December 6, 2017

Stress Test Analysis

Commonwealth of Pennsylvania State Employees' Retirement System

Stressing the SERS Total Fund

Stress Testing the SERS Fund Essentially Revolves Around Three Major Questions

1. How exposed is the SERS fund to major sources of financial stress?

2. How significant is the stress applied – depth and duration?

3. What consequences does it have for the Fund?

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SERS Exposure to Significant Sources of Stress

- In terms of downside risk, equity exposure accounts for approximately 75 to 80% of the downside risk in the asset value of the SERS fund.
- Beta accounts for equity like risk elsewhere in the total fund (e.g., real estate, multi-strategy, etc.)
- Negative net CF is additive to asset losses stemming from valuation declines

SERS Fund	Current	Proposed Long-term Target
Public Equity Exposure	51%	48%
Public + Private Equity Exposure	66%	64%
Beta	0.72	0.74
Expected Annual Net CF*	-$1,000,700,000	

*Calculated using the 2016 Capital Distributions, Capital Calls, and Net Benefits Payments net of contributions.

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How Significant is the Stress Applied?

Projecting the Distribution (Range) of Possible One Year Outcomes for the Total Fund

At the 10th percentile, the asset value of the SERS fund could decline by $3.4 billion to $3.5 billion.

SERS Total MV	SERS Current Fund at 10th Percentile	One Year Loss From Current
$28,459,237,448	$24,938,150,172	$3,521,087,276

SERS Total MV	SERS Proposed LT Strategic Plan at 10th Percentile	One Year Loss From Current
$28,459,237,448	$25,100,164,592	$3,359,072,856

*Most of this decline is likely to be associated with exposure to public equity.
*One year loss includes the effect of negative CF from the fund.

Market values are as of 9/30/2017.

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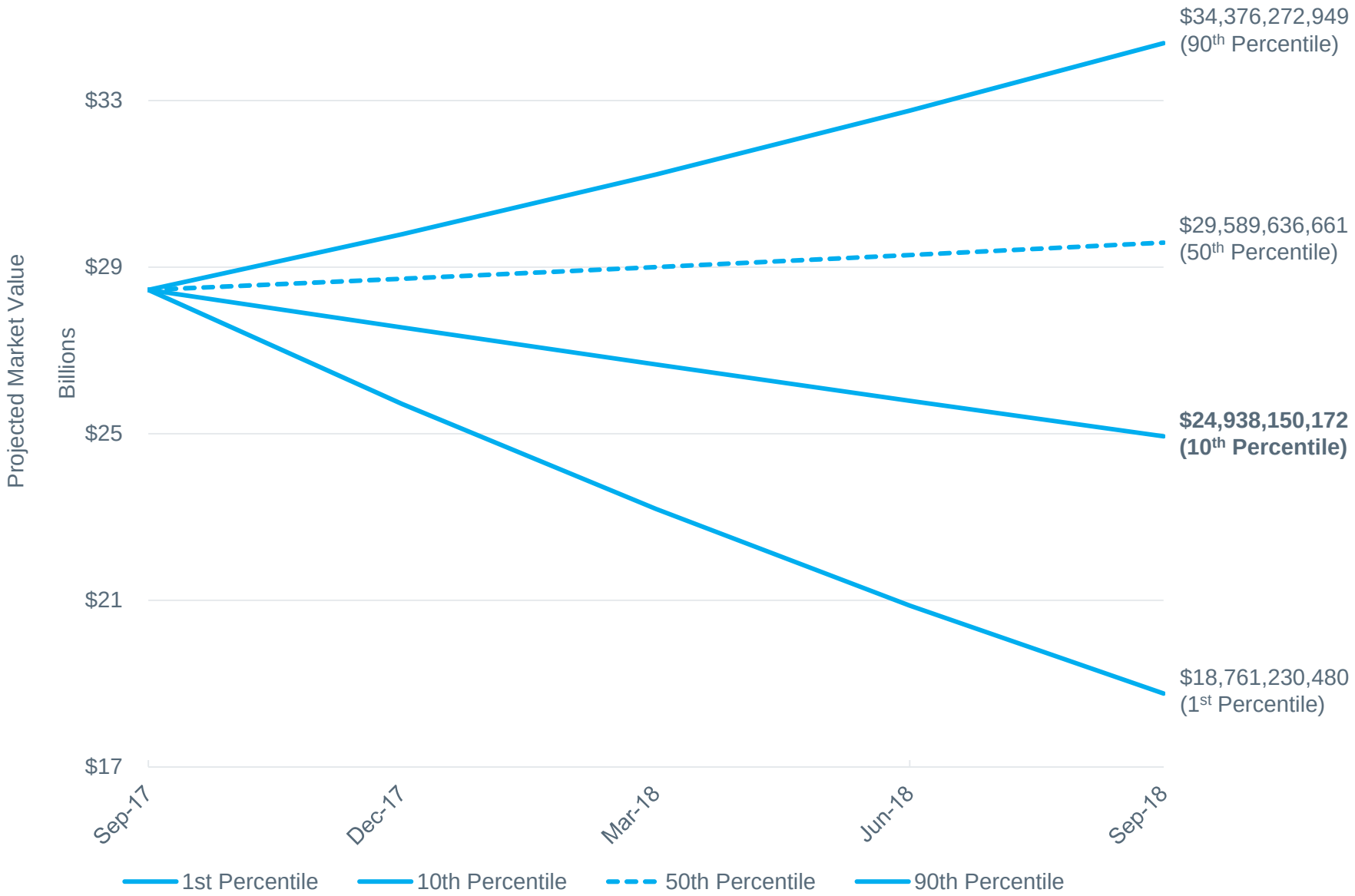
One Year Downside Loss – Current Allocation



Assumes negative quarterly cash flows of $250,175,000.

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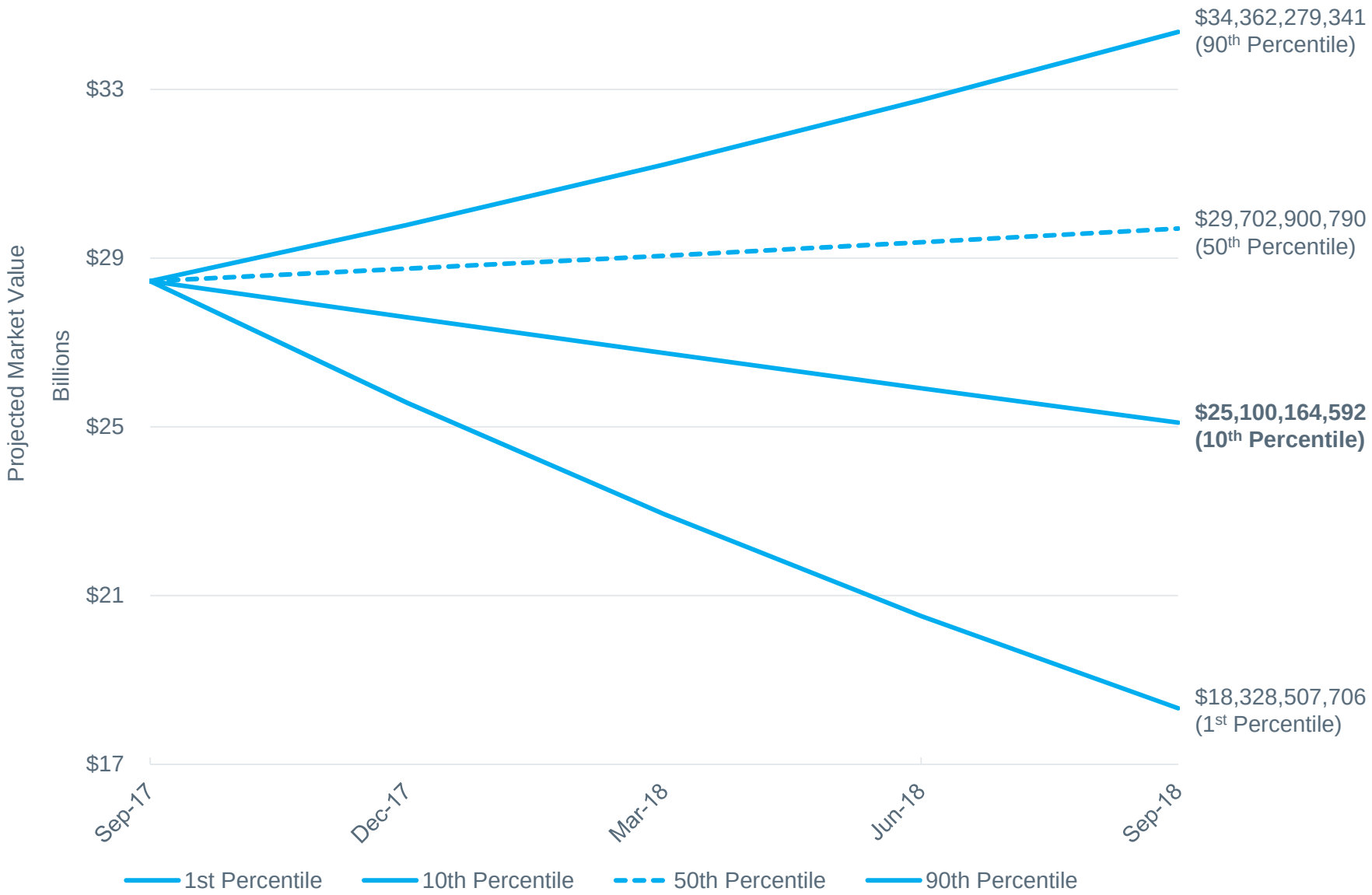
One Year Downside Loss – Potential New Strategic Target



Assumes negative quarterly cash flows of $250,175,000.

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Consequences for the SERS Fund?

The consequences of a 10th percentile event for the SERS fund will depend on many factors, some out of the Board's direct control. These include (but are not limited to) the following:

- The possible need to sell liquid equity securities at distressed prices.
- The possible exacerbation of negative net CF due to reduced returns of capital from existing LP investments and an acceleration/increase in capital calls (drawing down existing capital commitments).
- The degree to which public equity values (and other affected asset classes with embedded equity beta) recover and when.

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Consequences continued ….

Could SERS avoid selling public equity at prices 17% lower in the year following a 10th percentile event? How might that be done?

For the purposes of this exercise, assume that in a 10th percentile decline that:

1. Net CF from the fund increases by 20% as returns of capital decline and capital calls rise.
2. The decline in SERS public equity asset value equals 75% of the total $3.5 billion one year fund decline, or $2.6 billion.
3. Contributions do not change.
4. Fixed income and cash values remain unchanged (do not decline with public equity).
5. There are no sales or liquidations of private equity, real estate or multi-strategy investments.
6. Negative CF deficit is first filled by cash until exhausted then fixed income.
7. The SERS Board is only willing to liquidate fixed income to fill net negative CF needs up to the point where the ratio of public equity and fixed income equals the ratio in the current portfolio.

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Consequences continued ……

The simple math for the year following the 10th percentile event:

1.	Public equity market value	$12,971,686,011	(-17%)
2.	Cash market value	$648,770,391	(No change)
3.	Fixed income market value	$4,511,397,259	(No change)
4.	Net CF deficit	-$1,636,560,000	
5.	Cash exhausted first	+648,770,391	
6.	Maximum amount of FI available for liquidation*	+$763,091,529	
	Difference between #4, #5 and #6	-$224,698,080	

*Fixed Income threshold calculated using the current allocation of Global Public Equity to Fixed Income ratio. Market values are as of 9/30/2017.

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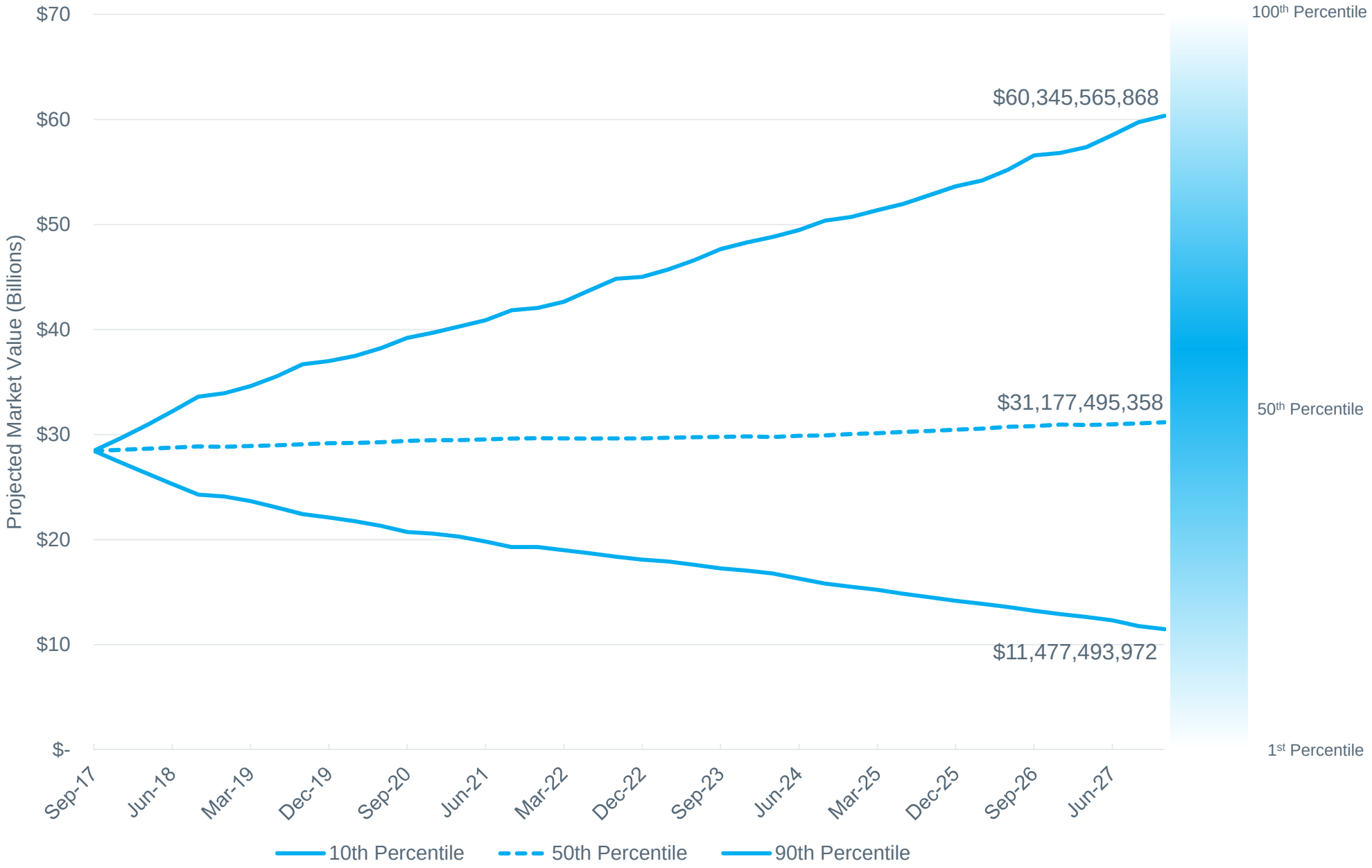
Appendix – Long-Term Stress Analysis

SERS MV Projection (Nominal Terms) - Current Allocation



Assumes negative quarterly cash flows of $420,000,000.

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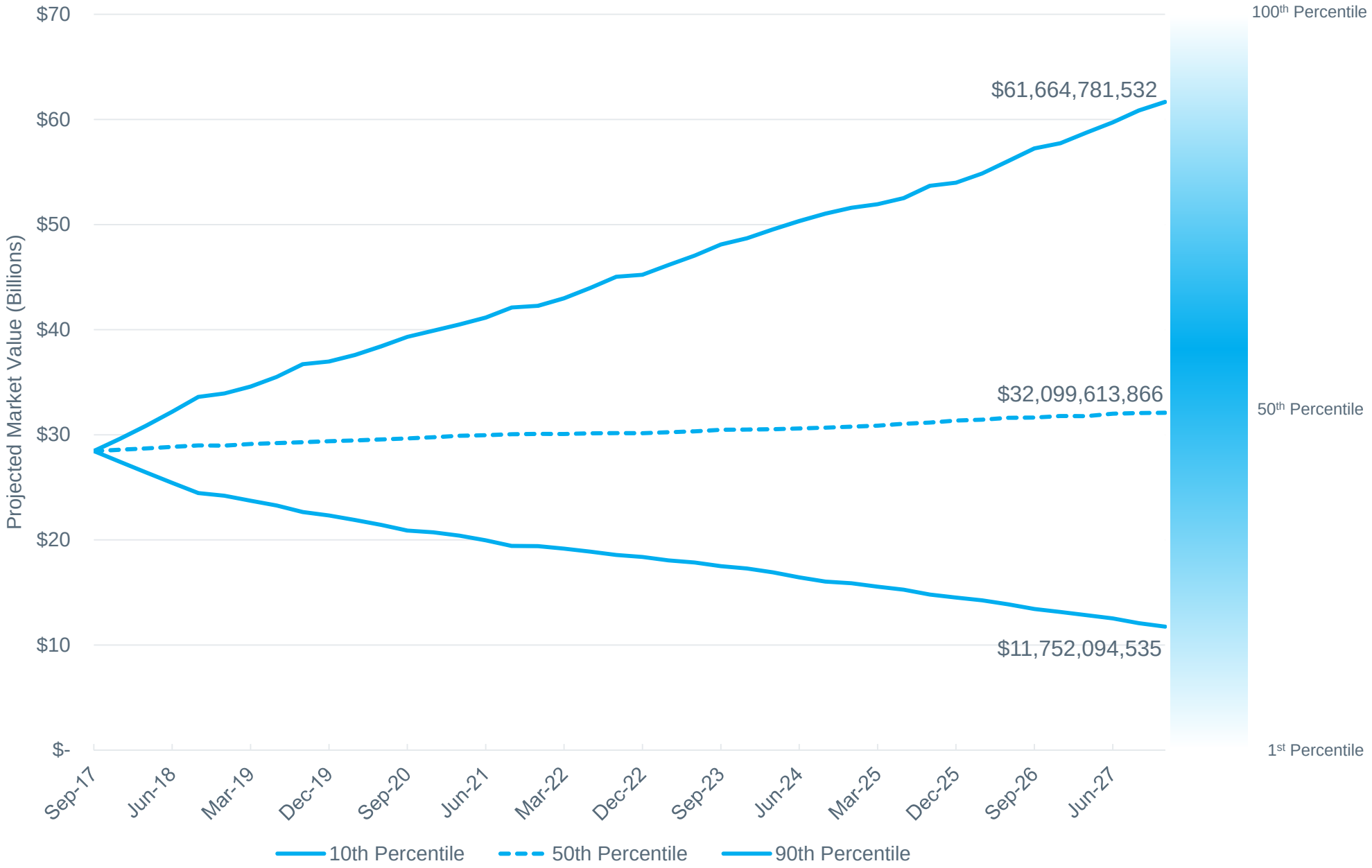
SERS MV Projection (Nominal Terms) - Potential Strategic Target



Assumes negative quarterly cash flows of $420,000,000.

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