems as other systems are not mandated to provide potentially larger benefits.

The comparative benefit information reviewed of other systems is limited to the most recent tier of benefits where multiple tiers are available. These are the provisions that would cover new hires covered under their respective systems. Since any change to the benefit structure of TRS would apply to new hires only, this is an appropriate comparison.

The focus of the comparison is on the normal retirement benefits of each system. Information is primarily from the National Association of State Retirement Administrators (NASRA) November 2017 version of the Retirement System Benefits & Eligibility Requirements for General Employees & Teachers. This information was augmented by reviewing additional information available on the respective retirement systems. It can be difficult to compare the various provisions of the 11 systems on a provision by provision basis. This comparison is limited to the percentage of final average earnings (FAE) accrued by a member age 62 and retiring with 30 years of service. This is the demographic profile of a typical TRS retiree. The chart below demonstrates the primary retirement benefits provided to TRS members are not an outlier. Indeed eight systems have higher benefits and only two have lower benefits (one has the same level of benefits).

Percentage of Final Average Earnings for Member age 62 with 30 years

System	Percentage
Connecticut TRS	~60%
Texas Teachers	~69%
Ohio STRS	~66%
Nevada Regular Employees	~67%
Missouri Teachers	~75%
Maine State and Teacher	~60%
Massachusetts Teachers	~50%
Louisiana Teachers	~75%
Kentucky Teachers	~75%
Illinois Teachers	~46%
Colorado PERA	~75%
CalSTRS	~70%

Our review of the systems found other similarities to the TRS retirement benefit provisions:
- Most of the plans provided cost of living adjustments.
- Active member contributions are generally around 8% of salary.
- 5 year vesting was more common than 10 year vesting.

Due to the positive impact of the historic bull market of the 1990's, many retirement systems made improvements in their retirement benefits (e.g., increases to benefit accrual rates, reductions to retirement age, enhancements to cost of living adjustments, etc.). Some of the systems above made improvements then and, in response to the 2008 – 2009 economic down-turn, have since implemented new "tiers" of benefit with reductions to benefits of new employees. The TRS retirement benefits have remained stable. Having not enhanced benefits or reduced retirement eligibility in reaction to the good results of the 1990's avoids the necessity to reduce benefits for new employees today. Again, the comparison above compares the TRS retirement benefits to the newest tier of benefits in the other systems that have multiple tiers.

From above, consideration may be given to participation in the Social Security program. The following discussion provides further information and a simple cost to benefit analysis to illustrate the value to the teachers and employers of remaining out of the Social Security program.

Section III: Research and Analysis of the Current State of TRS

Comparing Social Security benefits to a final average earnings defined benefit such as TRS is somewhat difficult. Social Security benefits are based on indexed career average earnings (AIME) with a progressive benefit formula while the System is based on a 2.0% per year of service times the 3 year average of highest earnings. Below is a simple comparison of salary replacement ratios for the hypothetical teacher with the following data:

Age: 62

Final Average Earnings equals AIME = $90,000

Years of Service: 30 (assume 35 years of employment for Social Security)

TRS Benefit: $4,500 per month	**Cost: 13.5% of pay***
SS Benefit: $1,869 per month	**Cost: 12.4% of pay**

* based on higher normal cost rate assuming 6.9% discount rate.

Full retirement age for Social Security benefits for the sample is 66 and 4 months (born in 1956). So, in the example above, the full Social Security benefit is reduced by 26.7% to account for 52 months of additional payments. The TRS benefit on the other hand is not reduced because the member has attained the normal retirement age. This illustration of the simple cost to benefit analysis favors TRS benefit over the Social Security program by more than double.

Research Concerning the State's Financial Capability

The Act requires the financial capability of the State be given significance. The State's Office of Policy and Management (OPM) provided a significant amount of information related to the current and historical financial condition of the State. In summary, the FY 2019 ADEC for TRS represents approximately 6.9% of the total revenue of the State forecasted for fiscal year. In comparison, the 2009 State contribution requirement for TRS as developed in the June 30, 2006 biennial actuarial valuation was 2.9% of the State's total revenue for 2009. The impact of the Great Recession of 2008-2009 was global and an extreme example of the sensitivity of retirement systems' funded status to market volatility resulting in substantial increases to actuarial contribution requirements.

Through consultation with OPM, the information concerning the financial capability of State was condensed to an assumed constraint in the model. The assumed funding constraint represents approximately 8% of the most recent forecast of the State's annual revenue for 2019 and is assumed to grow annually at a rate of 1.75% until 2028 and then 2.50% thereafter as suggested by OPM for purposes of modeling. The assumed funding constraint is not intended to accurately represent an actual limit on State funding in any given year, but rather its purpose is to provide a comparative metric of the ADEC amount which could be expected to require an allocation of approximately 8%

of the estimated State's total revenue in a given year. It is not known if in a given future year the level of ADEC represented by the assumed constraint would in fact exceed the State's financial capability. Therefore, modeled ADEC outcomes which are in excess of the assumed funding constraint in a given year as depicted in a chart do not imply the State cannot fully fund the ADEC for that year. Appendix A provides the assumed funding constraints utilized in the analysis.
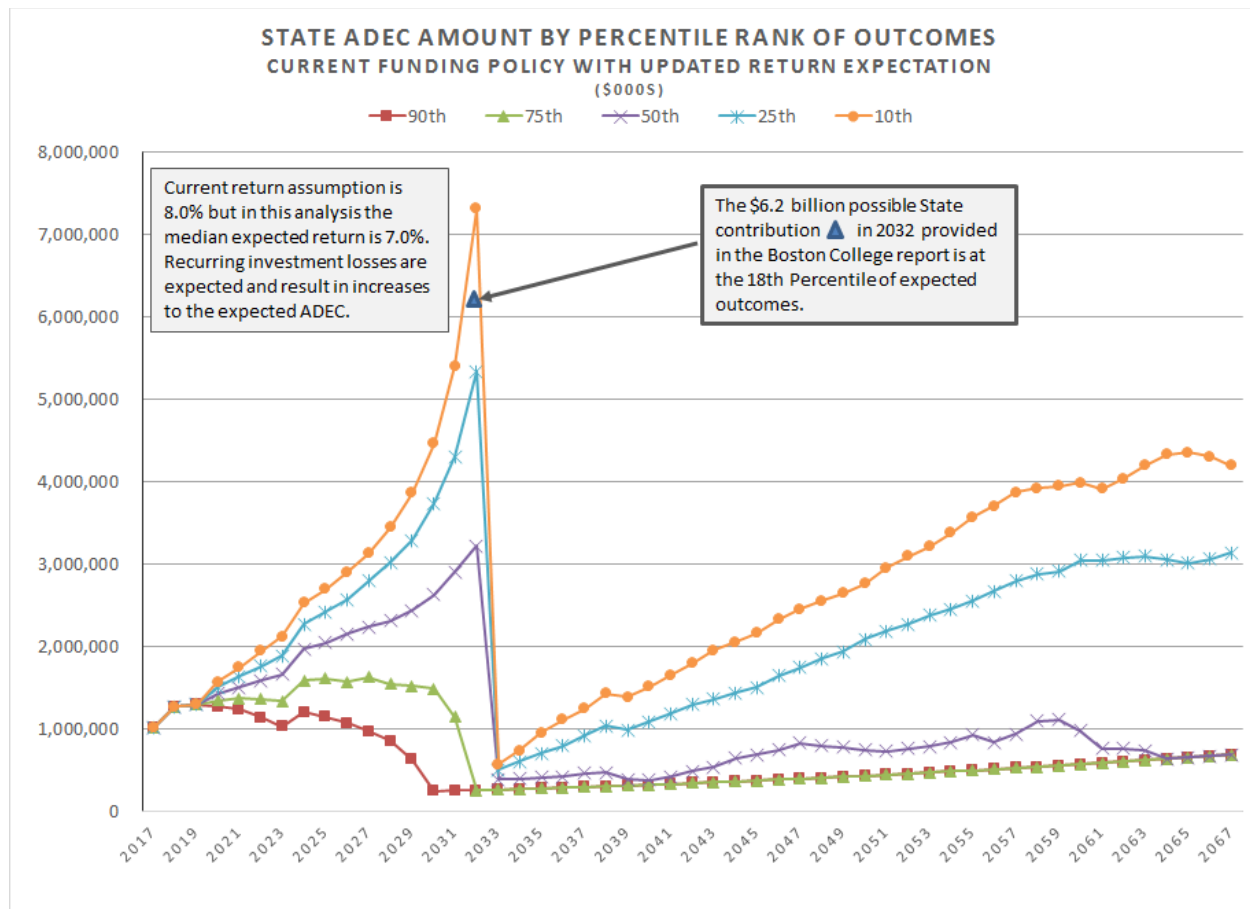
There is a common reference made to the Center for Retirement Research at Boston College calculation that TRS could require a contribution of $6.2 billion dollars in year 2032. The $6.2 billion forecast of required funding was based on an improbably low assumed return of 5.5% each and every year and assumes the State will fully fund the contributions each and every year, regardless of how implausible any State's ability to contribute over 25% of estimated total annual revenue in order to maintain an amortization schedule to attain a 100% funded ratio as of 2032.

The Current State of TRS Model – Unconstrained State Funding
In defining a viable retirement system as one which is sustainable and affordable, the Viability Commission recognizes the sensitivity of both the funded status of the System and the ADEC amount to future investment returns. The Commission utilized an asset liability model to assess the sustainability of TRS under expected future market volatility using the trend in the System's projected funded ratio as the relevant metric. This initial analysis provided on the current state of TRS assumes that the State always funds a minimum of the resulting ADEC in accordance with the opinion covering the bond covenant's requirements by Day Pitney, bond counsel to the State Treasurer's office. The ADEC's calculation is governed by statutory provisions which include the unfunded liability's amortization length and methodology. The model demonstrates that, under a reasonable expectation of rates of return and volatility, the projected ADEC in not likely to result in an ADEC amount of $6.2 billion in year 2032 (18th percentile of outcomes).

Chart 1 – The modeled output of ADEC results under current 8.0% assumed discount rate using modeled future returns with an expected geometric mean of 7.0% and a standard deviation of 11.0%. No change to the current amortization methodology is modeled until year 2032 where a 25-year layered amortization method is implemented after POB maturity and the end of the bond covenant.

Section III: Research and Analysis of the Current State of TRS

STATE ADEC AMOUNT BY PERCENTILE RANK OF OUTCOMES
CURRENT FUNDING POLICY WITH UPDATED RETURN EXPECTATION
($000S)

Legend: ■ 90th   ▲ 75th   ✕ 50th   ✳ 25th   ● 10th

Text box (left): Current return assumption is 8.0% but in this analysis the median expected return is 7.0%. Recurring investment losses are expected and result in increases to the expected ADEC.

Text box (right): The $6.2 billion possible State contribution ▲ in 2032 provided in the Boston College report is at the 18th Percentile of expected outcomes.
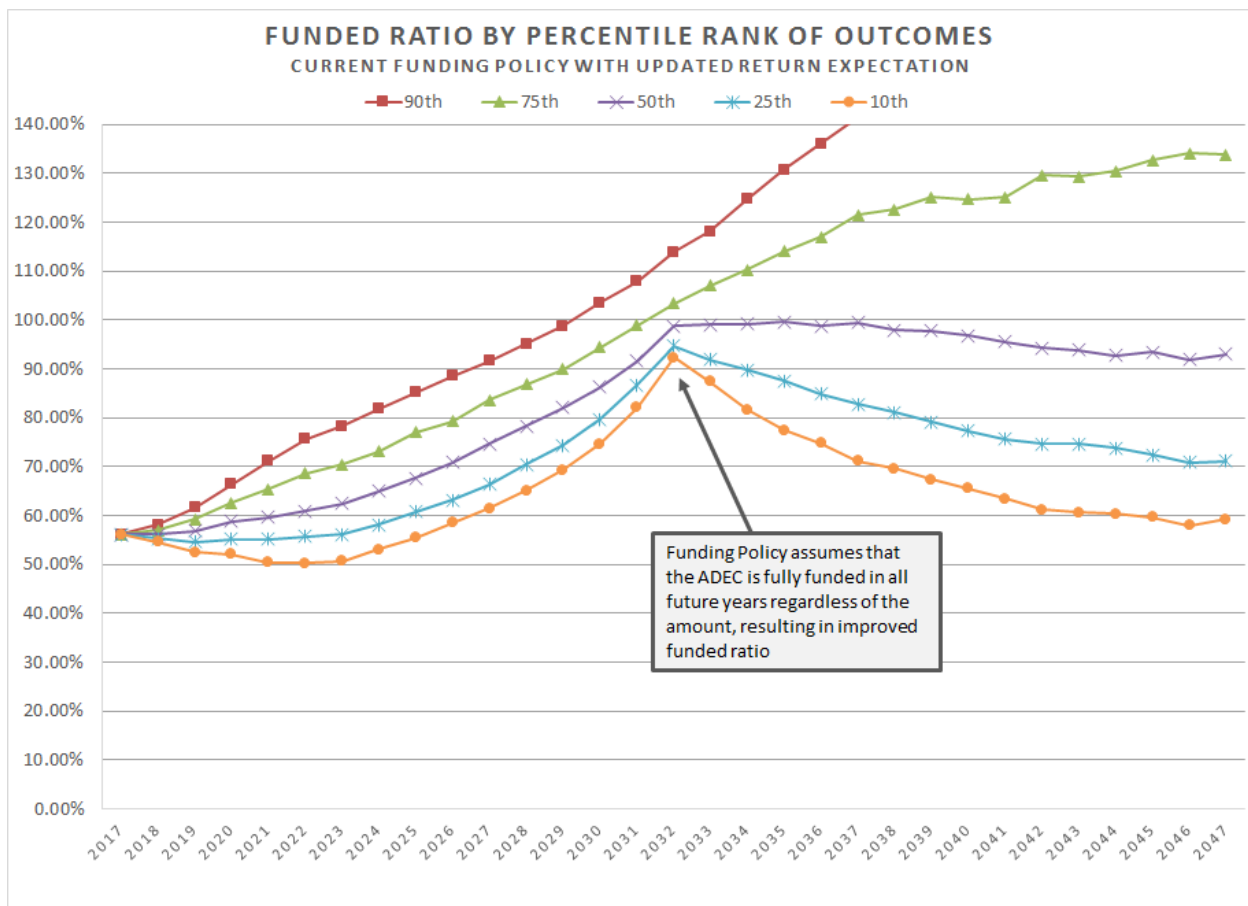
As shown in the chart above, the model output for each year contains 500 valuation results which are ranked in order of from worst outcome (lowest percentile ranks) to best outcome (highest percentile ranks) and the graph presents the specific percentile rank outcomes. This graph of the projected outcomes of the current state of TRS results in a greater than 50% likelihood that the 2032 ADEC amount will exceed $3.0 billion. For comparative purposes, the $6.2 billion ADEC from the Boston College report is placed on the graph and is approximately the 18th percentile of possible outcomes of the model for year 2032. The post-2032 (post-bond covenant) ADECs are based on the 25-year layered amortization methodology which reduces the rate of increase in ADECs under poor return scenarios. In comparison, the higher rate of ADEC increases are attributable to the pre-2032 closed amortization of the large unfunded actuarial accrued liability (UAAL) in which all annual gains and losses incurred are amortized over a small and declining number of years.

Under the assumption that the State always fully funds the ADEC, regardless of the ADEC amount provided in Chart 1, Chart 2 shows the modeled results produce high funded ratios with nearly all outcomes approaching 100% funded ratio or better at year 2032, the end of the statutory 40-year

amortization period. Scenarios with poor returns after year 2032 reflect the expected continued reduction to the funded ratio and corresponding increases to the ADEC as investment losses are recognized, partially attributable to assuming 8.0% annual returns while the model is based on a median return of 7.0%.

Chart 2 – The modeled output of funded ratio results under current 8.0% assumed discount rate using modeled future returns with an expected median return of 7.0% and a standard deviation of 11.0%. Again, no change to the current amortization methodology is modeled in the chart below until year 2032.

FUNDED RATIO BY PERCENTILE RANK OF OUTCOMES
CURRENT FUNDING POLICY WITH UPDATED RETURN EXPECTATION

Funding Policy assumes that the ADEC is fully funded in all future years regardless of the amount, resulting in improved funded ratio

The Current State of TRS Model – Assumed Funding Constraint
Chart 1 contains a very high degree of ADEC volatility as the remaining amortization period of the primary UAAL declines and investment losses are experienced. In contrast, under this model, and only in this model, we applied the assumed constraint as an actual limit on the annual contribution of the State. By assuming a funding constraint exists on expected State funding in the model,

unfavorable investment experience would impact the State funding of the ADEC up to the point the assumed constraint is reached and any excess impact of poor returns would result in funding shortfalls that would increase the UAAL and result in a decrease to the funded ratio of TRS.

Chart 3 – The constrained modeled output of funded ratio results under current 8.0% assumed discount rate using modeled future returns with an expected geometric mean of 7.0% and a standard deviation of 11.0%. The assumed constraint on State funding is used as limit on contributions only in this model to demonstrate that if poor experience increases expected State funding above the assumed funding constraint, if those full ADEC are not funded, TRS cannot expect to be near 100% funded in 2032. Again, no change to the current amortization methodology is modeled in the chart below until the implementation of the 25-year layered amortization method following the maturity of the POB in 2032.

Funded Ratio by Percentile Rank of Outcomes
Current Funding Policy With Assumed Funding Constraint

Limiting the state funding with an assumed constraint demonstrates the reduced funding progress which could be expected if State funding is less than the ADEC
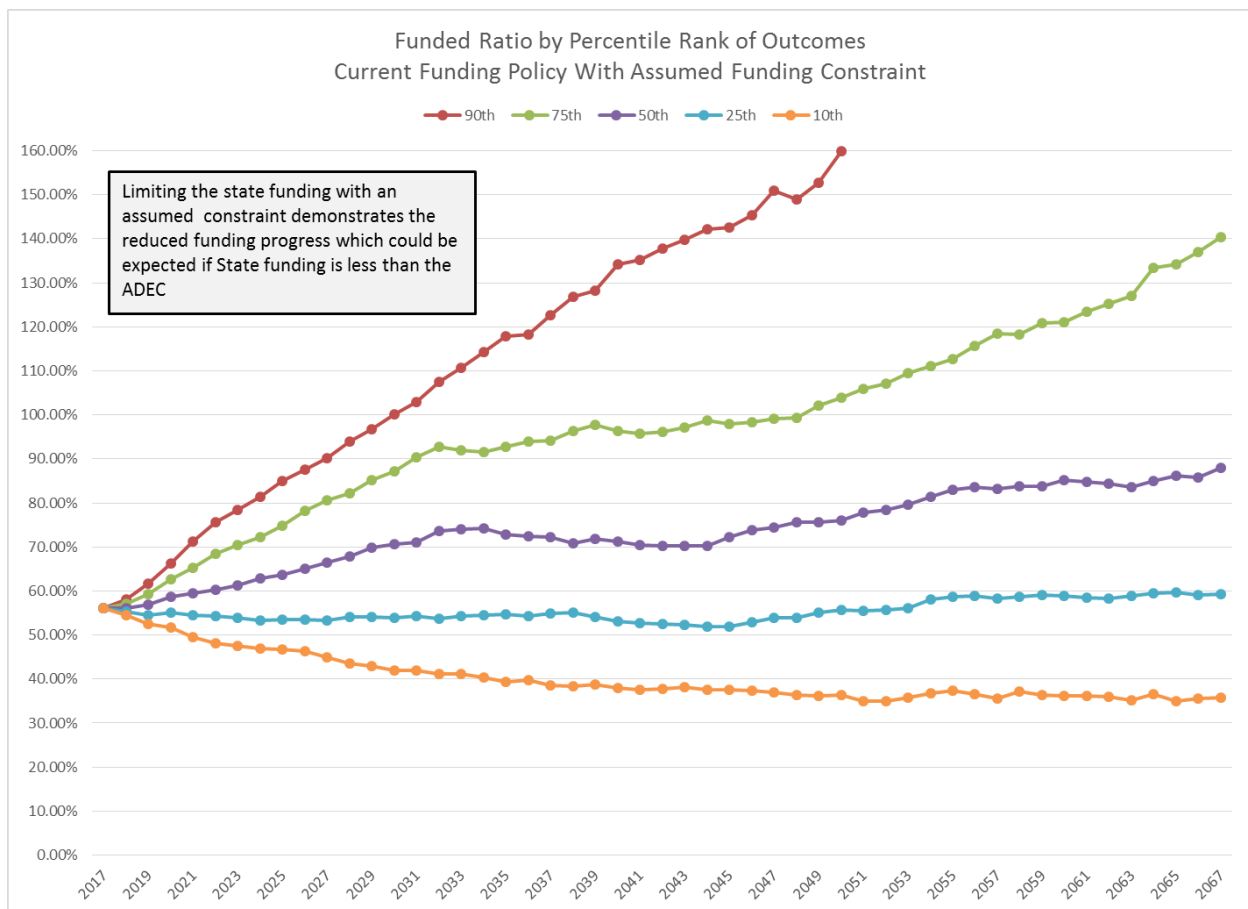
Section III: Research and Analysis of the Current State of TRS

The spread in the funded ratio of TRS in the above chart demonstrates the sensitivity of the projected funded ratio to the investment return when the availability of State funding to TRS is assumed to have a limit. In that the assumed constraint is set at a significant percentage of expected State revenue (approximately 8%), even at the 25th percentile of outcomes, TRS maintains a better than 50% funded ratio.

In summary, TRS provides members a moderate level of expected pension benefit as demonstrated by the annual normal cost rate of the expected benefits earned by active members and in a benefit comparison with other state teacher retirement systems providing retirement benefits to non-Social Security covered participants. In addition, the report demonstrates the significant advantage TRS provides over Social Security coverage for employees and employers using a simple cost-to-retirement benefit comparison. Finally, the modeled outcomes of the current state of TRS using current actuarial assumptions, methods and funding policy reflect the challenge imposed by the potential impact of significantly lower than expected investment returns may have on funded progress and ADEC levels.

Section IV: Discussion of Potential Viability Plans

After discussion of the current state of TRS and reviewing the results of the asset liability model, the Commission began consideration of potential plans to achieve short and long-term sustainability. A common feature of the discussion of alternatives was the decrease to the assumed discount rate (also the assumed rate of investment return) of TRS from the current 8.0% to either 6.9% or 7.0%.

The need to lower the discount rate reflects both the current lower, long-term expectation of the capital markets as presented by the System's fiduciary, State Treasurer Nappier, as well as the trend in reductions to actuarial assumed rates of return among other retirement systems around the country, including the Connecticut State Employees Retirement System (SERS) in 2016. The Charts 1 through 3 in the prior section of this report, reflect the impact in future expected results of maintaining an assumed discount rate higher than the expectation of the investment professionals for the System as even the 50th percentile (median) outcomes result in expected losses and increased ADECs since the modeled returns average around 7.0% and the assumed returns are at 8.0%.

Two alternative plans were recommended for further analysis. First, a plan proposed by the State Treasurer which will be referred to as the "POB Settlement" plan. The plan would maintain the current funding policy and assumptions until the earliest date the POB is callable. The POB would be settled with the diversion of the State's required ADEC for 2025 (estimated by the Treasurer's Office at $1.94 billion). Once the restrictions of the bond covenant ends at the completion of the POB settlement, the Board could then adopt a decreased discount rate and implement a 25-year layered amortization methodology for future changes to the UAAL. The changes would provide future stability in the funded ratio and calculated ADECs. Upon the end of the bond covenant, the Treasurer also recommends the adoption of strong statutory language which mandates a future funding discipline, for example, requirements for super-majority votes if less than the ADEC were to be considered in budget proceedings and public notices if the full ADEC is not contributed to TRS.

The second plan was proposed by OPM, and reflects the changes proposed in the Governor's recommended budget. The plan will be referred to as the "Change Funding Policy" plan and would incorporate, with the adoption of the 2018 actuarial valuation of TRS, changes to the funding policy similar to those implemented in 2016 by SERS. The primary funding policy changes would decrease the discount rate to 6.9%, re-amortize the current UAAL over 30-years with a 5-year phase-in to a level dollar amortization method, and implementation of a 25-year layered amortization approach for future UAAL changes.

Section IV: Discussion of Potential Viability Plans

An additional plan was added to the two plans above which would reflect the transfer to TRS of a State "asset" (e.g., State Lottery, State-owned buildings, etc.) and will be referred to in the analysis as the "Asset Transfer" plan. The relevant actuarial analysis is provided without regard to the specific type or market valuation of the asset to be transferred. The analysis assumes the asset provides approximately $350 million in net revenue to the General Fund in FY 2019 with an expected rate of increase in revenue of 2.0% per year. The analysis also assumes the transfer would occur in FY 2019 and the asset has a market value of $5 billion as has been discussed in other concurrent Committees.

The Asset Transfer plan is first modeled assuming the only change to the valuation basis would be a decrease in the discount rate to 6.9% in the next following valuation (as of June 30, 2019). The impact of the decrease to the discount rate partially offsets the beneficial improvement to the funded ratio of the asset transfer. Under the current 8.0% discount rate, it is approximately 76% likely the transfer of a $5 billion asset would improve the funded ratio of TRS to at least 70%. As an alternative to only reducing the discount rate under the Asset Transfer plan, analysis is also provided which models changes to the TRS assumptions and funding policy to reduce to the 6.9% discount rate and implement a 25-year layered level dollar amortization methodology in the next valuation following the transfer in FY 2019.

The asset transfer would reflect an increase to TRS assets corresponding to the market value of the asset value. This would reduce the UAAL by the same amount and would correspond to a decreased ADEC in TRS valuations. Under the current 8.0% assumption, the UAAL amortization includes 8.0% interest in the calculation of the UAAL amortization portion of the ADEC. Therefore, under the 8.0% assumption, a $5 billion asset would be expected to reduce the ADEC by at least the $400 million of interest alone.

The potential plans were selected by the Commission for analysis using an asset liability model. The analysis of each potential viability plan followed the approach used for the analysis of the current state of TRS presented in the prior section. The asset liability model was prepared with the specifics of each plan. The same randomly generated return scenarios were used in each of the plans' analyses as those used in the analysis of the current state.

The assumed funding constraint was not utilized in testing the solvency or in the determination of the ADEC under these plans as the unconstrained outcomes for these plans would be assessed for the desired improvement in the trends of projected funded ratio in contrast to the current state results provided in Charts 1 - 3. The assumed funding constraint was overlaid on the projected ADEC outcomes of the model for each plan to again assess the potential plan improvement over the current state projected outcome and to provide a scale of affordability. The assumed constraint

overlaid on the chart of modeled ADEC outcomes for the POB Settlement analysis would be modified to reflect an increase to the assumed constraint due to the elimination of the post-settlement POB debt service costs due to early settlement of the bonds in 2025. Under the Asset Transfer plan, a reduction to the assumed funding constraint is necessary to reflect the loss of the net revenue provided to the General Fund resulting from the asset transfer.

Section V: Analysis of Viability Plans

Analysis of the POB Settlement Plan

Chart 4 - The POB Settlement plan maintains the current assumptions and method until the POB is settled in 2025. The chart provides the modeled output of funded ratio results using modeled future returns with an expected geometric mean of 7.0% and a standard deviation of 11.0%.

Funded Ratio by Percentile Rank of Outcomes $1.94 bil POB Settlement@ 2025
8.0% Discount Rate to 2025 then 6.9% Discount Rate and New Funding Policy

Decrease in funded ratio due to the diversion of the $1.94 billion of the 2025 ADEC necessary to settle the POB
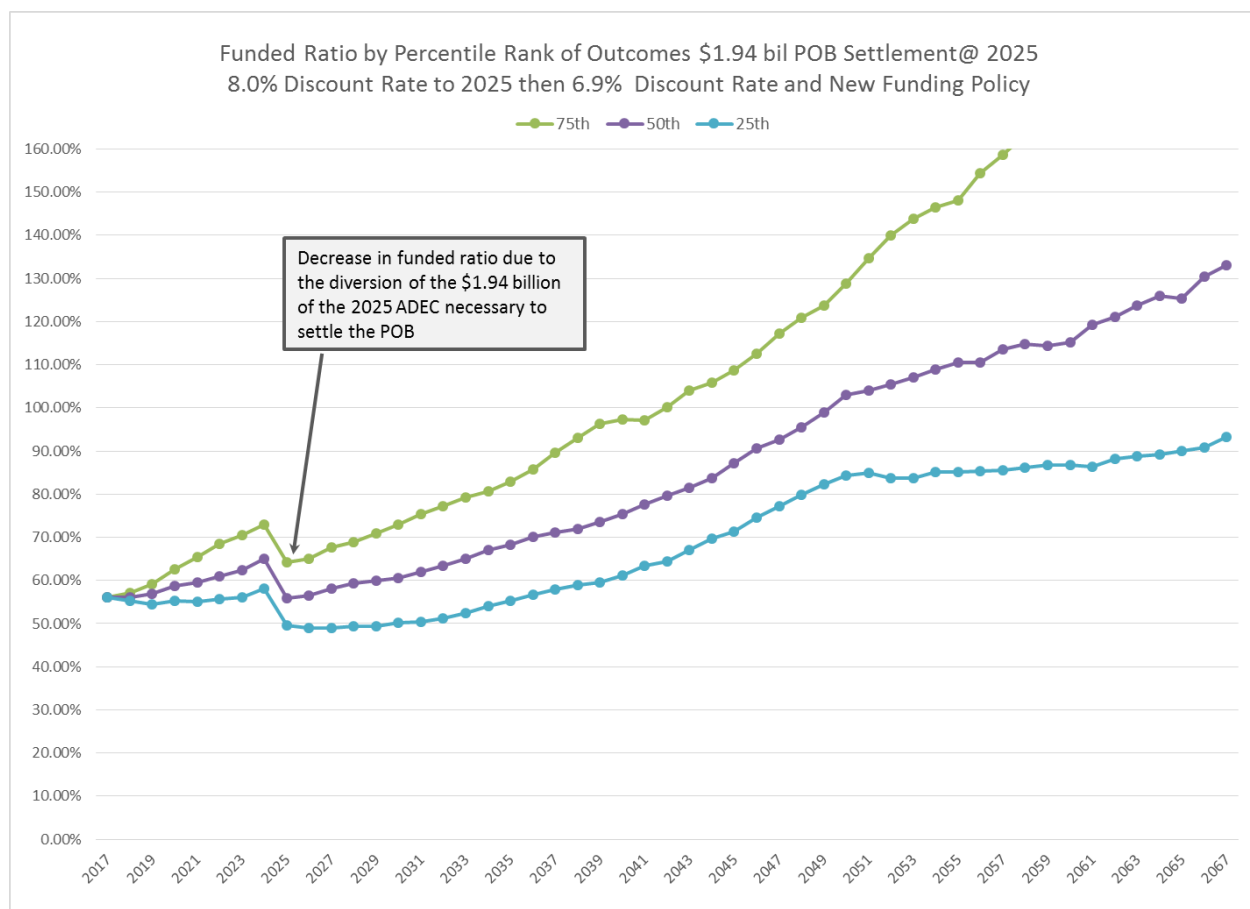
Even with the diversion of the $1.94 billion estimated for the settlement of the POB, the modeled funded ratio outcomes exhibit a consistent trend in improved funded ratio over the projection. It is important to note the analysis provided throughout this report is focused on the impact of changes to TRS and the measures of the System's viability. Although not directly tied to the viability of TRS, in the case of the POB Settlement Plan, the year 2025 settlement of the POB would eliminate the expected debt service cost from FY 2026 through FY 2032 related to the POB. Based on information provided by the Treasurer's office, this savings is expected to total over $2.2 billion.

Section V: Analysis of Viability Plans

Chart 5 - The modeled output of ADEC results under the POB Settlement plan.

State ADEC Amount by Percentile Rank of Outcomes POB Settlement@ 2025
8.0% Discount Rate to 2025 then 6.9% Discount Rate and Change to Funding Policy
($000s)

POB modified assumed constraint line is the estimate of the 8% of State revenue constraint increased by the elimination of the debt service cost due to the 2025 POB settlement

Reduced by $1.94 billion POB settlement

New Funding Policy effective 2025: 6.9% discount rate iwith 25-year layered level percent of payroll amortizaton.

An alternative to the model output above, the next chart provides the modeled output using a level dollar amortization with the 2025 changes to the funding policy.

Section V: Analysis of Viability Plans

Chart 6 - The modeled output of ADEC results under the POB Settlement plan using level dollar amortization.

State ADEC Amount by Percentile Rank of Outcomes POB Settlement@ 2025
8.0% Discount Rate to 2025 then 6.9% Discount Rate and Change to Funding Policy
($000s)

POB modified assumed constraint line is the estimate of the 8% of State revenue constraint increased by the elimination of the debt service cost due to the 2025 POB settlement

New Funding Policy effective 2025: 6.9% discount rate and 25-year layered UAAL level dollar amortization
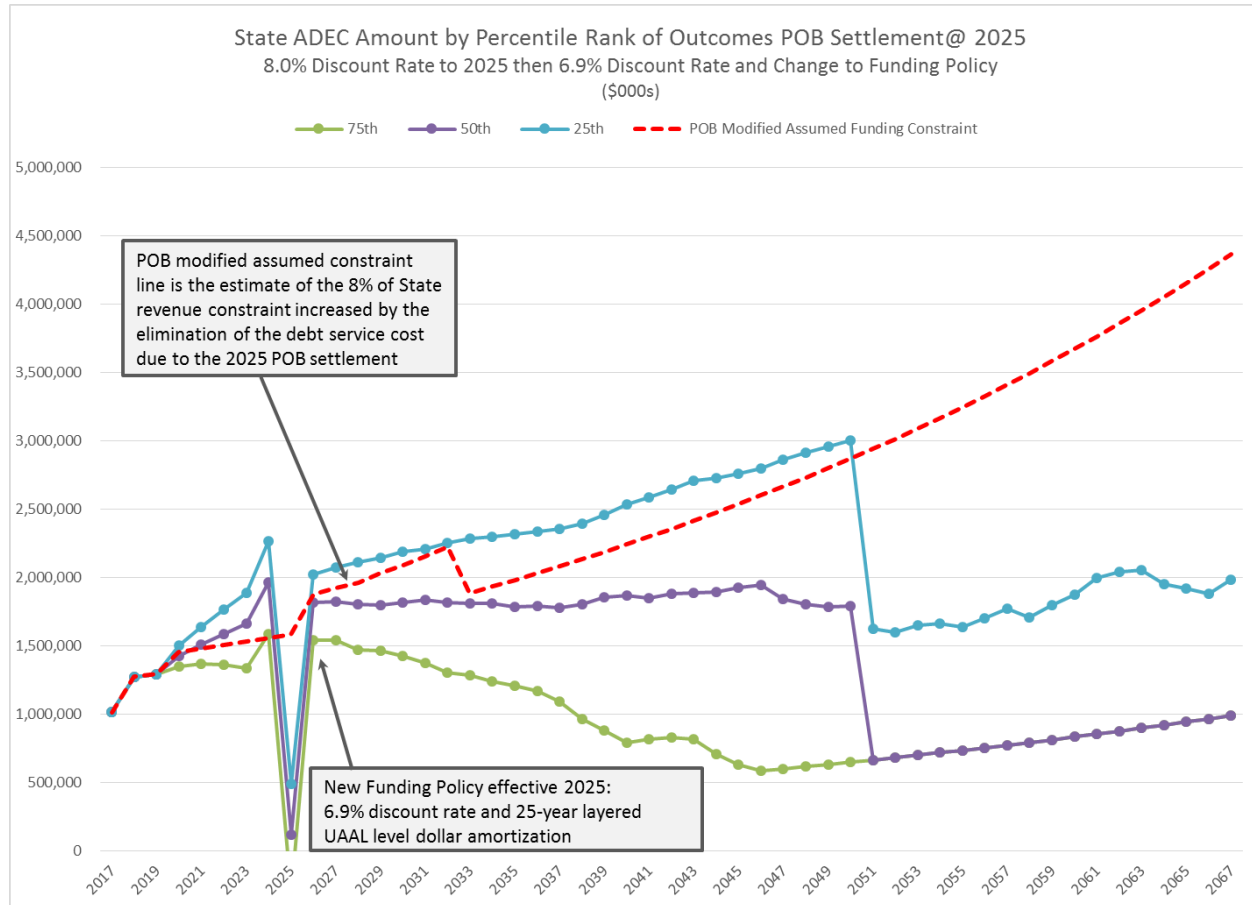
Analysis of the Change Funding Policy Plan

Chart 7 - The Change Funding Policy plan uses a 6.9% discount rate and similar change to the TRS funding policy as implement by SERS. The chart provides the modeled output of funded ratio results using modeled future returns with an expected geometric mean of 7.0% and a standard deviation of 11.0%.

Funded Ratio by Percentile Rank of Outcomes Change Funding Policy @ 2018
6.9% Discount Rate

Decreasing the discount rate in 2018 would initially decrease the funded ratio approximately 7%

Section V: Analysis of Viability Plans

Chart 8 - The modeled output of ADEC results under the Change Funding Policy plan which phases-in level dollar amortization over 5 years.

State ADEC Amount by Percentile Rank of Outcomes Change Funding Policy @ 2018
6.9% Discount Rate
($000s)
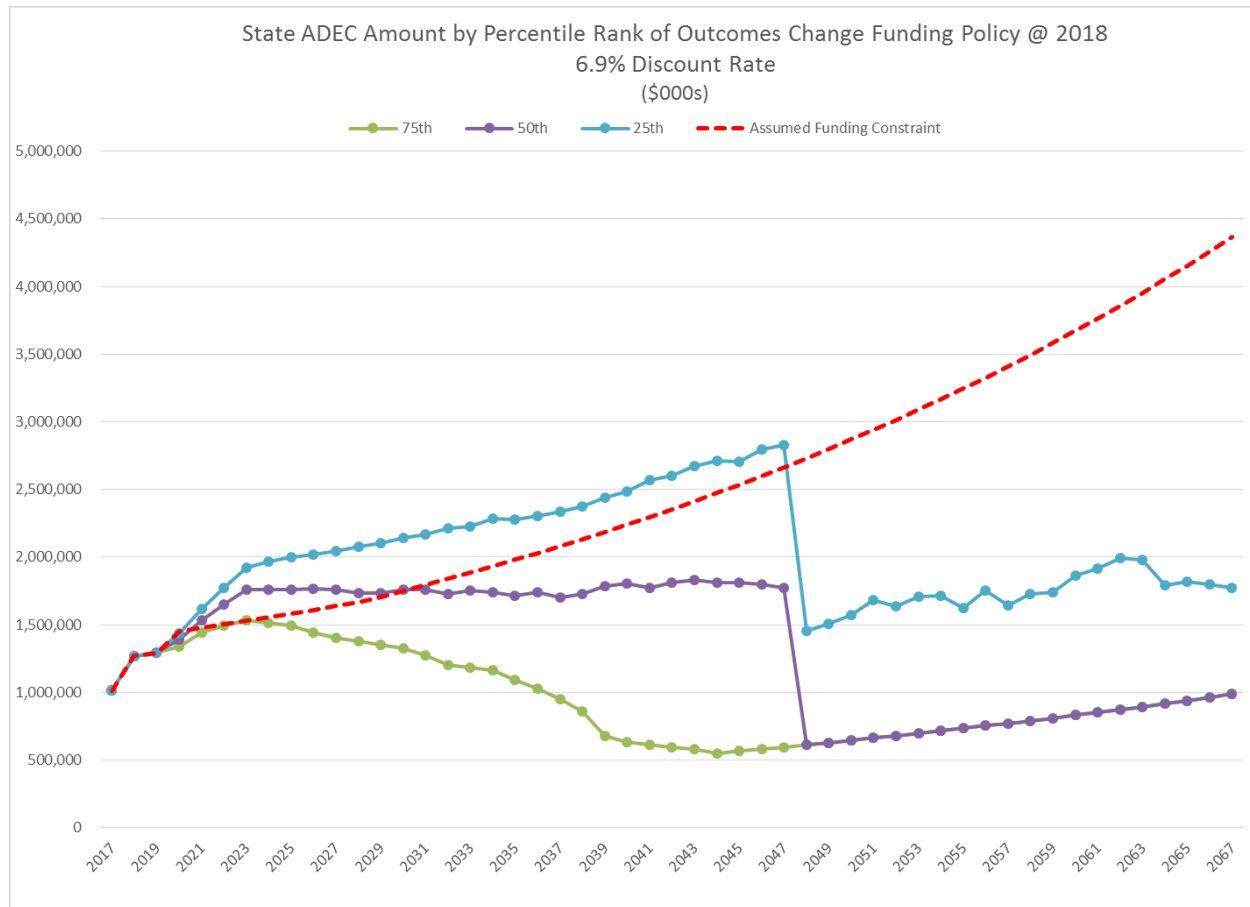
As an alternative to the model output above, in the next chart, we provide the modeled output using a level percentage amortization with the 2018 changes to the funding policy.

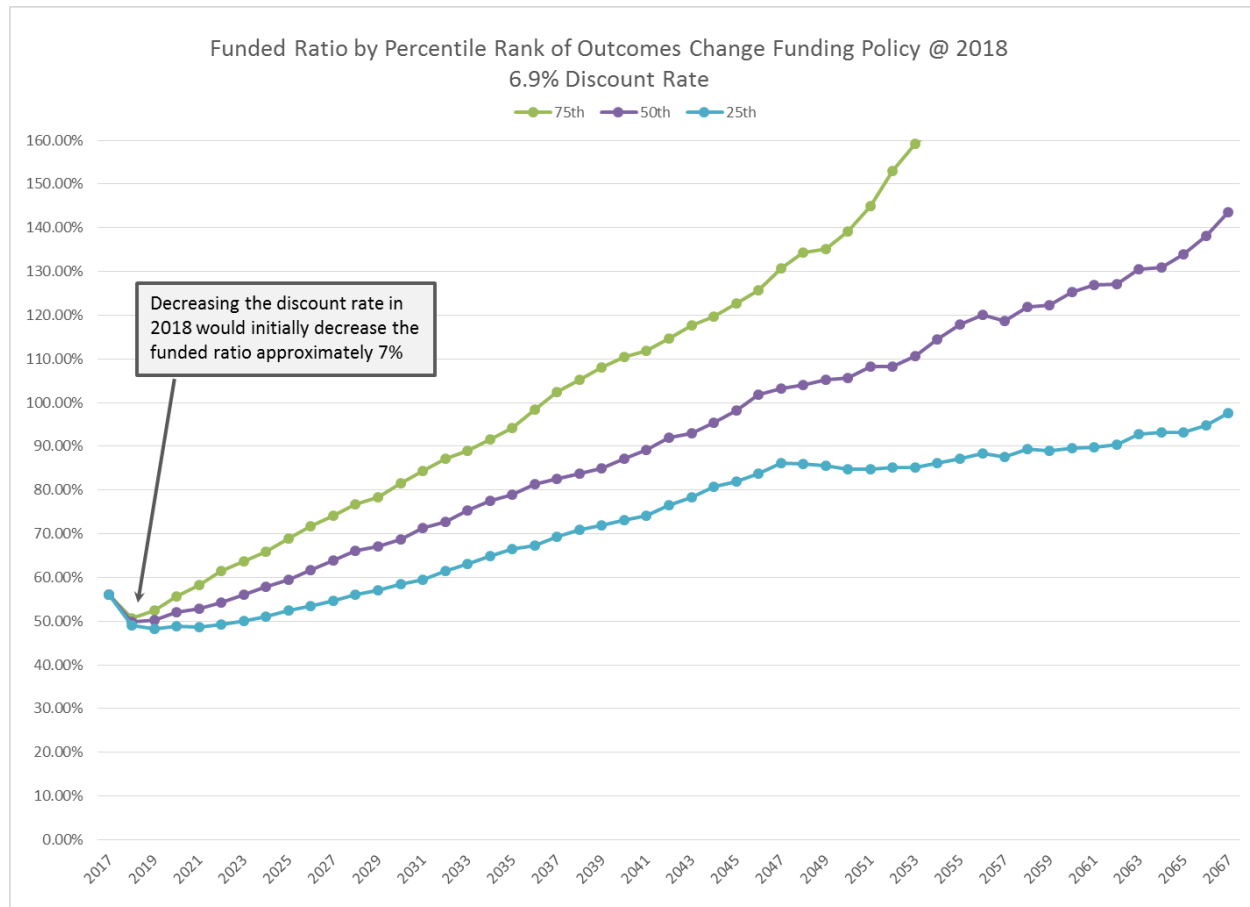# Section V: Analysis of Viability Plans

Chart 9 - The modeled output of ADEC results under the Change Funding Policy plan using level percentage amortization.

State ADEC Amount by Percentile Rank of Outcomes Change Funding Policy Except with Level Percent Amortization @ 2018 Using 6.9% Discount Rate ($000s)
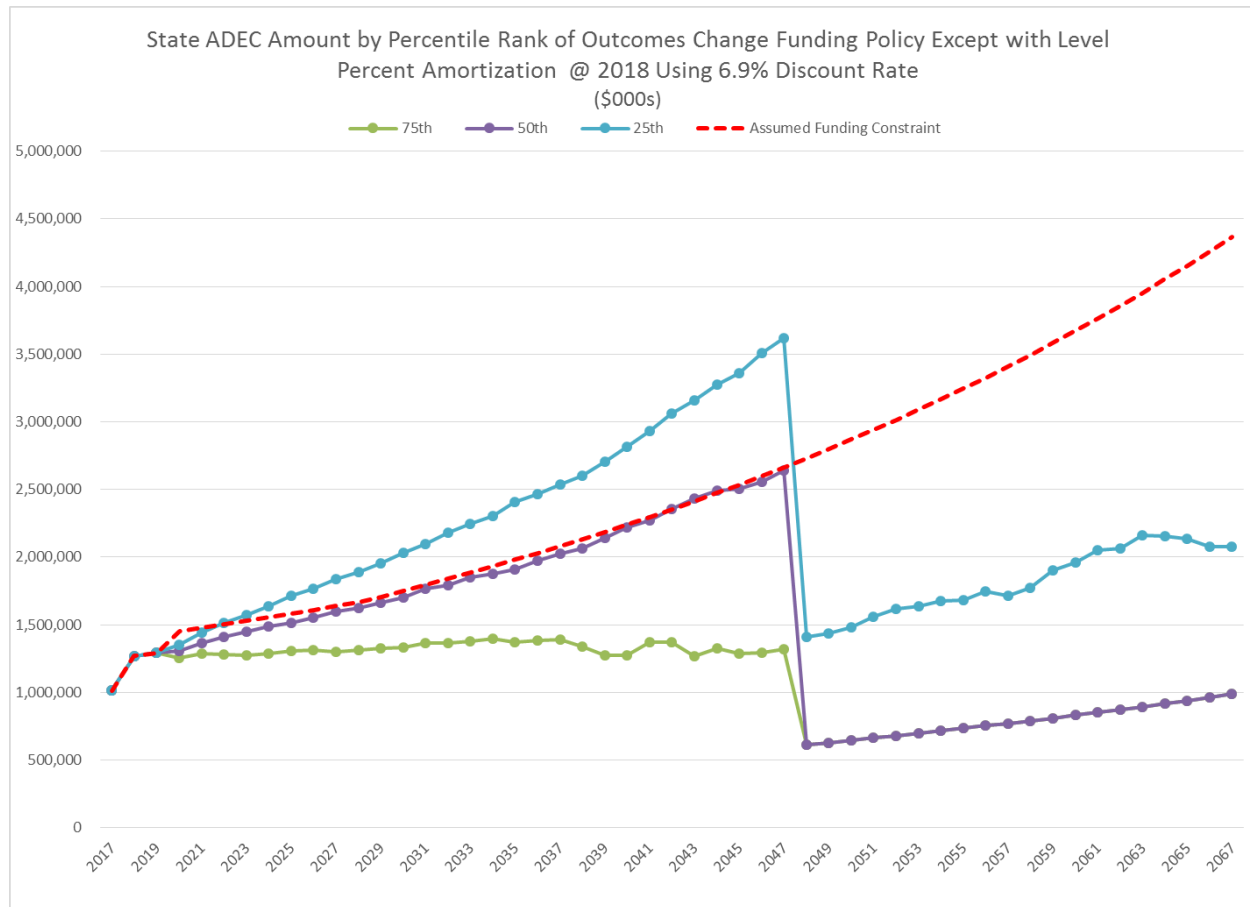
Section V: Analysis of Viability Plans

Analysis of the Asset Transfer Plan

Chart 10 - The Asset Transfer plan's assumes the transfer occurs in FY 2019 and a reduction in the discount rate to 6.9% as of July 1, 2019. The chart provides the modeled output of funded ratio results using future returns with an expected geometric mean of 7.0% and a standard deviation of 11.0%.
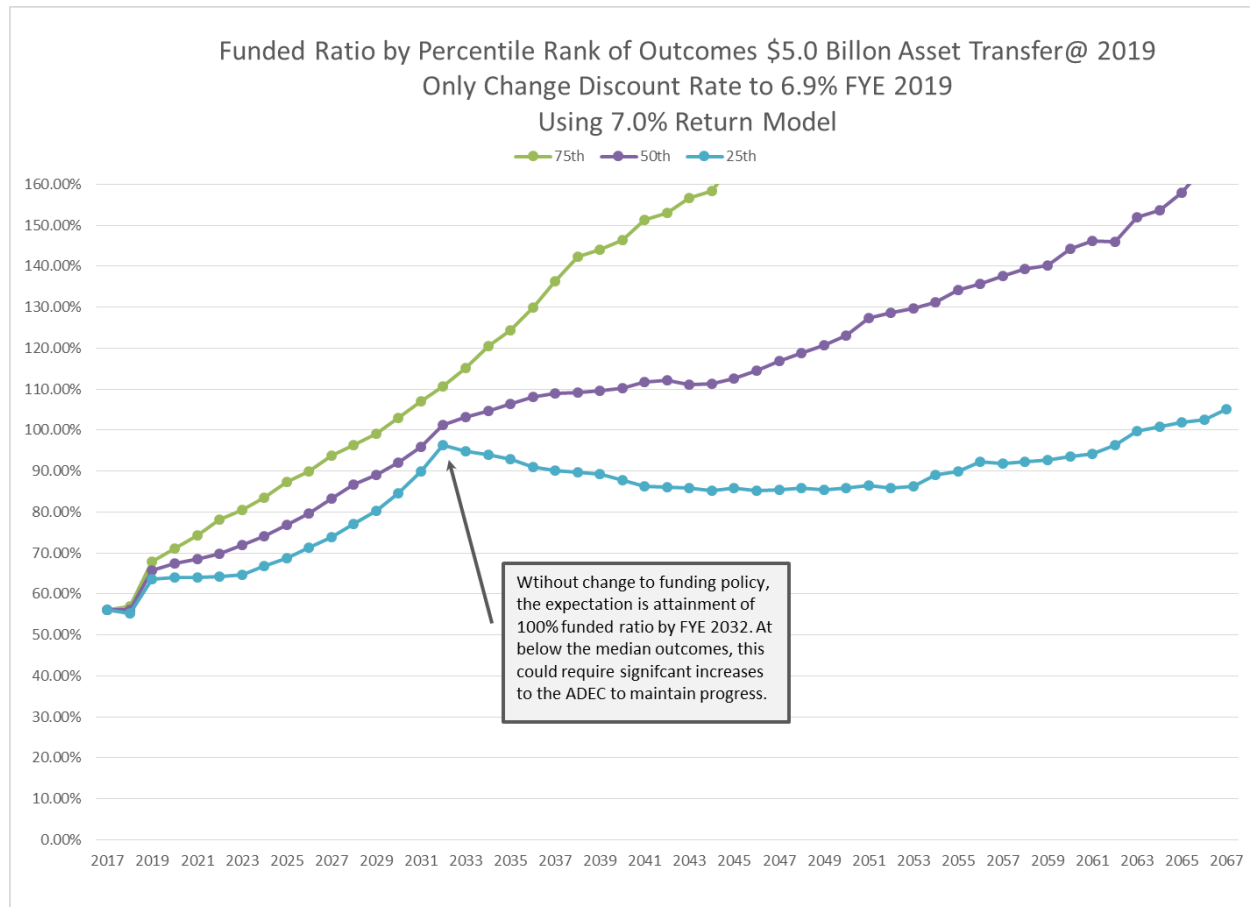

Funded Ratio by Percentile Rank of Outcomes $5.0 Billon Asset Transfer@ 2019
Only Change Discount Rate to 6.9% FYE 2019
Using 7.0% Return Model

Wtihout change to funding policy, the expectation is attainment of 100% funded ratio by FYE 2032. At below the median outcomes, this could require signifcant increases to the ADEC to maintain progress.

The chart above, similar to Chart 1, shows expected trends in funded ratio under the current funding policy and assuming all ADECs are fully funded. Chart 11 on the next page, provides the ADEC levels associated with the funded trends.

Chart 11 - The modeled output of ADEC results under the Asset Transfer under a 6.9% discount rate and no changes to the current funding policy.
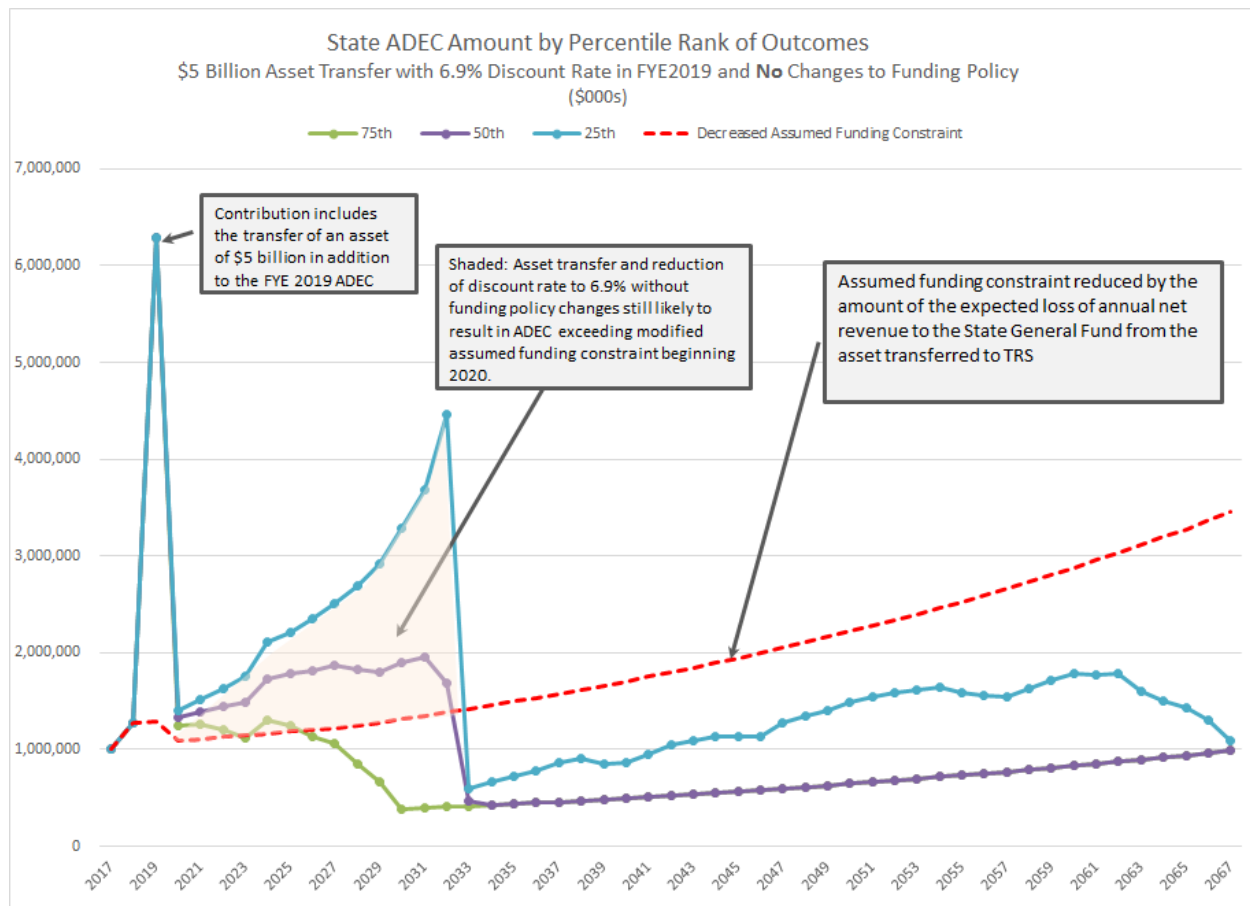
When looking at Chart 11, it is important to consider the ADEC output in the chart does not include the loss of revenue to the General Fund due to the asset transfer. The transferred asset's annual net revenue is assumed to be $350 million in 2019 with annual increases of 2.0%. Therefore, under the current funding policy which maintains the statutory amortization method through FY 2032 until the POB matures, even with the asset transfer, the possible ADEC volatility could be extreme, especially when combined with the loss of revenue to the General Fund. The assumed constraint line does include a reduction to reflect the loss of revenue to the General Fund.

Chart 12 – Because the change to the funding policy has a significant change to the funded ratio output as shown in Chart 10, we include the modeled output funded ratio results with the Asset Transfer under a 6.9% discount rate with the implementation of a 25-year layered amortization and 5-year phase-in to a level dollar method.

Funded Ratio by Percentile Rank of Outcomes $5 Billion Asset Transfer using 6.9% Discount Rate and Change to Funding Policy in FYE 2019

—— Likely Best   —— Median   —— Likely Worst

A transfer of $5 billion asset occurs during FY 2019. The model assumes the change to the discount rate and funding method are implemented with the June 30, 2019 valuation.
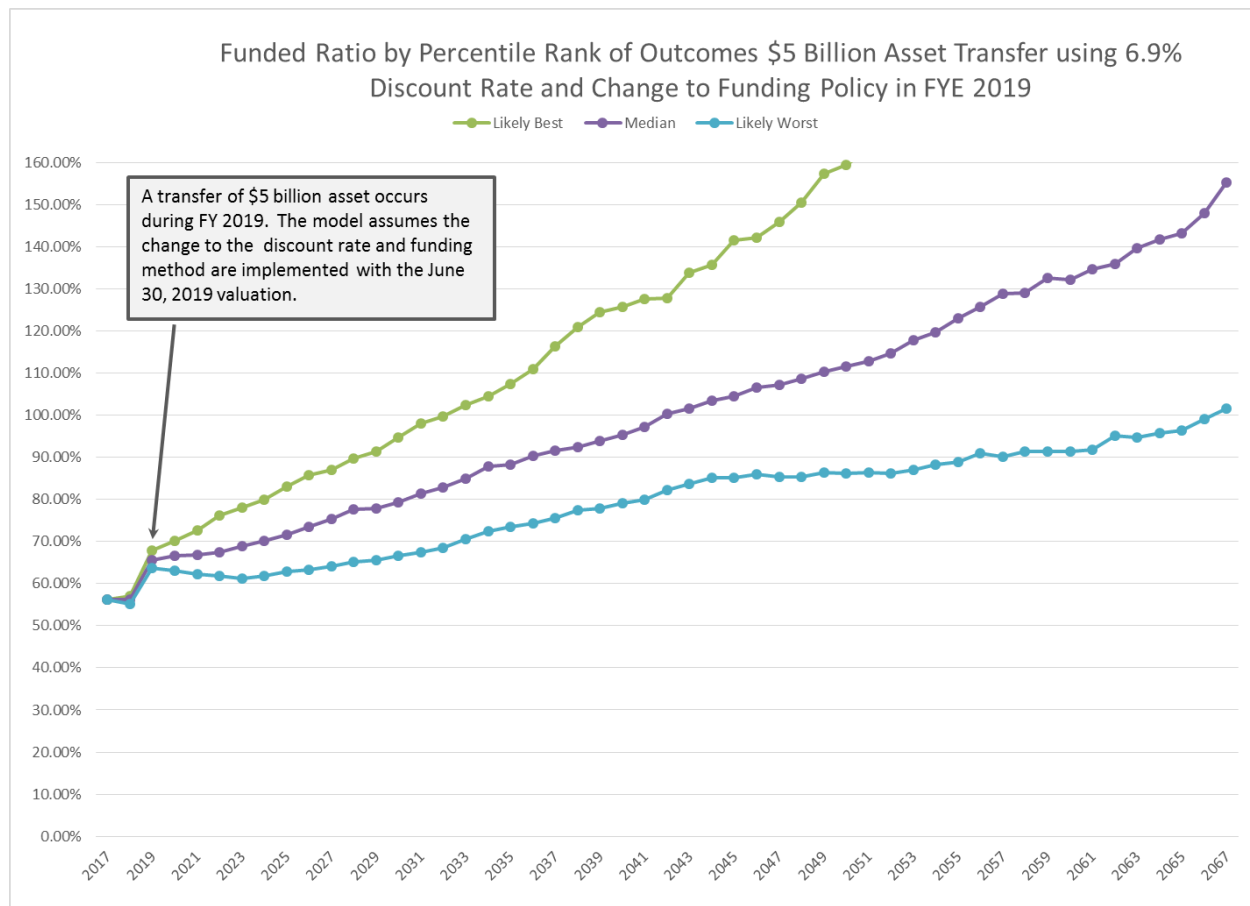
Section V: Analysis of Viability Plans

Chart 13 - The modeled output of ADECs under the Asset Transfer Plan using 6.9% discount rate with changes to the funding policy as of June 30, 2019.

State ADEC Amount by Percentile Rank of Outcomes
$5 Billion Asset Transfer using 6.9% Discount Rate and Funding Policy Change in FYE 2019
($000s)

Legend: 75th — 50th — 25th — Assumed Decreased Funding Constraint

Annotations on chart:
- Contribution includes the transfer of an asset of $5 billion in addition to the FYE 2019 ADEC
- Funding Policy Change effective FYE 2019: 25-year layered amortizaton with a 5-year phase-in to level dollar amortization using 6.9% discount rate.
- Assumed funding constraint is reduced to reflect the loss of net revenue to the General Fund

Section V: Analysis of Viability Plans

Sustainability Analysis of Plans

To compare the relative sustainability of the plans, we establish goals for the attainment of desirable funded ratios at five different years (2023, 2028, 2033, 2038 and 2043) in the near and long-term future. We also compare likelihood of failing to demonstrate funded progress as of year 2038. For this comparison, the Asset Transfer plan includes the change to the funding policy as of June 30, 2019.

Table 1 – Comparison of Improvement in Likelihood of Meeting Future Levels of Desired Funded Ratios.

	Likelihood of 65% Funded @2023	Likelihood of 70% Funded @2028	Likelihood of 75% Funded @2033	Likelihood of 80% Funded @2038	Likelihood of 100% Funded @2043	Likelihood of less than 56% Funded @2038
Current State Constrained	34%	44%	49%	39%	23%	26%
Viability Plans						
POB	34%	21%	28%	35%	25%	22%
CFP	15%	32%	46%	54%	38%	6%
AT	64%	61%	64%	68%	48%	4%

Red numbers demonstrate reduced likelihood of attaining desired funded ratio, Yellow is no change and Green is improved likelihood of attaining goals.

All viability plans demonstrate long-term improved sustainability. Due to the addition of a $5 billion asset in 2019, only the Asset Transfer plan (with FYE 2019 change to funding policy) demonstrates shorter-term likelihood of improved funded status. Conversely, the POB Settlement plan diverts $1.94 billion from TRS and reduces the short-term likelihood of meeting funded ratio gates of this analysis. The analysis does not reflect the significant benefit to the State's General Fund of the reduction to future debt service costs resulting from the POB settlement.

Section V: Analysis of Viability Plans

Affordability Analysis of Plans

The table below provides analysis of the metrics for affordability. The table provides the likelihood that a plan or alternative will exceed the assumed constraint for the applicable Plan.

Table 2 – Comparison of likelihood that the modeled output of the ADEC will exceed the specific plan's applicable assumed constraint. This analysis is only intended to provide a metric to compare the measures of affordability and does not represent the Commission's belief or finding that favors the contribution of less than the ADEC nor that the assumed constraint utilized is an actual measure of the State's actual limit to provide contributions.

	Likelihood ADEC >Constraint @2023	Likelihood ADEC > Constraint @2028	Likelihood ADEC > Constraint @2033	Likelihood ADEC > Constraint @2038	Likelihood ADEC > Constraint @2043
POB Modified Constraint Amount ($Billion)	1.53	1.97	1.88	2.13	2.41
POB Settlement Plan	62%	7%	40%	41%	46%
POB Settlement Level Dollar	62%	38%	46%	37%	34%
CFP Constraint Amount ($Billion)	1.53	1.67	1.88	2.13	2.41
CFP Plan	75%	57%	43%	35%	33%
CFP Plan Level Percentage	34%	46%	46%	48%	50%
AT Reduced Constraint Amount ($Billions)	1.15	1.25	1.42	1.62	1.85
AT Plan with change to Funding Policy	59%	57%	49%	41%	41%

Section V: Analysis of Viability Plans

From Table 2 above, plans implementing a level dollar amortization method demonstrate more favorable measures of long-term affordability. This is due to the assumption that the approximation of the State revenue underlying all the constraints is assumed to ultimately grow at 2.5% annually where the amortization costs under the level percentage of payroll method is expected to grow annually at 3.0%. If revenue growth is actually faster than assumed, all these affordability measures would improve (show further declines in likelihood of exceeding the assumed funding constraint over time).

Pros and Cons of the Plans

Each plan has separate positive and negative attributes. The table on the following page lists the primary positive and negative attributes of the viability plans which have been identified through the analysis provided in this report. The listed attributes are not provided in an order of importance. There may be additional pros and or cons of each plan.

Section V: Analysis of Viability Plans

Plan:	POB Settlement	Change Funding Policy	Asset Transfer
Pros:	1. Settles the POB which saves, in total, more than $2.2 billion of POB debt service cost in years following the settlement through the POB maturity date in 2032. 2. Does not violate the terms of the bond covenant based on bond counsel's opinion. 3. Reduces the discount rate to 6.9% and provides for re-amortization in 2025 following the settlement of the POB.	1. Reduces the discount rate to 6.9% and provides for re-amortization as early as 2018. 2. Provides the highest reduction in short-term exposure to assumption driven investment losses to TRS.	1. Transfer of an asset in FY 2019 would reflect immediate reduction in the UAAL and improvement to the funded ratio. 2. ADEC reduction would be expected to more than offset loss of revenue to the General Fund. 3. The TRS assets would benefit by a stable source of significant income. 4. Reduces the discount rate to 6.9% as of FYE 2019 following the transfer.
Cons:	1. Maintaining the current return assumptions continues the current exposure to assumption driven investment losses until 2025.	1. The Treasurer's bond counsel has opined that any change to the current amortization length or methodology would violate the bond covenant, which may have negative implications outside of TRS.	1. To reduce potential ADEC volatility, an alternative change to the funding policy is modeled as implemented following the transfer in 2019. The Treasurer's bond counsel has opined that any change to the current amortization length or methodology would violate the bond covenant, which may have negative implications outside of TRS. 2. Depending on the structure of the transfer, the transfer may not be treated as an asset under GASB for financial reporting.

Note: Assumption driven asset losses would result from assuming an 8.0% investment return while expecting actual returns of 7.0%.

Section VI: Key Findings of the Viability Commission

The Commission has the following key findings:

1. The Teachers' Retirement System has consistently provided a moderate level of retirement benefits to its participants as confirmed through both a comparative review of other similar plans and as a cost analysis based on the System's historical, current and projected normal cost rate. Any consideration of adding the TRS active participants to Social Security coverage could be expected to greatly increase the cost per dollar of benefit.

2. The model outputs consistently indicates the benefit to TRS to reduce the assumed 8.0% assumed rate of investment return (discount rate) to a rate of return assumption nearer the investment professionals' long-term expectation of the capital markets. The models, on which most of this report's analysis heavily depends, utilize the most recent expected measures of return (7.0% median annual return) and volatility (11.0% annual standard deviation of returns) as recommended by the Treasurer and her staff. Therefore, all viability plans analyzed include a reduction to the investment return assumption to 6.9%. The point in time of the assumption change may differ from plan to plan.

3. The model output heavily depends on the continued dedication of the State to fully fund the future ADECs. The current bond covenant requires the State's full funding of ADEC for TRS. If the implementation of a viability plan includes the earlier than scheduled end to the covenant, it is important, as the Treasurer has suggested, that an equally strong alternative to the covenant be adopted which mandates the State continue the same funding discipline into the future which has been required by the bond covenant and complied with by the State over the past nine years.

4. The analysis of the viability plans favors the implementation of a level dollar amortization method in recognition of OPM's assumed 2.5% long-term expected annual growth in revenue. Also, the budget process focuses on the ADEC in dollar amount rather than the percentage of payroll.

5. The Commission offers three viability plans as presented in this report. Each individual plan demonstrates a potential to improve short and long-term viability of TRS, but may also have other potential considerations, perhaps some not aware to this Commission and not addressed in this report. Further, combining of plans or aspects of plans could have a materially different impact than the simple sum of their individual results provided in this report.

Appendix A: Assumed Funding Constraints

The table of assumed funding constraints are used in the analysis of the affordability of outcomes as a comparative metric. The constraint is based on approximately 8% of forecasted total State revenue for fiscal year 2019 as presented the Final Consensus of State Revenue Estimates for the FY2017 - 2019 biennium dated January 16, 2018.

Based on discussions with OPM, annual growth rates were applied to the FY 2019 assumed constraint utilizing an expectation of annual revenue growth of 1.75% through FY 2028 then 2.50% thereafter.

The constraint as applied to the POB Settlement plan and the Asset Transfer plan was modified based on review and recommendation of the Commission. Due to the elimination of the POB debt service cost with the year 2025 settlement of the POB, the POB assumed funding constraint was increased correspondingly for the amount of debt service cost eliminated from years 2026 through 2032. A report of the amounts of the debt service cost was supplied by the Treasurer's Office.

The assumed funding constraint applied to the Asset Transfer plan was decreased to reflect the loss of the net revenue to the General Fund provided by an asset similar to the lottery transferred to TRS. The net revenue assumed for this purpose was $350 million for 2019 with assumed annual increases of 2.0%.

The table on the next page provides the assumed funding constraints for each year of the projection for the three versions.

Appendix A: Assumed Funding Constraints

Fiscal Year	Assumed Annual Constraint	POB Settlement Assumed Annual Constraint	Asset Transfer Assumed Constraint
2020	1,450,000	1,450,000	1,093,000
2021	1,475,375	1,475,375	1,111,235
2022	1,501,194	1,501,194	1,129,771
2023	1,527,465	1,527,465	1,148,614
2024	1,554,196	1,554,196	1,167,768
2025	1,581,394	1,581,394	1,187,237
2026	1,609,068	1,877,320	1,207,028
2027	1,637,227	1,921,591	1,227,146
2028	1,665,879	1,967,324	1,247,597
2029	1,707,526	2,027,707	1,280,878
2030	1,750,214	2,089,586	1,315,033
2031	1,793,969	2,153,677	1,350,084
2032	1,838,818	2,220,090	1,386,056
2033	1,884,789	1,884,789	1,422,971
2034	1,931,908	1,931,908	1,460,854
2035	1,980,206	1,980,206	1,499,731
2036	2,029,711	2,029,711	1,539,627
2037	2,080,454	2,080,454	1,580,568
2038	2,132,465	2,132,465	1,622,581
2039	2,185,777	2,185,777	1,665,695
2040	2,240,421	2,240,421	1,709,938
2041	2,296,432	2,296,432	1,755,339
2042	2,353,843	2,353,843	1,801,928
2043	2,412,689	2,412,689	1,849,736
2044	2,473,006	2,473,006	1,898,794
2045	2,534,831	2,534,831	1,949,135
2046	2,598,202	2,598,202	2,000,792
2047	2,663,157	2,663,157	2,053,799
2048	2,729,736	2,729,736	2,108,190
2049	2,797,979	2,797,979	2,164,002
2050	2,867,929	2,867,929	2,221,273
2051	2,939,627	2,939,627	2,280,038
2052	3,013,118	3,013,118	2,340,337
2053	3,088,446	3,088,446	2,402,209
2054	3,165,657	3,165,657	2,465,696
2055	3,244,798	3,244,798	2,530,837
2056	3,325,918	3,325,918	2,597,678
2057	3,409,066	3,409,066	2,666,261
2058	3,494,293	3,494,293	2,736,632
2059	3,581,650	3,581,650	2,808,836
2060	3,671,191	3,671,191	2,882,921
2061	3,762,971	3,762,971	2,958,935
2062	3,857,046	3,857,046	3,036,930
2063	3,953,472	3,953,472	3,116,953
2064	4,052,308	4,052,308	3,199,059
2065	4,153,616	4,153,616	3,283,302
2066	4,257,457	4,257,457	3,369,737
2067	4,363,893	4,363,893	3,458,418

Appendix B: Description of Asset Liability Model

Actuarial Modeling Methodology

The starting point of the model is the June 30, 2016 actuarial valuation. This is the most recent actuarial valuation of the retirement system. Actuarial valuations such as this are performed as of a certain date using the membership data and the value of assets as of that date only. Actuarial assumptions of future demographic and economic events are used in the valuation to estimate the total expected future benefits provided under the plan. The present value of the future benefits is determined using a constant assumed rate of interest equal to the expected rate of investment return. The valuation uses actuarial methods to allocate the present value of benefits and solves for the expected future annual contributions that, together with the current assets, is expected to fully fund by the end of the desired funding period all the future benefits to be paid. The valuation is a closed-group model in that it does not reflect future new entrants into the system.

Using the June 30, 2016 actuarial valuation, we developed a deterministic model to project the actuarial status of the retirement system for each future year using open-group projections of the covered membership. An open-group projection rebuilds the active membership in each future year by replacing those members expected to exit with a cohort of new entrants that are demographically similar to actual cohorts of recent new entrants to the system. The system's assets are developed assuming a static rate of investment return and a contribution policy. Provided the constant rate of investment return is an unbiased "best estimate" of expected future returns, the model will develop annual valuation results for each year of the projection period that approximates the median of future results. A deterministic model is useful to compare the impact of changes on the trend in expected future valuation results under the basis that all assumptions are exactly met.

The deterministic model for this analysis was based on the following:

- The valuation assumptions developed in the 2010-2015 TRS experience study and utilized in the June 30, 2016 actuarial valuation with the exception of modeled changes to the rates of inflation and investment return.
- The 2017 projected valuation results are based on the actual 14.38% investment return on the market value of assets and the State contribution as determined in the 2014 actuarial valuation. The State contribution for FYs 2018 and 2019 is fixed at the amounts determined in the 2016 valuation. Modeled changes impact the FY 2020 ADEC and later.
- The active membership headcount remains constant at the 2016 level of 50,877.
- Exiting active members are replaced at each valuation date with new entrants that are demographically comparable to actual new entrants over the period from 2011 to 2016.
- The actuarial methods as utilized in the June 30, 2016 valuation of TRS with the exception of modelled changes to the amortization methodology.
- Valuation results are determined annually to reduce the possible impact of contribution lag due to biennial valuations.
- The State contributes the annual actuarial determined employer contribution (ADEC) each year (unless assumed otherwise in a specific analysis).

Appendix B: Description of Asset Liability Model

We then developed an asset liability model to produce an expected range of future outcomes which vary by the investment experience in future years.   By comparing the ranges of outcomes for these key plan measures, the model provides information about potential variability, thus demonstrating the increase or decrease in the "risk" associated with various changes.

We develop the asset side of the model to project plan assets under a variable return in each future year; to smooth the return experience based on the current TRS asset smoothing method; and to determine the annual investment gain and loss resulting from the variable returns which are applied to plan years beginning 7/1/2018. The investment returns for the model are based on 500 series of 50-year returns with each annual return randomly drawn from a distribution of returns statistically similar to the TRS return expectations. The investment returns were based on a distribution of returns with the approximate statistical attributes of the current plan assets with a geometric average return of 7.0% and a standard deviation of 11.0% per discussions with the System's fiduciary, the Office of the State Treasurer.

Next, the deterministic liability model is upgraded to properly handle the addition of investment return gains and losses in the measures of future unfunded actuarial liabilities (UAALs), funded ratio and actuarially determined employer contributions (ADECs).

For each scenario modeled, five hundred iterations of the model are generated using the series of 50-year random returns. Each series of returns are input into the open-group projection model to produce one possible 50-year projection of valuation results. All the iterations are assumed to be equally likely. The 500 sets of 50-year projected results are then ranked and charted to provide the graphical range of possible outcomes produced by the model.

Actuarial Modeling Assumptions

All of the actuarial assumptions used in this study are the same as those used in the June 20, 2016 actuarial valuation except where indicated by the analysis of modeled changes. The discount rate used to determine the present value of future benefit payments and the expected return on assets were the two assumptions that were changed to perform some of the scenarios tested in this study. Also, because we know the actual return on assets for the July 1, 2016-June 30, 2017 period (14.38%), we used that return for the first year of all the projections performed for this study.

Although the expected return on assets assumption used in the June 30, 2016 actuarial valuation was 8.0%, we have assumed an actual 7.0% median return with an annual standard deviation of 11.0% for most of this study. This can result in the model reflecting a degree of assumption driven asset losses while the assumption exceeds the return expectation.

Appendix C: Detailed Model ADEC Output

Basis: FYE	Current State Median Model Output	POB Settlement Median Model Output	Change Funding Polcy Median Model Output	Asset Transfer Median Model Output
2018	1,271,033	1,271,033	1,271,033	1,271,033
2019	1,292,314	1,292,314	1,292,314	6,292,314
2020	1,425,939	1,425,939	1,391,265	990,646
2021	1,504,513	1,504,513	1,533,334	1,146,800
2022	1,586,374	1,586,374	1,651,721	1,229,247
2023	1,661,629	1,661,629	1,761,600	1,308,012
2024	1,964,656	1,964,656	1,760,061	1,362,823
2025	2,046,958	113,527	1,759,615	1,413,660
2026	2,150,123	1,462,962	1,768,390	1,427,273
2027	2,237,994	1,502,117	1,760,737	1,408,019
2028	2,307,952	1,523,411	1,736,618	1,394,046
2029	2,430,918	1,554,113	1,733,833	1,383,365
2030	2,623,002	1,605,042	1,757,985	1,412,089
2031	2,899,065	1,661,457	1,757,015	1,418,498
2032	3,215,828	1,682,253	1,724,365	1,382,104
2033	384,712	1,721,784	1,756,183	1,393,640
2034	391,701	1,755,197	1,740,682	1,389,085
2035	406,887	1,805,088	1,713,953	1,363,592
2036	418,409	1,850,194	1,741,692	1,389,518
2037	457,064	1,887,915	1,700,854	1,320,943
2038	471,355	1,939,944	1,728,524	1,352,985
2039	381,765	2,005,579	1,785,887	1,427,154
2040	377,518	2,064,284	1,803,141	1,435,644
2041	417,600	2,109,249	1,771,523	1,364,715
2042	482,250	2,191,356	1,813,426	1,458,495
2043	537,991	2,275,708	1,830,142	1,473,457
2044	639,685	2,332,041	1,813,845	1,444,234
2045	687,701	2,392,850	1,810,850	565,775
2046	743,874	2,448,397	1,799,554	581,283
2047	827,790	2,458,340	1,775,005	596,998
2048	793,030	2,461,964	612,981	612,981
2049	776,887	2,491,182	629,263	629,263
2050	742,846	2,556,103	645,958	645,958
2051	723,741	663,336	663,336	663,336
2052	775,701	680,563	680,563	680,563
2053	783,850	698,319	698,319	698,319
2054	849,196	716,280	716,280	716,280
2055	936,488	734,537	734,537	734,537
2056	877,982	753,143	753,143	753,143
2057	970,595	772,071	772,071	772,071
2058	1,138,985	791,389	791,389	791,389
2059	1,128,710	811,157	811,157	811,157
2060	982,335	831,386	831,386	831,386
2061	865,886	852,114	852,114	852,114
2062	839,531	873,330	873,330	873,330
2063	817,997	895,052	895,052	895,052
2064	776,082	917,315	917,315	917,315
2065	685,052	940,120	940,120	940,120
2066	666,649	963,484	963,484	963,484

Appendix D: Glossary

Actuarial Accrued Liability - The difference between the actuarial present value of future benefits payments and the actuarial present value of future normal costs. Also referred to as "accrued liability."

Actuarial Assumptions - Estimates of expected future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Demographic estimates (rates of mortality, disability, turnover and retirement) are generally based on past experience, modified for projected changes in conditions. Fiscal estimates (salary increases, inflation and real investment return) consist of the underlying rates in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method - A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future benefit payments" between future normal cost and actuarial accrued liability.

Actuarial Present Value - The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest and by probabilities of payment. Also referred to as "present value."

Actuarial Value of Assets - The value of current plan assets recognized for valuation purposes.

Amortization - Paying off an interest-discounted amount with periodic payments of interest and principal, as opposed to paying off with a lump sum payment.

Experience Gain (Loss) - A measure of difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

Normal Cost - The annual cost assigned, under the actuarial funding method, to current and subsequent plan years.

Unfunded Actuarial Accrued Liability - The difference between the actuarial accrued liability and actuarial value of assets. Also referred to as "unfunded accrued liability" or "unfunded liability".