

May 5, 2015



Asset/Liability Results

Kentucky Retirement Systems



Asset/Liability Studies

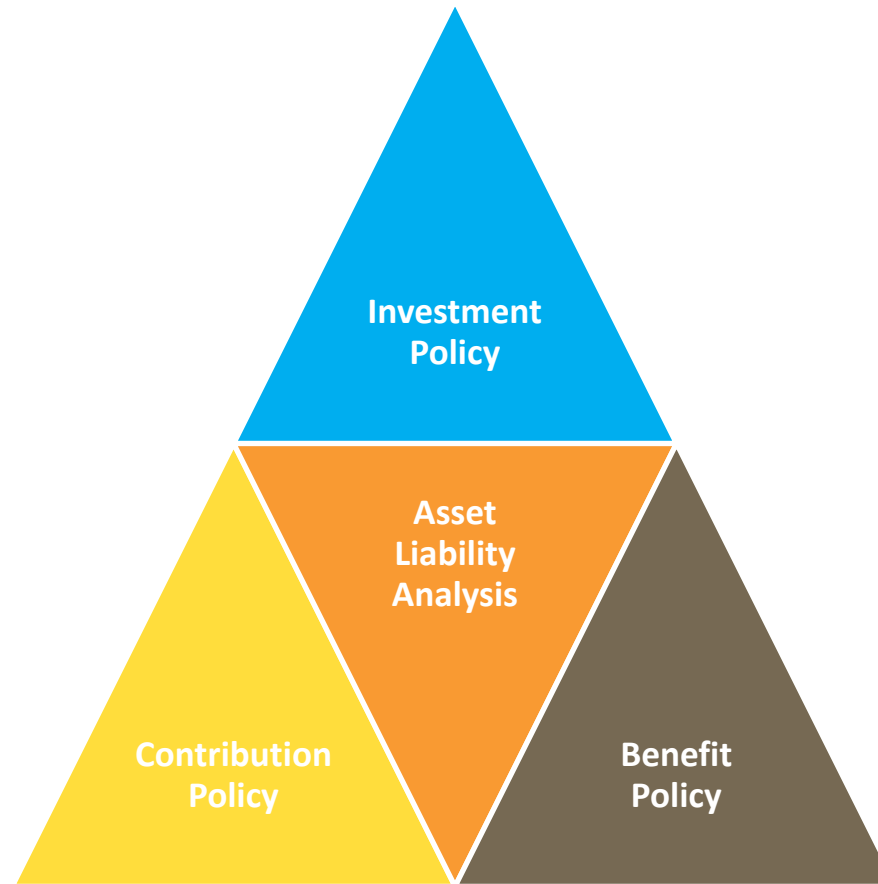
Introduction

- This presentation outlines the key findings from the following Asset/Liability studies:
 - KERS Non-Hazardous Pension Plan
 - KERS Hazardous Pension Plan
 - CERS Non-Hazardous Pension Plan
 - CERS Hazardous Pension Plan
 - State Police Pension Plan
- This presentation is only a partial summary of the full Asset/Liability Studies submitted to KRS.
 - The complete versions of these studies contain important background information and caveats important to a complete understanding of the issues addressed.

Asset/Liability Studies

What are they?

- Asset/Liability Studies are the only standard analysis that fully link all three aspects of a Plan's key financial drivers – Investment Policy, Contribution Policy, and Benefit Policy



Asset/Liability Studies

What are they?

- Asset/Liability Studies are...
 - A tool to examine how well differing asset allocations address the objectives served by the funds – the funds’ “liabilities”
 - A “guidepost” for the target asset allocation of the funds
 - Gold standard for assessing the health of a pension plans

Asset/Liability Studies

What are they?

- Asset/Liability Studies are not...
 - An actuarial study
 - Purview of the Plan's actuary
 - A prescription for plan benefits
 - Purview of the elected representatives
 - An assessment of the affordability of contribution levels
 - Purview of the elected officials and their constituents
 - An implementation plan for specific asset classes
 - The sole determinant of the final asset allocation adopted by a fund

Asset/Liability Studies

What are the objectives?

- Objectives of Asset/Liability Studies
 - To present projected valuation results of the Plans with respect to the funded status of the Plans, including minimum required contributions, but particularly in the context of current and alternative expected long-term fund returns
 - To present projected benefit payments of the Plans, but particularly in the context of current expected and alternative long-term fund returns
 - To estimate liquidity demands on the Plans' assets in the context of current expected and alternative long-term fund returns
 - To investigate asset allocation mixes to determine those which best serve to protect or increase funding levels, while providing adequate liquidity for benefit payments and minimizing associated risks

Asset/Liability Studies

What do they consist of?

- Deterministic Forecast
 - Provides an analysis of Plan assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions
- Stochastic Forecast
 - Analyzes Plan assets, liabilities, funded status, and benefit payments under many capital market environments based on expected asset returns, inflation, and their expected volatility
 - Answers questions about the best/worst case outcomes along with the probability of such outcomes

Asset/Liability Studies in Practice...

- Begin with a forecast of the financial liabilities (i.e., benefit obligations)
- Include a baseline estimation of the financial contributions to the Plan over time
- Compare alternative investment strategies (i.e., total fund asset allocations to the Plan's financial needs)
- Draw conclusions regarding how well various investment strategies satisfy the Plans' financial needs

These Asset/Liability Studies...

- Use data from the June 30, 2014 Actuarial Valuations.
- Use the Actuarial Cost Method described in the June 30, 2014 Actuarial Valuations, and the actuarial assumptions from the KRS Experience Study July 1, 2008 to June 30, 2013
- Compare six specific investment strategies for discussion (outlined later)
- Assume the Plans' current benefit policy does not change throughout the entire projection period
- Does not assume any actuarial adjustments that may take place in future years.
- **Assumes the current contribution policy**

Asset/Liability Studies

Deterministic Analysis

- Uses the same assumptions as the Plans' actuary to project the future status of the Plans assuming no uncertainty
- Deterministic's virtues are that it is simple and that the findings reflect what will happen if the future turns out to be precisely as forecasted—no better, but also no worse
- It is useful for gauging the general direction of change and associated consequences
- It also allows for sensitivity analysis such as assuming lower returns or higher contributions

Asset/Liability Studies

Stochastic Analysis

- Introduces uncertainty to the projections...
 - Future rates of return and inflation based on RVK's most recent capital market assumptions
- Analyzes most likely outcomes based on Monte Carlo simulation as well as the likelihood and severity of worst case and best case outcomes
- Focuses on funding ratios, payout ratios, and contributions
- Analyzes probability of full funding and insolvency in 20 years
- Stochastic analysis is more complex but also more realistic and offers insights into the range of potential outcomes

Asset/Liability Studies

Stochastic Analysis

- A wide range of investment portfolios is tested because at the heart of the Plan's situation is a simple question that is difficult to answer: whether the Plans are better off following a strategy that:
 - (A) Falls in the general category of higher prospective return with greater risk (i.e. potential for more widely varying outcomes – good or bad), or
 - (B) Falls in the general category of lower prospective return with concomitantly lower risk (i.e. a tighter band of likely outcomes).

Asset/Liability Studies

Stochastic Analysis

- Essential to answering this question is to ask precisely how the Plans' broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plans are "better off" under one approach versus another are:
 1. The effect on funding ratio (and thus on contribution rates which decline with higher funding ratios).
 2. The effect on Plan liquidity (i.e. the Plans' ability to pay annual benefits without major disruption of their strategic asset allocations, the driver of their investment strategies).
 3. The effect on the trend line and stability of annual contributions.
 4. The risk of large, sudden, and highly disruptive short-term declines in the Plans' assets over the course of time and the associated effects on contributions and potentially investment decisions.

Asset/Liability Studies

Stochastic Analysis – Portfolios Tested

Asset Class	Current Target	Conservative Portfolio	Potential Portfolio 1	Potential Portfolio 2	Potential Portfolio 3	Aggressive Portfolio
Global Equity	43%	0%	30%	53%	67%	75%
Int. Duration Fixed Income	10%	100%	20%	6%	2%	0%
Custom KRS Fixed Income	10%	0%	8%	6%	2%	0%
Core Real Estate	5%	0%	10%	5%	5%	0%
Diversified Hedge Funds	10%	0%	10%	10%	5%	0%
Private Equity	10%	0%	10%	10%	15%	25%
Diversified Inflation Strategies	10%	0%	10%	8%	2%	0%
Cash Equivalents	2%	0%	2%	2%	2%	0%
Total Equity	53%	0%	40%	63%	82%	100%
Expected Return	6.93%	3.50%	6.49%	7.23%	7.81%	8.47%
Expected Risk	12.83%	6.00%	10.67%	14.06%	16.48%	19.27%
RVK Liquidity Metric	69	85	66	70	71	69

CERS Non-Hazardous Pension Plan



CERS Non-Hazardous Pension Plan

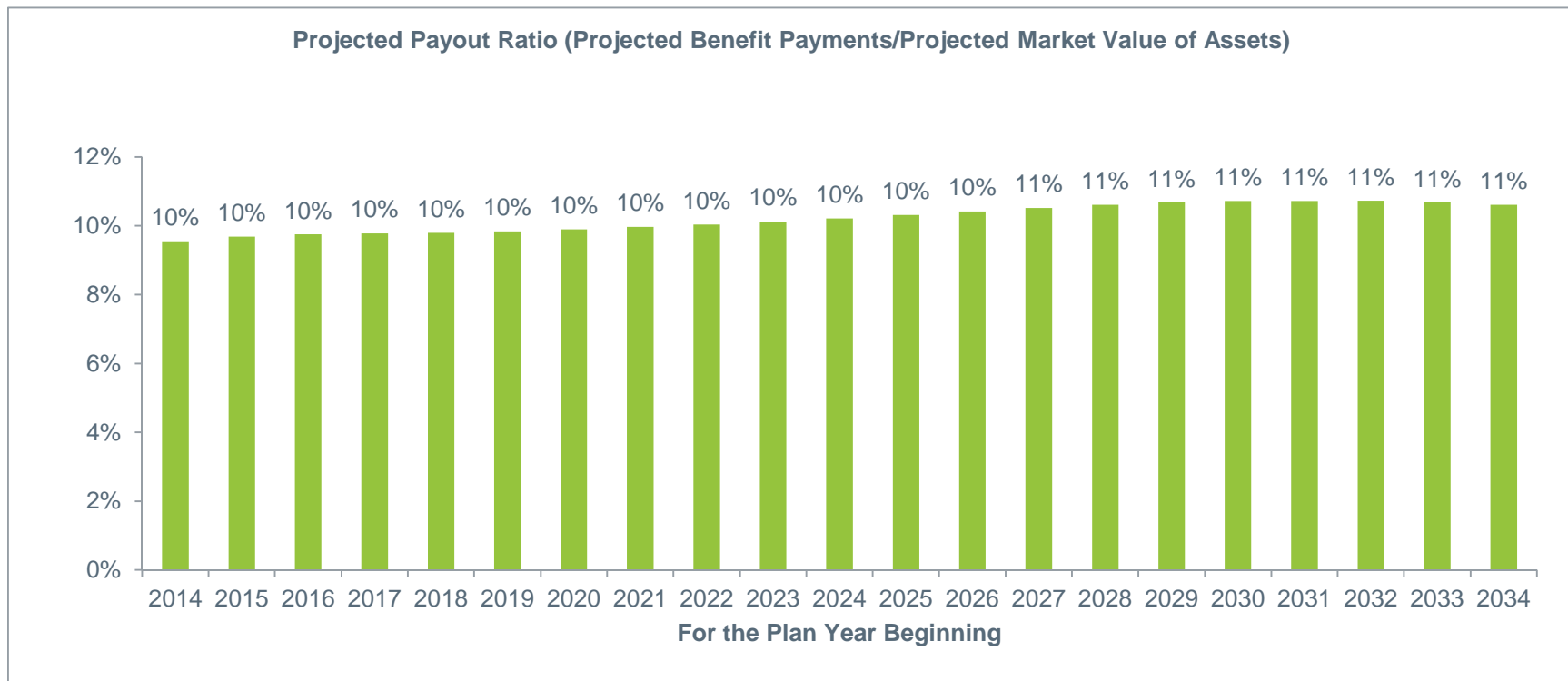
Deterministic Summary Results

	Current (June 30, 2014)	Projected Year 20 (Deterministic)
Actuarial Accrued Liability	\$9.8 billion	\$15.1 billion
Market value of Assets	\$6.5 billion	\$11.8 billion
Deficit	\$3.7 billion	\$3.3 billion
Market Value Funded Ratio	67%	78%
Payout Ratio	10%	11%
Annual Contribution	\$403 million	\$737 million

CERS Non-Hazardous Pension Plan

Deterministic Summary Results

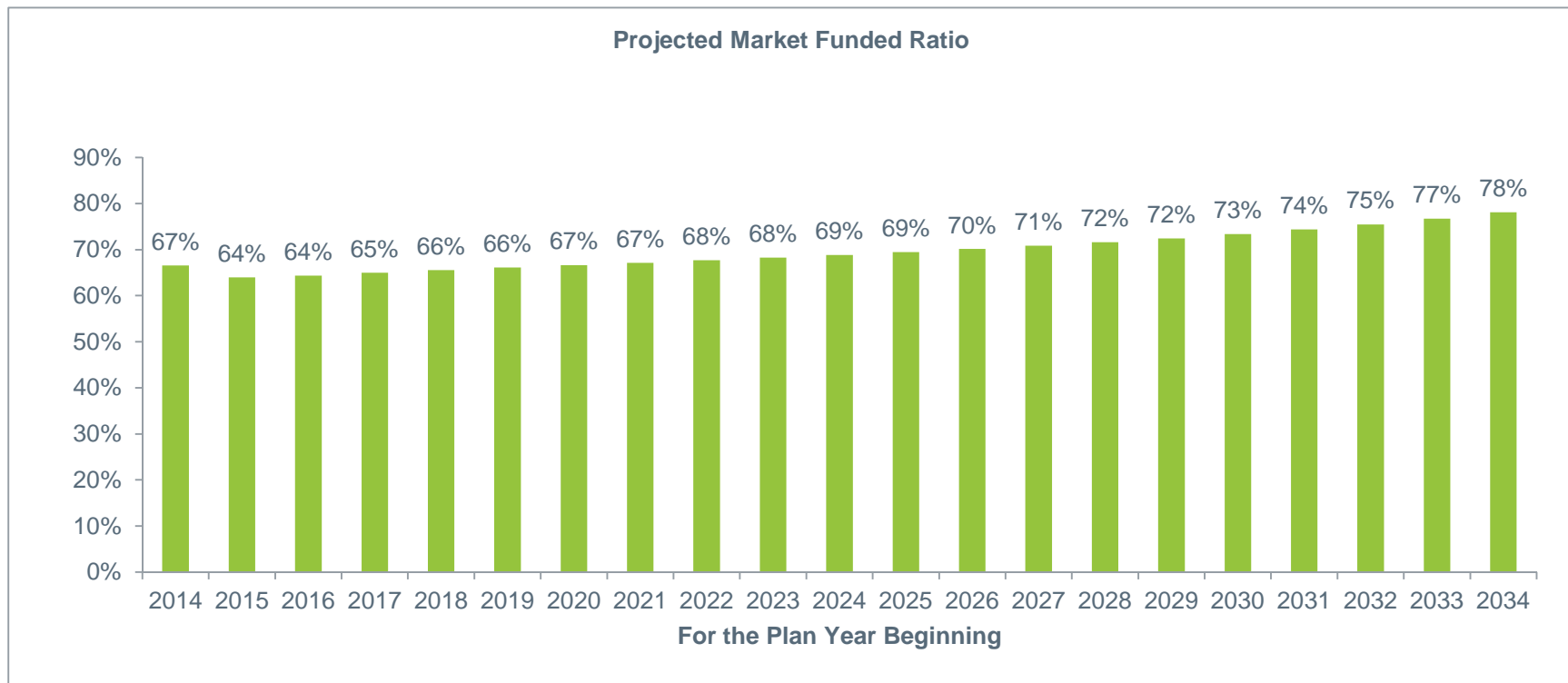
- The payout ratio is healthy and not materially increasing



CERS Non-Hazardous Pension Plan

Deterministic Summary Results

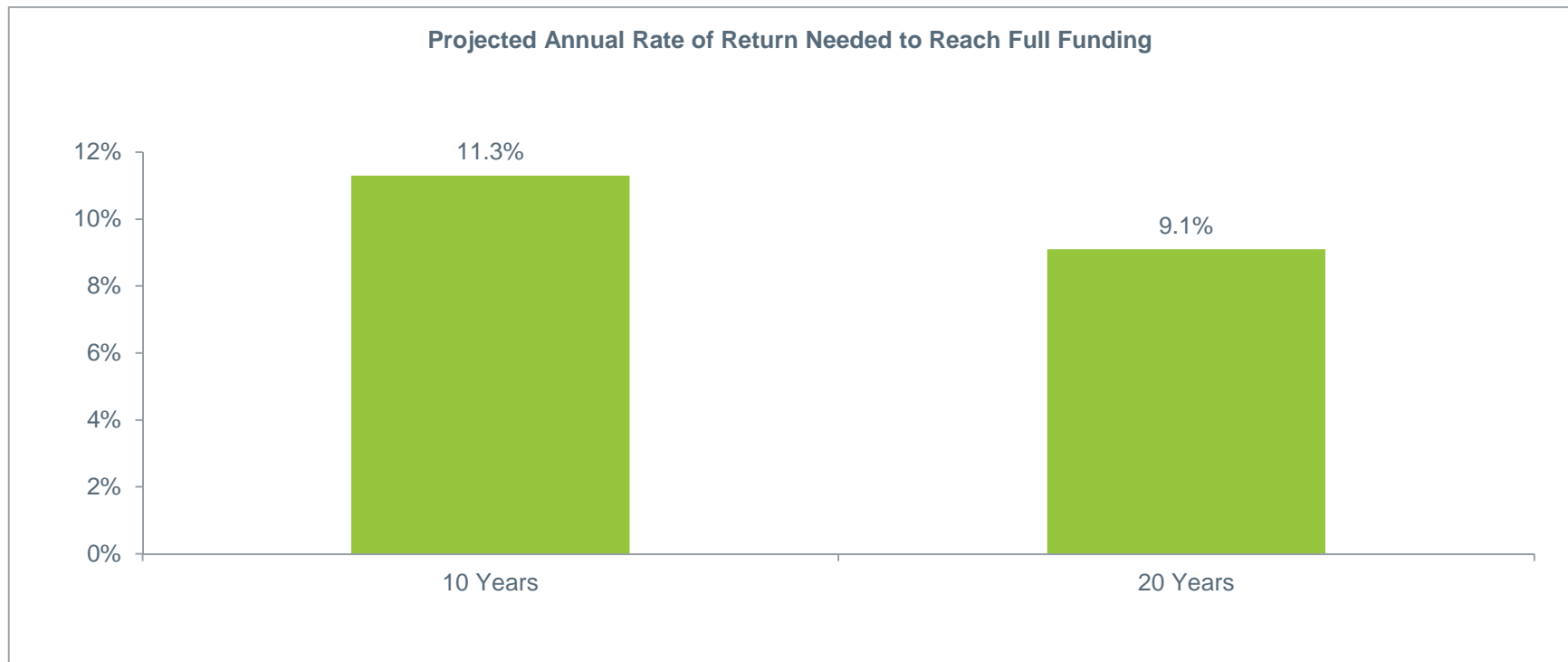
- The funded ratio will likely improve over time



CERS Non-Hazardous Pension Plan

Deterministic Summary Results

- Investing out the current situation is not a reasonable expectation



CERS Non-Hazardous Pension Plan

Deterministic Summary Results

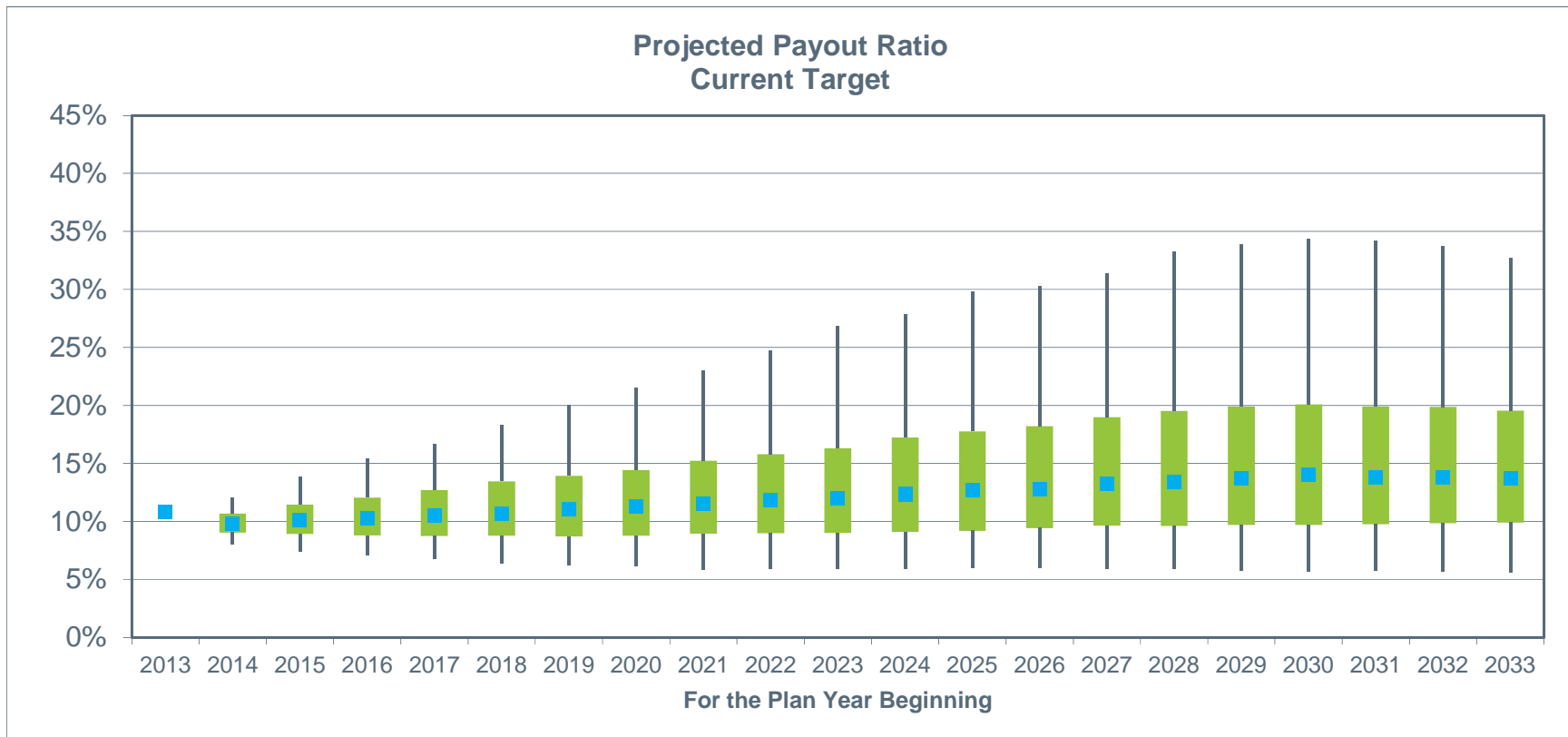
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

	Value in 2034			
	Actuarially Assumed Rate of Return	Reduced Return (100 bps)	Impact of Reduced Return	
Projected Payout Ratio	11%	12%	2%	▲
Projected Employer Contributions (millions)	\$520	\$695	\$175	▲
Projected Benefit Payments/Projected Total Contributions	169%	137%	-33%	▼
Projected Actuarial Accrued Liabilities (billions)	\$15.1	\$15.0	(\$0.1)	▼
Projected Market Value of Assets (billions)	\$11.8	\$10.0	(\$1.8)	▼
Projected Deficit (billions)	\$3.3	\$5.0	\$1.7	▲
Projected Market Funded Ratio	78%	67%	-11%	▼
20 Year Cumulative Total				
Projected Cumulative Employer Contributions (billions)	\$8.2	\$9.4	\$1.2	▲

CERS Non-Hazardous Pension Plan

Stochastic Summary Results

- Peak payout ratios remain unrestrictive



CERS Non-Hazardous Pension Plan

Stochastic Summary Results

- There is some probability of full funding in 20 years
- There is a significant chance of being better off in 20 year than today
- There is some probability of falling below 40%
- Potential Portfolios 2 and 3 appear superior to the Current Target

20 Years	Probability of Full Funding in 2034	Probability of < 67% (Current) Funding in 2034	Probability of < 40% (Current) Funding in 2034	Maximum 1 Year Investment Loss	Maximum 1 Year Employer Contribution
Current Target	16%	58%	20%	-38%	36%
Conservative Portfolio	0%	97%	42%	-22%	38%
Potential Portfolio 1	10%	64%	21%	-32%	36%
Potential Portfolio 2	19%	56%	20%	-41%	36%
Potential Portfolio 3	26%	51%	20%	-46%	36%
Aggressive Portfolio	32%	48%	21%	-51%	36%

CERS Non-Hazardous Pension Plan

Stochastic Summary Results

- Improvement is possible but not guaranteed
- The ultra-conservative portfolio is likely to end the projection period far worse off than today and with the highest contributions and payout ratios
- A diversified return seeking portfolio maximizes outcomes

20 Years	Market Funded Ratio in Year 20			Cumulative Employer Contributions in Year 20 (Billions)			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20	2014-2034	
							Median	Peak	Trough
Current Target	61%	27%	144%	\$10	\$14	\$3	14%	34%	6%
Conservative Portfolio	42%	26%	63%	\$12	\$14	\$10	20%	35%	9%
Potential Portfolio 1	57%	28%	118%	\$10	\$14	\$4	14%	32%	7%
Potential Portfolio 2	62%	26%	163%	\$10	\$14	\$3	13%	35%	5%
Potential Portfolio 3	66%	25%	205%	\$9	\$14	\$2	13%	38%	4%
Aggressive Portfolio	70%	24%	281%	\$9	\$15	\$2	12%	41%	3%

CERS Non-Hazardous Pension Plan

Conclusions

- Continued diversification of Plan assets is desirable and should be the focus
 - Avoiding large market declines while generating near the assumed rate of return maximizes outcomes
- Liquidity does not appear to be a concern during the projection period

CERS Hazardous Pension Plan



CERS Hazardous Pension Plan

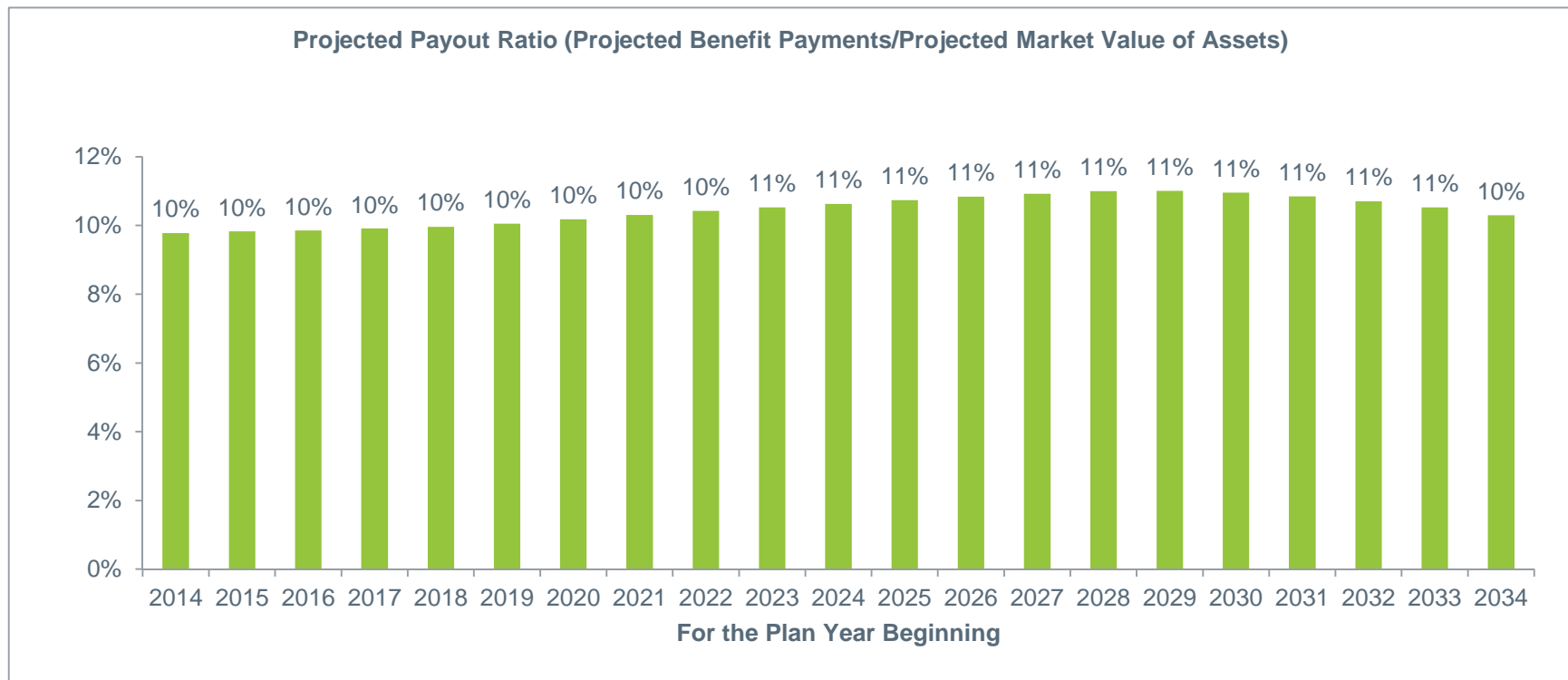
Deterministic Summary Results

	Current (June 30, 2014)	Projected Year 20 (Deterministic)
Actuarial Accrued Liability	\$3.3 billion	\$5.1 billion
Market value of Assets	\$2.1 billion	\$3.9 billion
Deficit	\$1.2 billion	\$1.2 billion
Market Value Funded Ratio	60%	77%
Payout Ratio	10%	10%
Annual Contribution	\$137 million	\$261 million

CERS Hazardous Pension Plan

Deterministic Summary Results

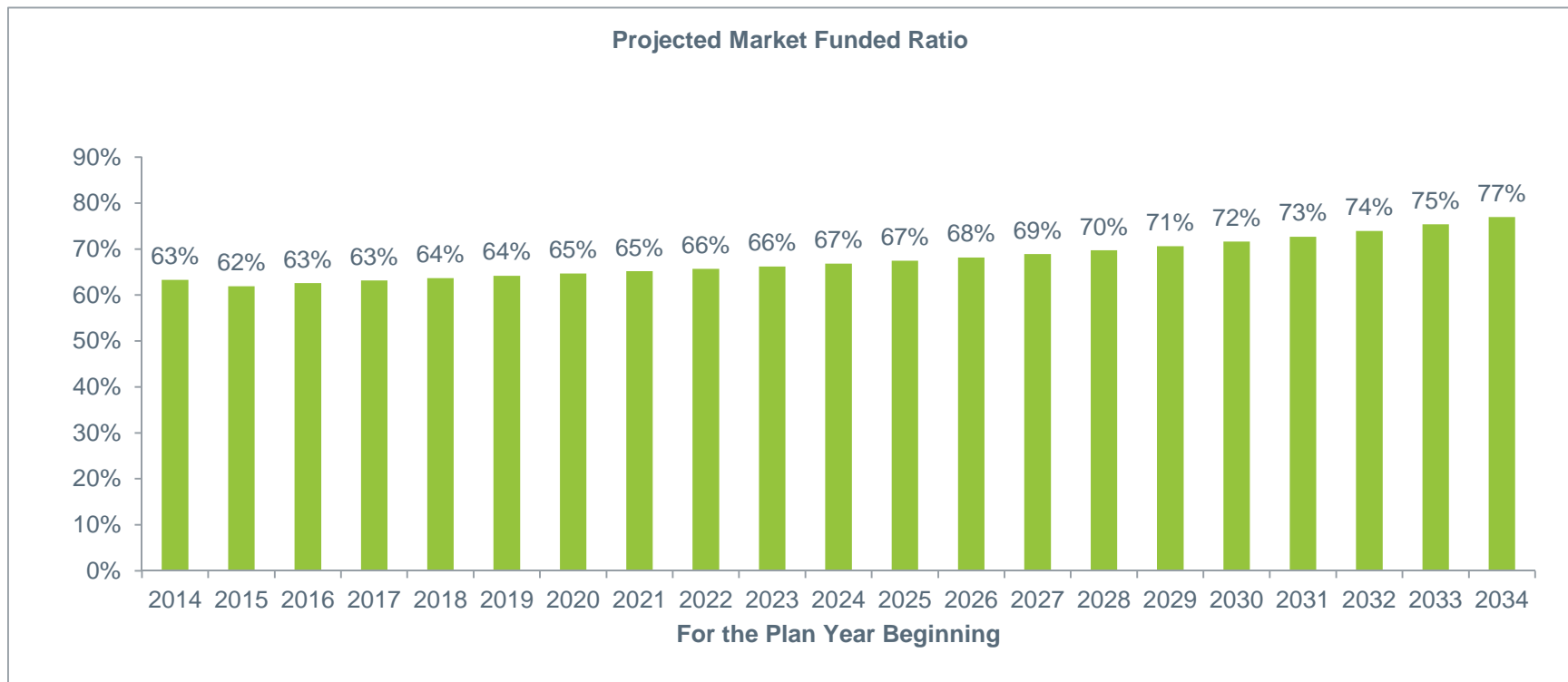
- The payout ratio is healthy and not materially increasing



CERS Hazardous Pension Plan

Deterministic Summary Results

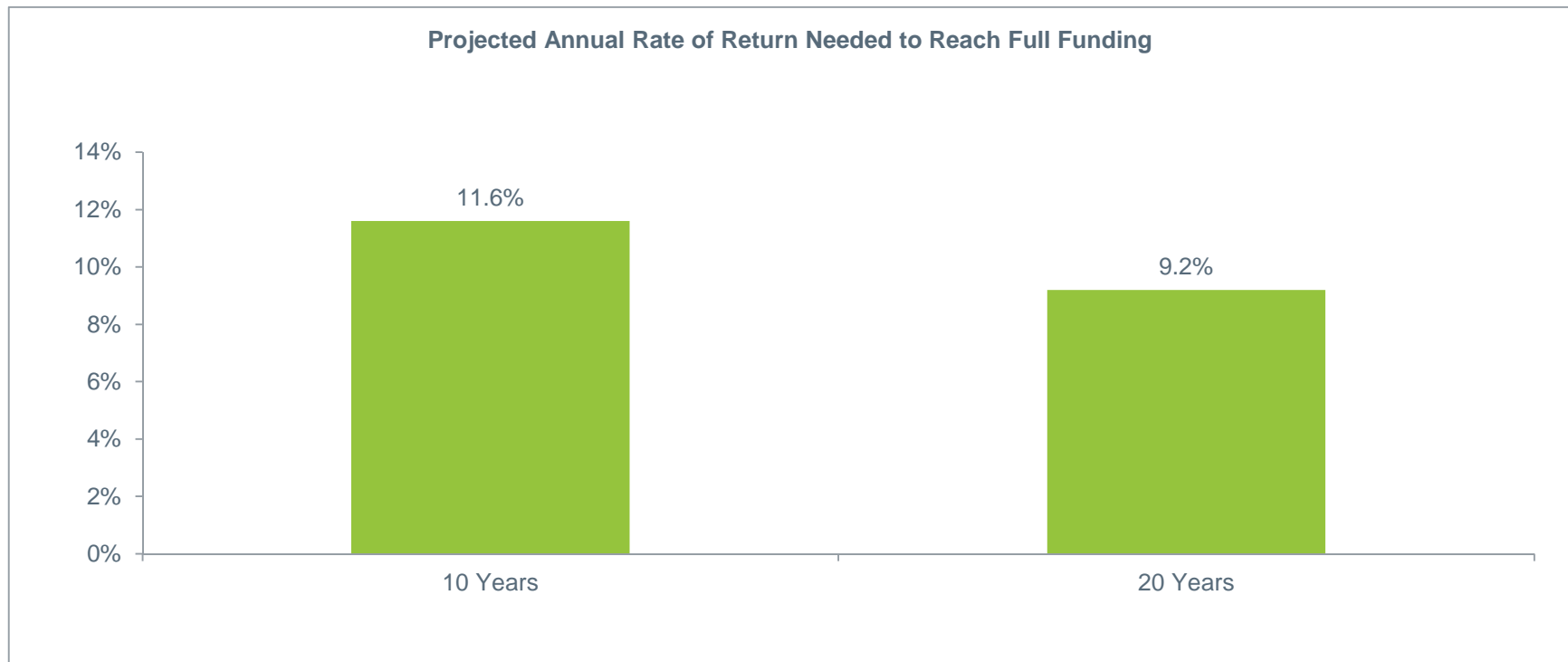
- The funded ratio will likely improve over time



CERS Hazardous Pension Plan

Deterministic Summary Results

- Investing out the current situation is not a reasonable expectation



CERS Hazardous Pension Plan

Deterministic Summary Results

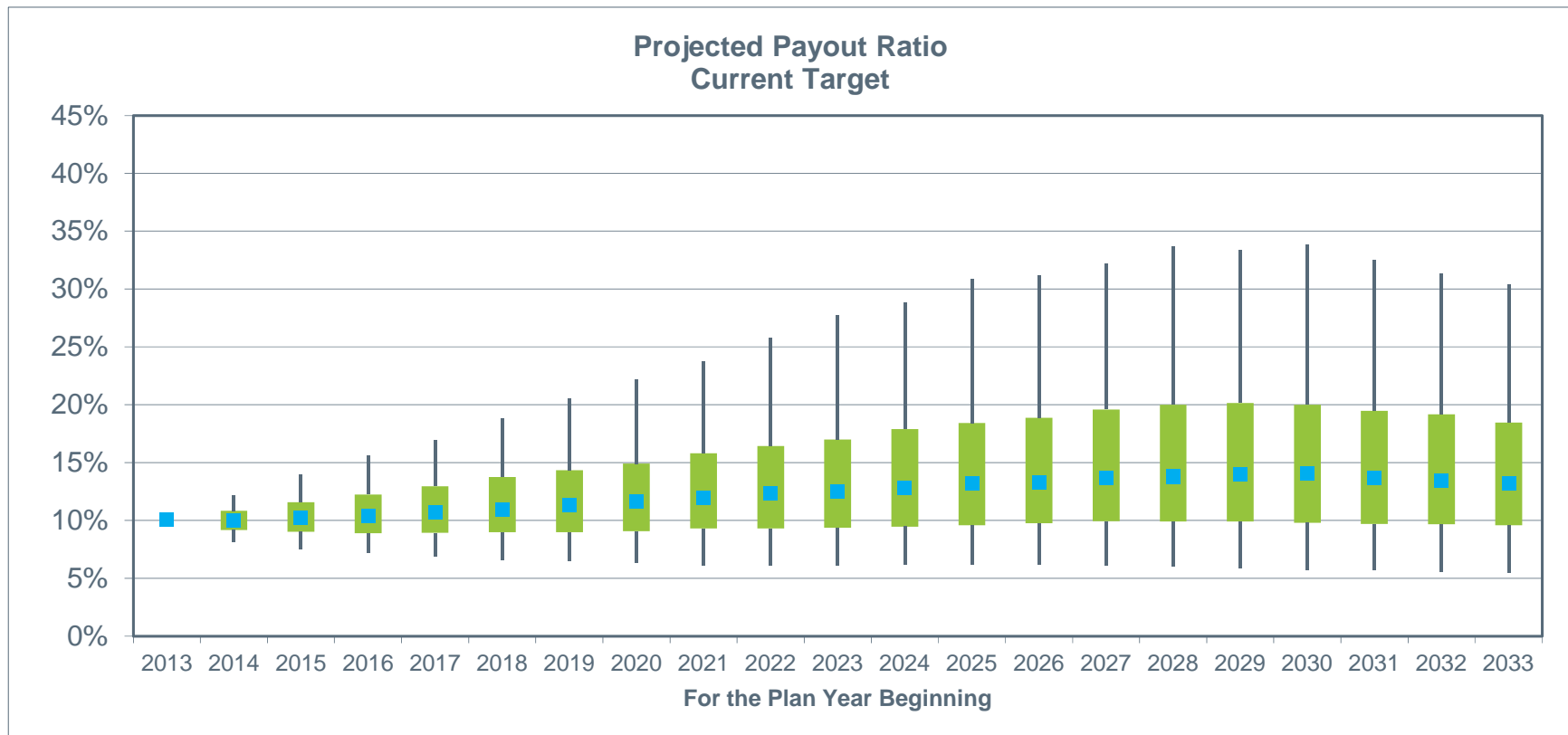
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

	Value in 2034			
	Actuarially Assumed Rate of Return	Reduced Return (100 bps)	Impact of Reduced Return	
Projected Payout Ratio	10%	12%	2%	▲
Projected Employer Contributions (millions)	\$184	\$240	\$56	▲
Projected Benefit Payments/Projected Total Contributions	154%	126%	-27%	▼
Projected Actuarial Accrued Liabilities (billions)	\$5.1	\$5.1	(\$0.0)	▼
Projected Market Value of Assets (billions)	\$3.9	\$3.3	(\$0.6)	▼
Projected Deficit (billions)	\$1.2	\$1.7	\$0.5	▲
Projected Market Funded Ratio	77%	66%	-11%	▼
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (billions)	\$2.7	\$3.1	\$0.4	▲

CERS Hazardous Pension Plan

Stochastic Summary Results

- Peak payout ratios remain unrestrictive



CERS Hazardous Pension Plan

Stochastic Summary Results

- There is some probability of full funding in 20 years
- There is a significant chance of being better off in 20 year than today
- There is some probability of falling below 40%
- Potential Portfolios 2 and 3 appear superior to the Current Target

20 Years	Probability of Full Funding in 2034	Probability of < 63% (Current) Funding in 2034	Probability of < 40% (Current) Funding in 2034	Maximum 1 Year Investment Loss	Maximum 1 Year Employer Contribution
Current Target	15%	54%	20%	-38%	55%
Conservative Portfolio	0%	95%	40%	-22%	58%
Potential Portfolio 1	10%	59%	20%	-32%	55%
Potential Portfolio 2	19%	51%	19%	-41%	55%
Potential Portfolio 3	25%	48%	20%	-46%	55%
Aggressive Portfolio	31%	44%	21%	-51%	56%

CERS Hazardous Pension Plan

Stochastic Summary Results

- Improvement is possible but not guaranteed
- The ultra-conservative portfolio is likely to end the projection period far worse off than today and with the highest contributions and payout ratios
- A diversified return seeking portfolio maximizes outcomes

20 Years	Market Funded Ratio in Year 20			Cumulative Employer Contributions in Year 20 (Millions)			Payout Ratios		
	50th	5th	95th	Contributions in Year 20 (Millions)			Year 20 Median	2014-2034	
				50th	5th	95th		Peak	Trough
Current Target	60%	28%	142%	\$3,278	\$4,624	\$1,055	13%	34%	5%
Conservative Portfolio	43%	27%	63%	\$4,046	\$4,578	\$3,268	19%	34%	9%
Potential Portfolio 1	58%	29%	118%	\$3,386	\$4,523	\$1,433	14%	32%	7%
Potential Portfolio 2	62%	27%	161%	\$3,210	\$4,676	\$904	13%	35%	5%
Potential Portfolio 3	66%	26%	199%	\$3,090	\$4,781	\$742	12%	38%	4%
Aggressive Portfolio	69%	25%	271%	\$2,935	\$4,870	\$599	11%	42%	3%

CERS Hazardous Pension Plan

Conclusions

- Continued diversification of Plan assets is desirable and should be the focus
 - Avoiding large market declines while generating near the assumed rate of return maximizes outcomes
- Liquidity does not appear to be a concern during the projection period

KERS Hazardous Pension Plan



KERS Hazardous Pension Plan

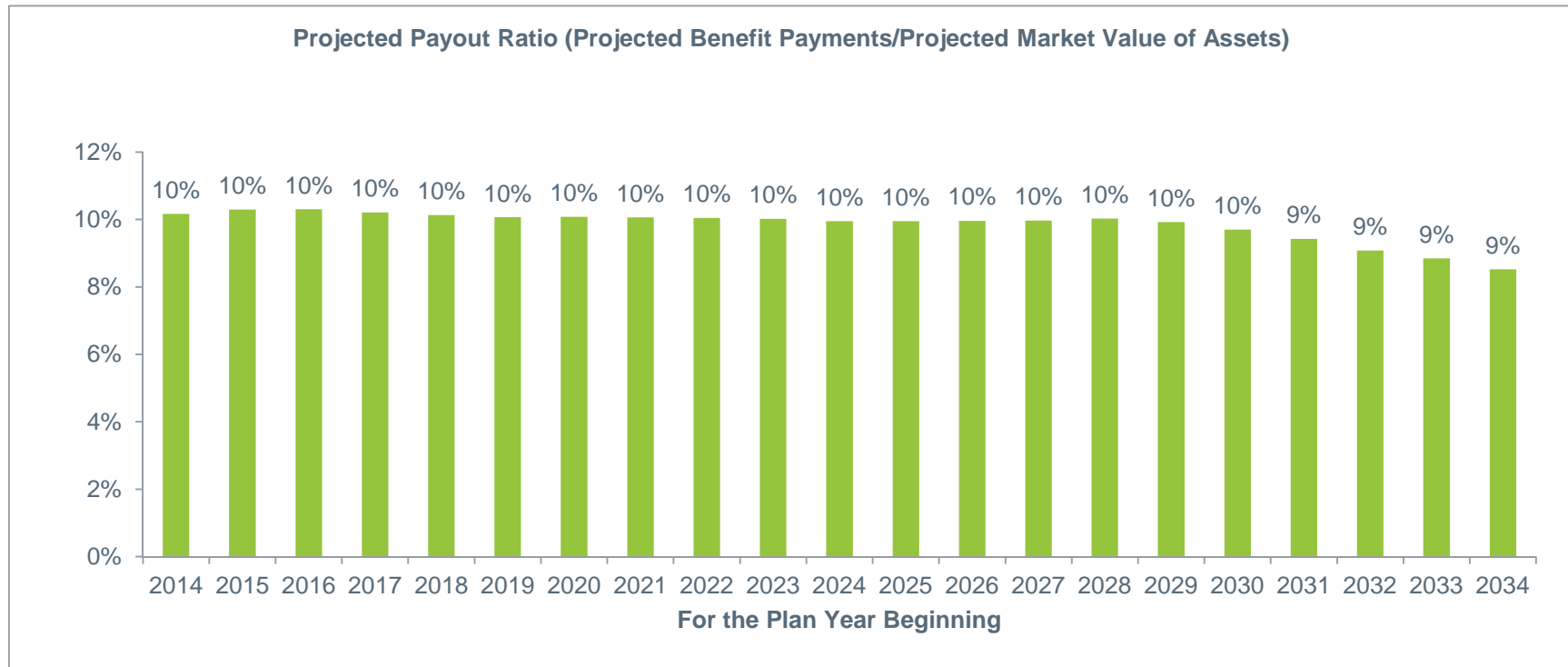
Deterministic Summary Results

	Current (June 30, 2014)	Projected Year 20 (Deterministic)
Actuarial Accrued Liability	\$817 million	\$1,418 million
Market value of Assets	\$560 million	\$1,152 million
Deficit	\$257 million	\$265 million
Market Value Funded Ratio	68%	81%
Payout Ratio	10%	9%
Annual Contribution	\$31 million	\$70 million

KERS Hazardous Pension Plan

Deterministic Summary Results

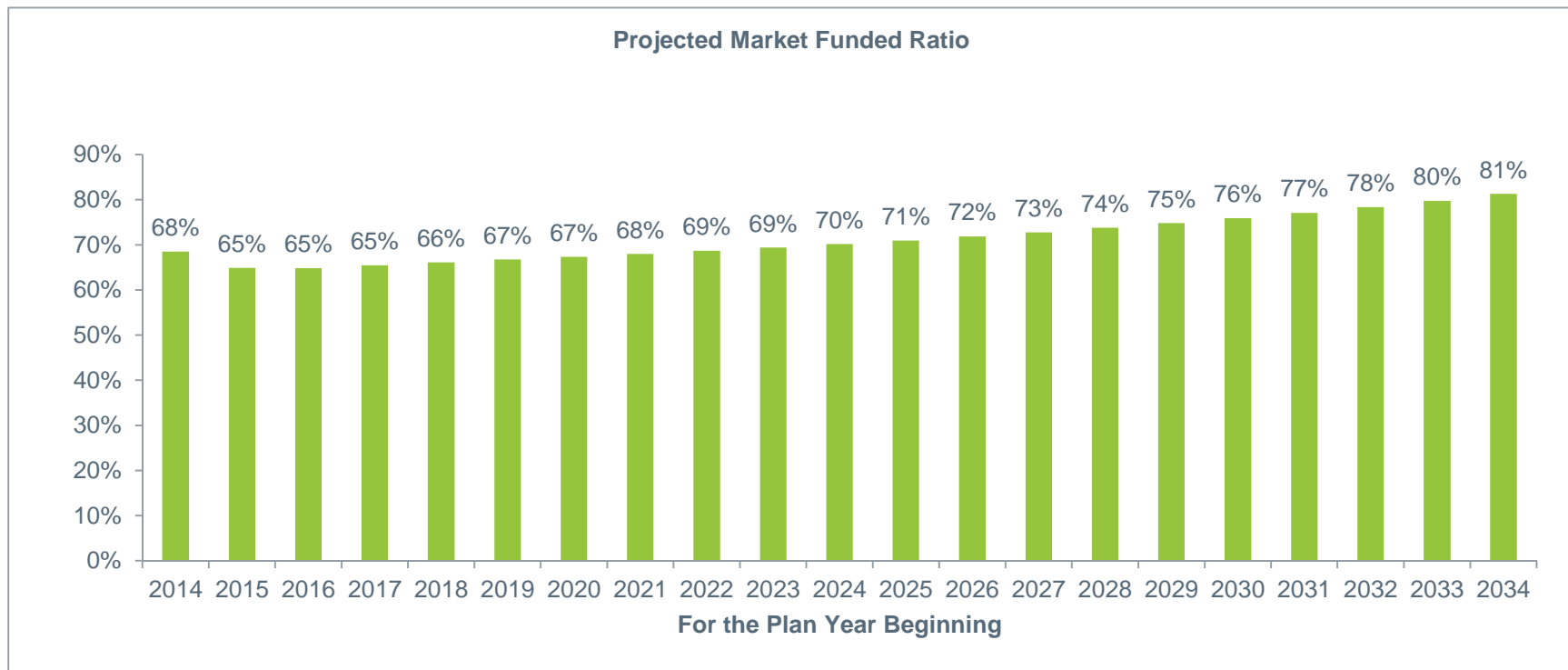
- The payout ratio is healthy and slowly declining



KERS Hazardous Pension Plan

Deterministic Summary Results

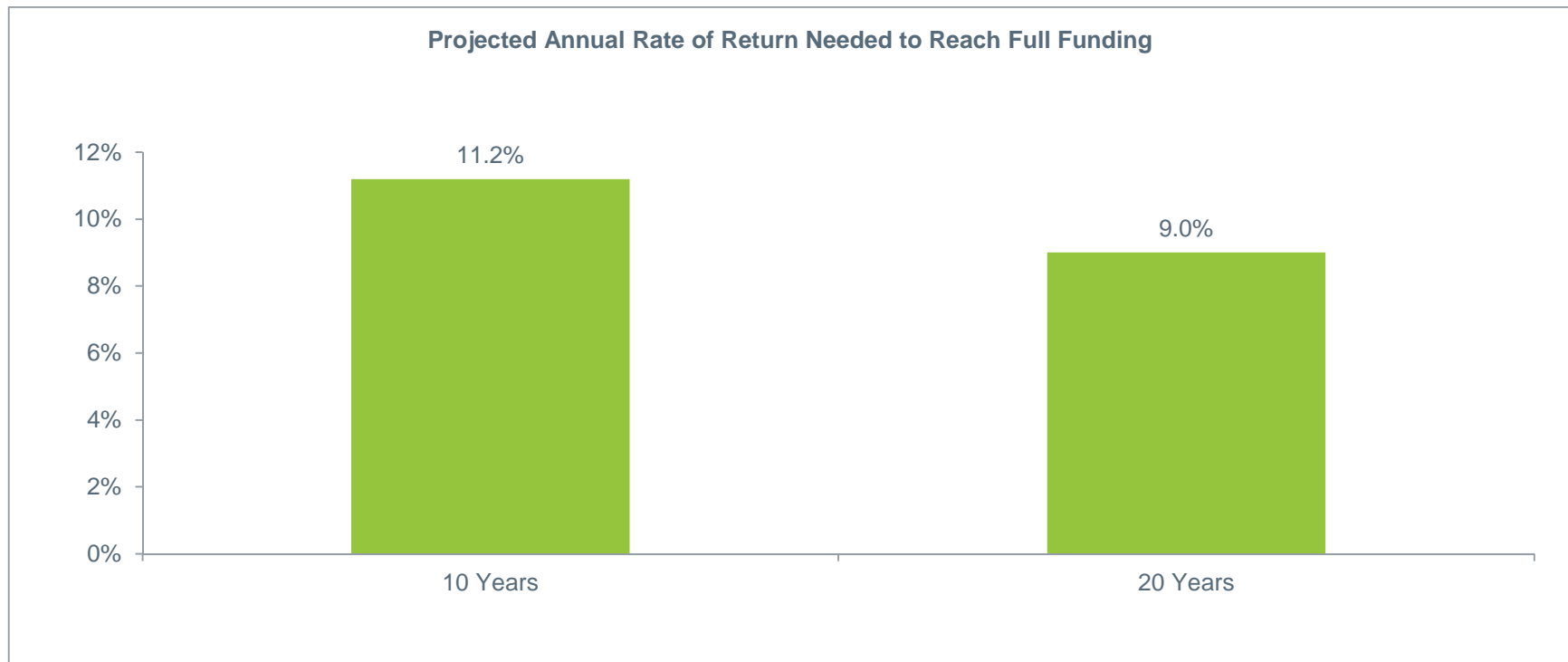
- The funded ratio will likely improve over time



KERS Hazardous Pension Plan

Deterministic Summary Results

- Investing out the current situation is not a reasonable expectation



KERS Hazardous Pension Plan

Deterministic Summary Results

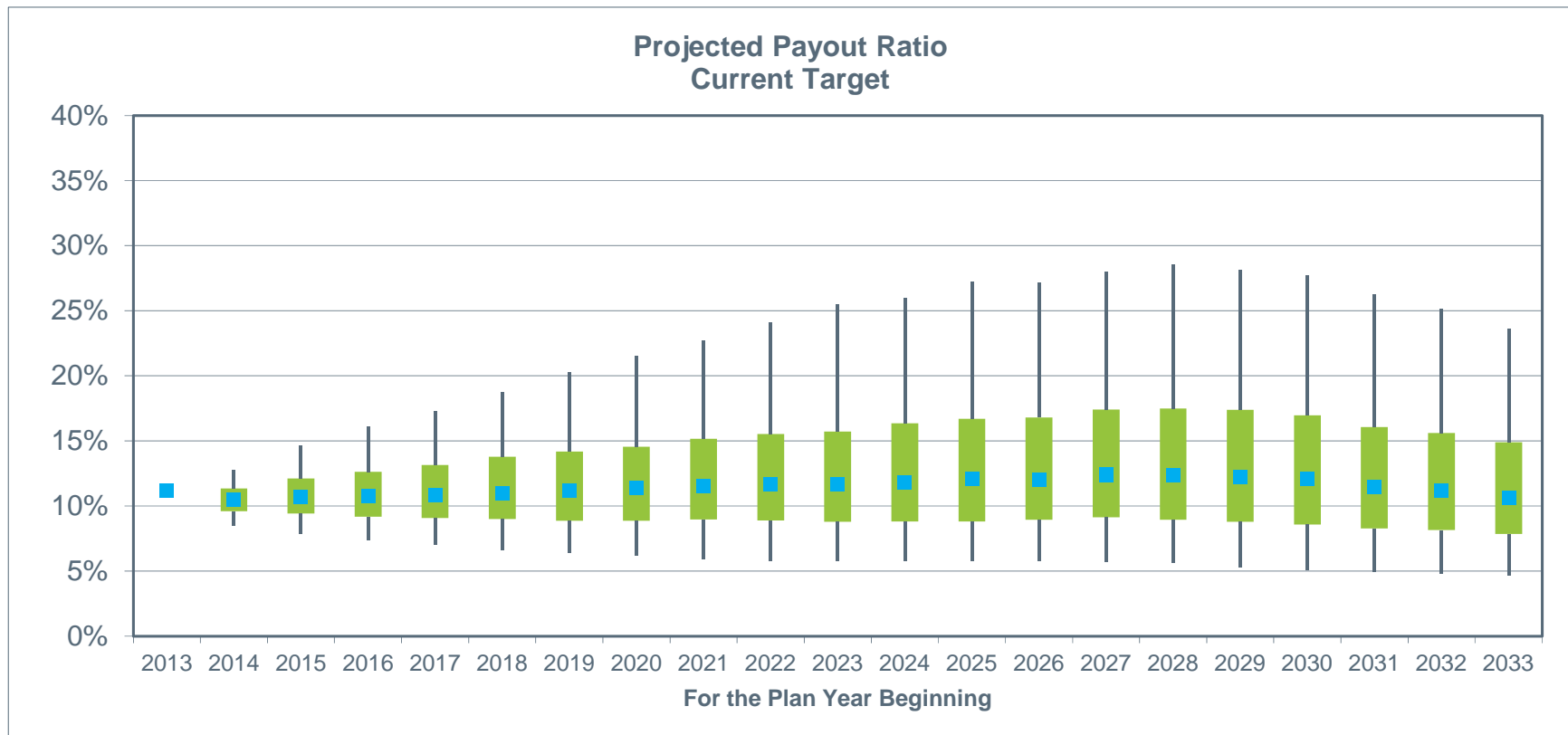
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

	Value in 2034			
	Actuarially Assumed Rate of Return	Reduced Return (100 bps)	Impact of Reduced Return	
Projected Payout Ratio	9%	10%	1%	▲
Projected Employer Contributions (millions)	\$47	\$62	\$15	▲
Projected Benefit Payments/Projected Total Contributions	140%	115%	-25%	▼
Projected Actuarial Accrued Liabilities (millions)	\$1,418	\$1,412	(\$6)	▼
Projected Market Value of Assets (millions)	\$1,152	\$996	(\$156)	▼
Projected Deficit (millions)	\$265	\$416	\$150	▲
Projected Market Funded Ratio	81%	71%	-11%	▼
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (millions)	\$722	\$825	\$104	▲

KERS Hazardous Pension Plan

Stochastic Summary Results

- Peak payout ratios remain unrestrictive



KERS Hazardous Pension Plan

Stochastic Summary Results

- There is some probability of full funding in 20 years
- There is a significant chance of being better off in 20 year than today
- There is some probability of falling below 40%
- Potential Portfolios 2 and 3 appear superior to the Current Target

20 Years	Probability of Full Funding in 2034	Probability of < 68% (Current) Funding in 2034	Probability of < 40% (Current) Funding in 2034	Maximum 1 Year Investment Loss	Maximum 1 Year Employer Contribution
Current Target	17%	54%	14%	-38%	47%
Conservative Portfolio	0%	95%	24%	-22%	50%
Potential Portfolio 1	11%	59%	13%	-32%	47%
Potential Portfolio 2	21%	51%	14%	-41%	47%
Potential Portfolio 3	27%	48%	15%	-46%	47%
Aggressive Portfolio	33%	45%	16%	-51%	48%

KERS Hazardous Pension Plan

Stochastic Summary Results

- Improvement is possible but not guaranteed
- The ultra-conservative portfolio is likely to end the projection period far worse off than today and with the highest contributions and payout ratios
- A diversified return seeking portfolio maximizes outcomes

20 Years	Market Funded Ratio in Year 20			Cumulative Employer Contributions in Year 20 (Millions)			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20 Median	2014-2034	
								Peak	Trough
Current Target	65%	32%	144%	\$868	\$1,221	\$290	11%	29%	5%
Conservative Portfolio	47%	31%	67%	\$1,072	\$1,219	\$877	15%	28%	10%
Potential Portfolio 1	62%	33%	118%	\$895	\$1,196	\$392	11%	27%	6%
Potential Portfolio 2	67%	31%	162%	\$848	\$1,236	\$247	10%	30%	4%
Potential Portfolio 3	70%	30%	200%	\$817	\$1,258	\$205	10%	32%	3%
Aggressive Portfolio	74%	28%	267%	\$772	\$1,286	\$165	9%	35%	3%

KERS Hazardous Pension Plan

Conclusions

- Continued diversification of Plan assets is desirable and should be the focus
 - Avoiding large market declines while generating near the assumed rate of return maximizes outcomes
- Liquidity does not appear to be a concern during the projection period

State Police Pension Plan



State Police Pension Plan

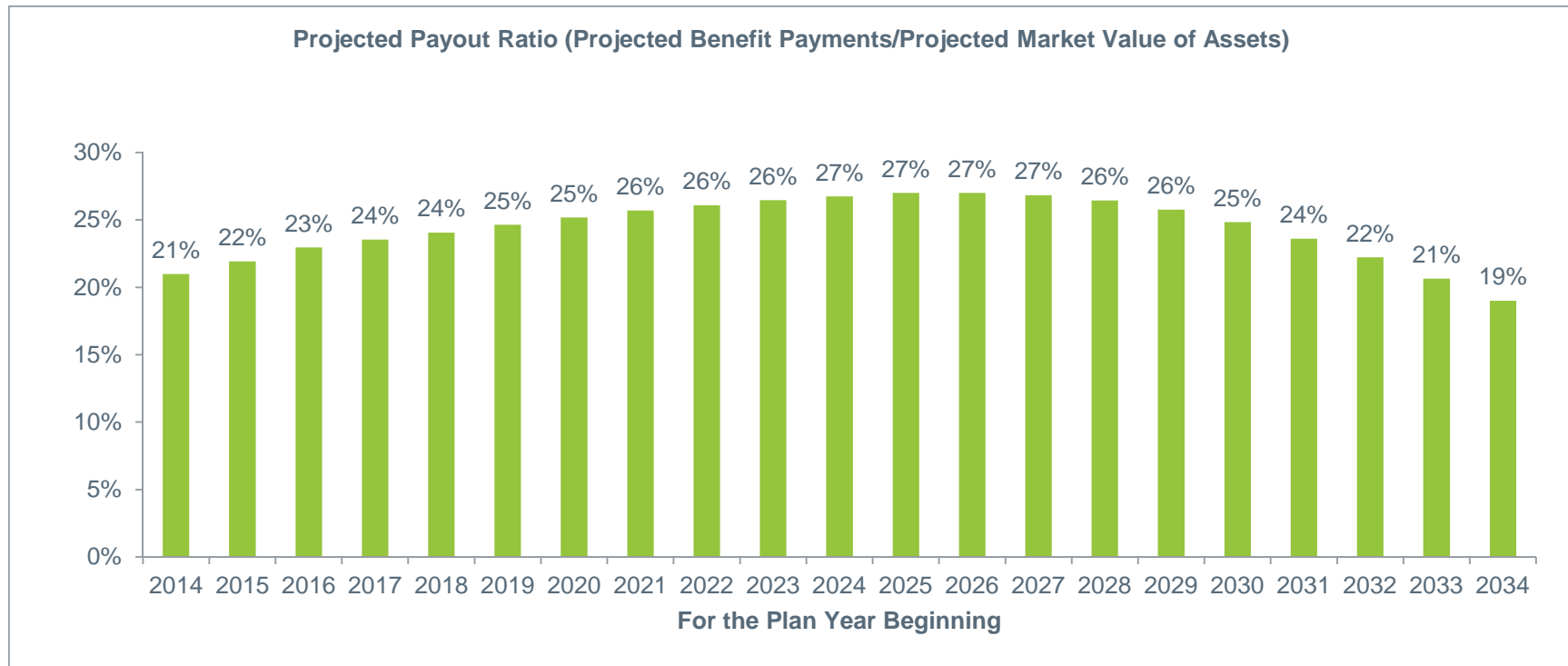
Deterministic Summary Results

	Current (June 30, 2014)	Projected Year 20 (Deterministic)
Actuarial Accrued Liability	\$681 million	\$754 million
Market value of Assets	\$261 million	\$336 million
Deficit	\$420 million	\$418 million
Market Value Funded Ratio	38%	45%
Payout Ratio	21%	19%
Annual Contribution	\$28 million	\$66 million

State Police Pension Plan

Deterministic Summary Results

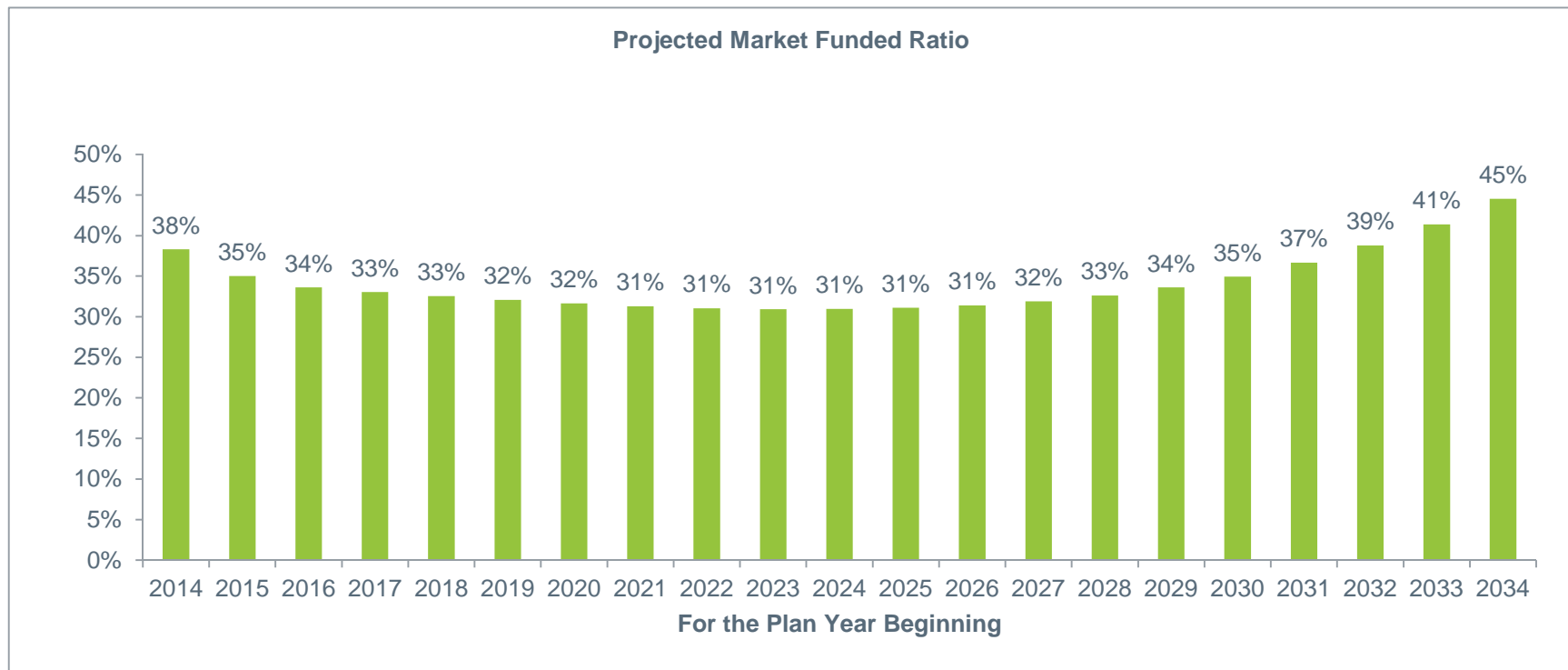
- The payout ratio is approaching levels that may inhibit investment options



State Police Pension Plan

Deterministic Summary Results

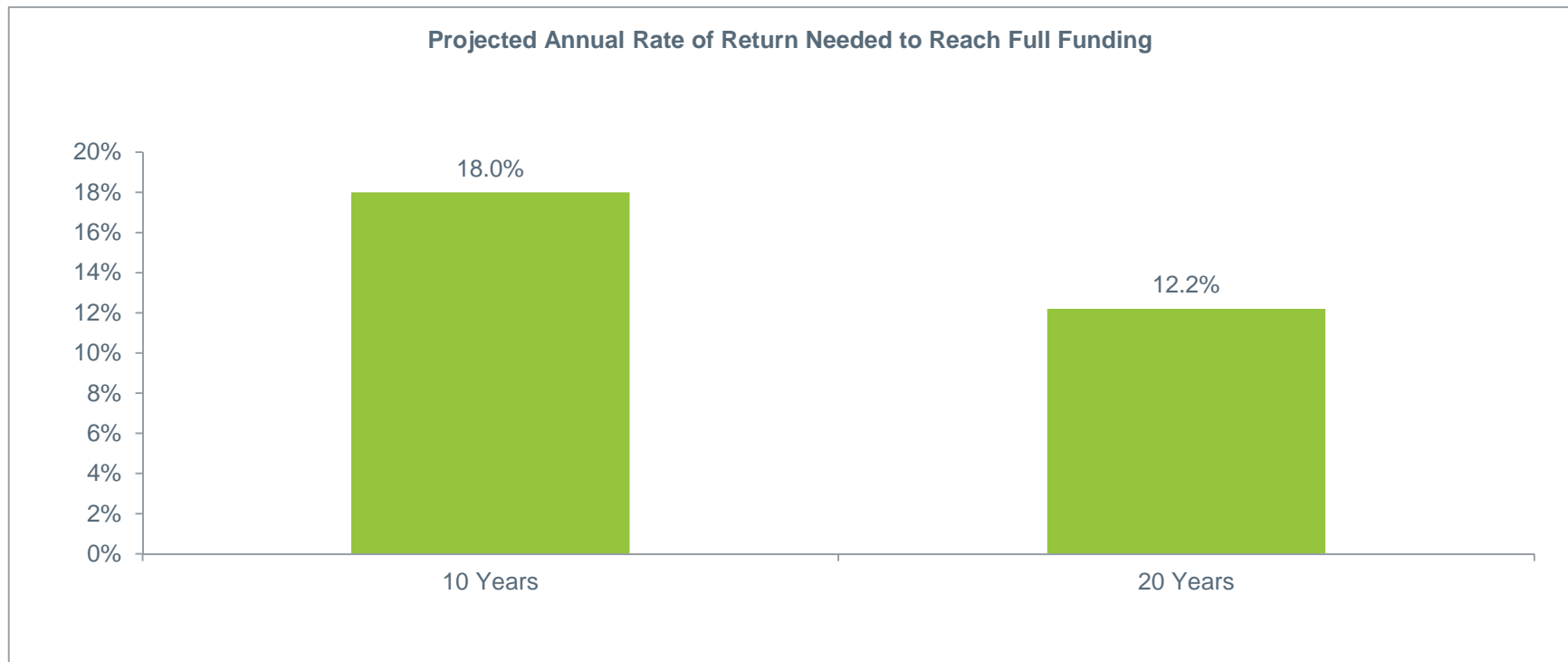
- The funded ratio will likely improve over time



State Police Pension Plan

Deterministic Summary Results

- Investing out the current situation is not a reasonable expectation



State Police Pension Plan

Deterministic Summary Results

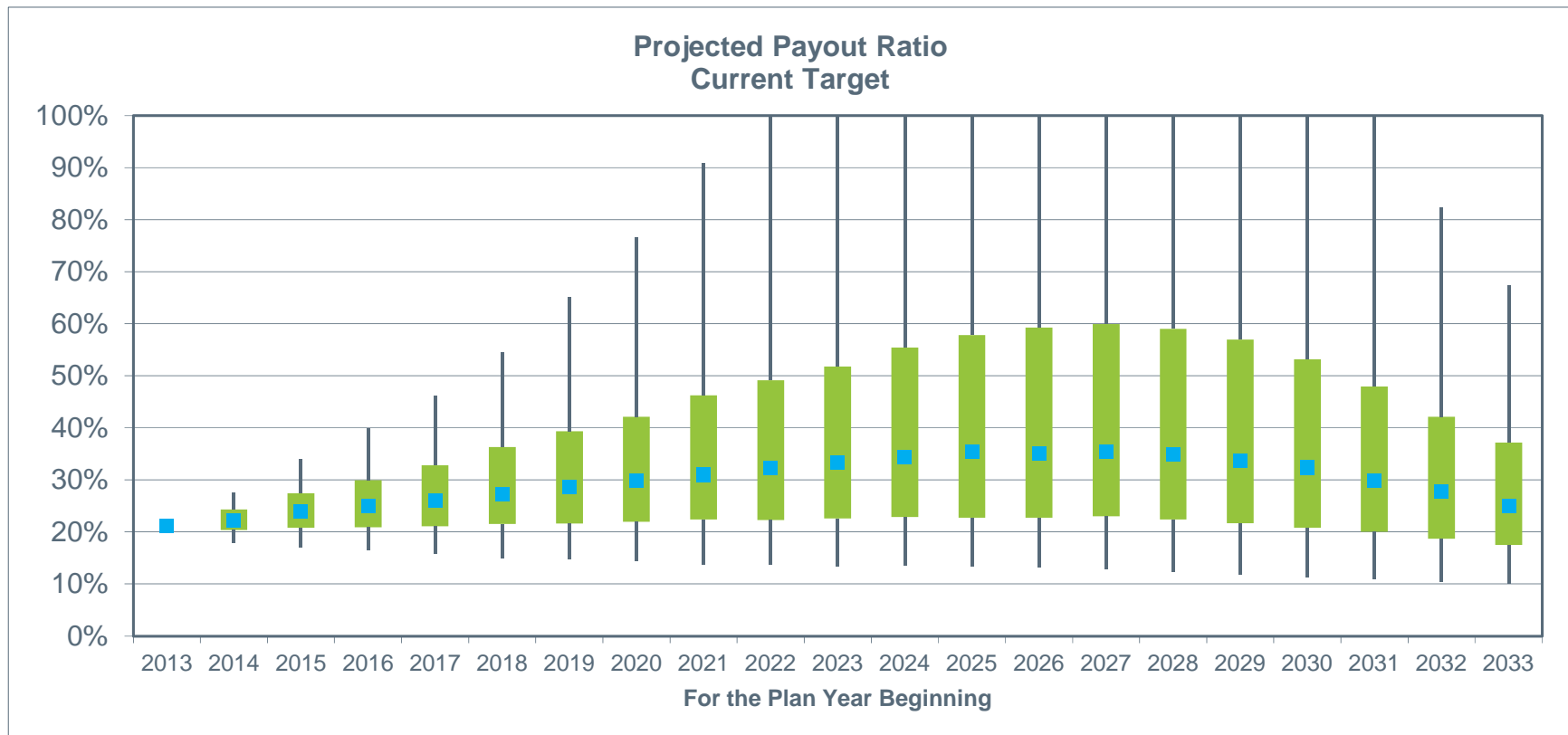
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

	Value in 2034			
	Actuarially Assumed Rate of Return	Reduced Return (100 bps)	Impact of Reduced Return	
Projected Payout Ratio	19%	22%	3%	▲
Projected Employer Contributions (millions)	\$58	\$63	\$5	▲
Projected Benefit Payments/Projected Total Contributions	96%	90%	-7%	▼
Projected Actuarial Accrued Liabilities (millions)	\$754	\$752	(\$2)	▼
Projected Market Value of Assets (millions)	\$336	\$285	(\$51)	▼
Projected Deficit (millions)	\$418	\$468	\$49	▲
Projected Market Funded Ratio	45%	38%	-7%	▼
20 Year Cumulative Total				
Projected Cumulative Employer Contributions (millions)	\$864	\$902	\$38	▲

State Police Pension Plan

Stochastic Summary Results

- Peak payout approach restrictive levels



State Police Pension Plan

Stochastic Summary Results

- There is very little probability of full funding in 20 years under any investment approach
- There is a significant chance of being worse off in 20 year than today

20 Years	Probability of Full Funding in 2034	Probability of < 38% (Current) Funding in 2034	Probability of < 20% (Current) Funding in 2034	Maximum 1 Year Investment Loss	Maximum 1 Year Employer Contribution
Current Target	2%	58%	18%	-38%	108%
Conservative Portfolio	0%	94%	32%	-22%	112%
Potential Portfolio 1	1%	63%	18%	-32%	108%
Potential Portfolio 2	3%	56%	18%	-41%	108%
Potential Portfolio 3	7%	52%	18%	-46%	108%
Aggressive Portfolio	11%	49%	18%	-51%	107%

State Police Pension Plan

Stochastic Summary Results

- Improvement is possible but not guaranteed
- The ultra-conservative portfolio is likely to end the projection period far worse off than today and with the highest contributions and payout ratios
- A diversified return seeking portfolio maximizes outcomes

20 Years	Market Funded Ratio in Year 20			Cumulative Employer Contributions in Year 20 (Millions)			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20	2014-2034	
							Median	Peak	Trough
Current Target	34%	13%	82%	\$918	\$1,052	\$642	25%	100%	10%
Conservative Portfolio	24%	12%	40%	\$990	\$1,054	\$915	36%	100%	20%
Potential Portfolio 1	32%	13%	69%	\$928	\$1,043	\$717	26%	100%	12%
Potential Portfolio 2	35%	13%	90%	\$910	\$1,058	\$590	24%	100%	9%
Potential Portfolio 3	37%	13%	110%	\$897	\$1,069	\$489	23%	100%	8%
Aggressive Portfolio	39%	12%	138%	\$883	\$1,080	\$387	22%	100%	6%

State Police Pension Plan

Conclusions

- The Plan faces severe challenges
- Investing to significantly improved financial health is not possible
- To the extent possible, continued diversification of Plan assets is desirable and should be the focus
- The Plan will face liquidity constraints in the near future making investments in illiquid assets classes difficult to maintain
 - A heavy reliance on illiquid investments risks turning even normal asset value declines into disruptive events
 - Active liquidity management and planning must be a priority

KERS Non-Hazardous Pension Plan



KERS Non-Hazardous Pension Plan

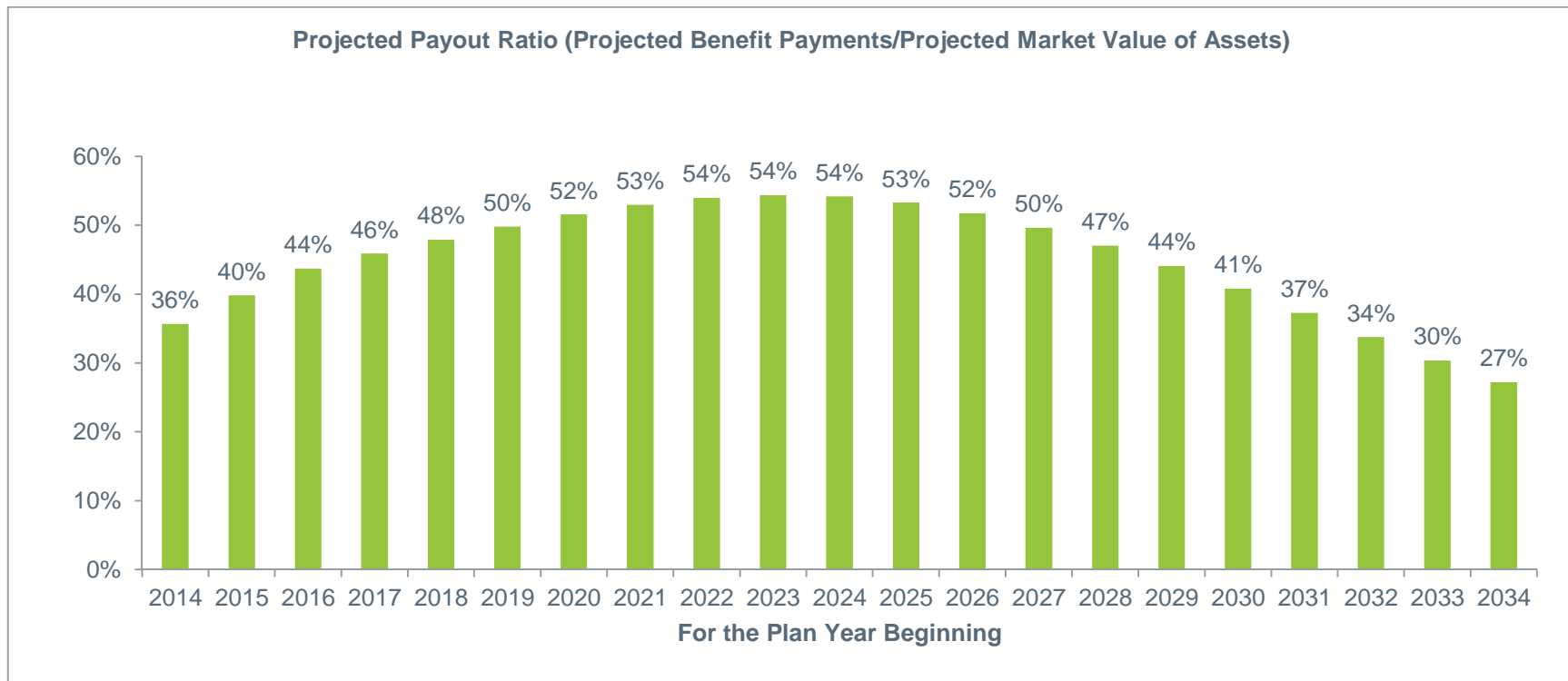
Deterministic Summary Results

	Current (June 30, 2014)	Projected Year 20 (Deterministic)
Actuarial Accrued Liability	\$11.6 billion	\$13.1 billion
Market value of Assets	\$2.6 billion	\$4.2 billion
Deficit	\$9.0 billion	\$8.9 billion
Market Value Funded Ratio	22%	32%
Payout Ratio	36%	27% (max 54% in 2023)
Annual Contribution	\$565 million	\$1,358 million

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Deterministic Summary Results

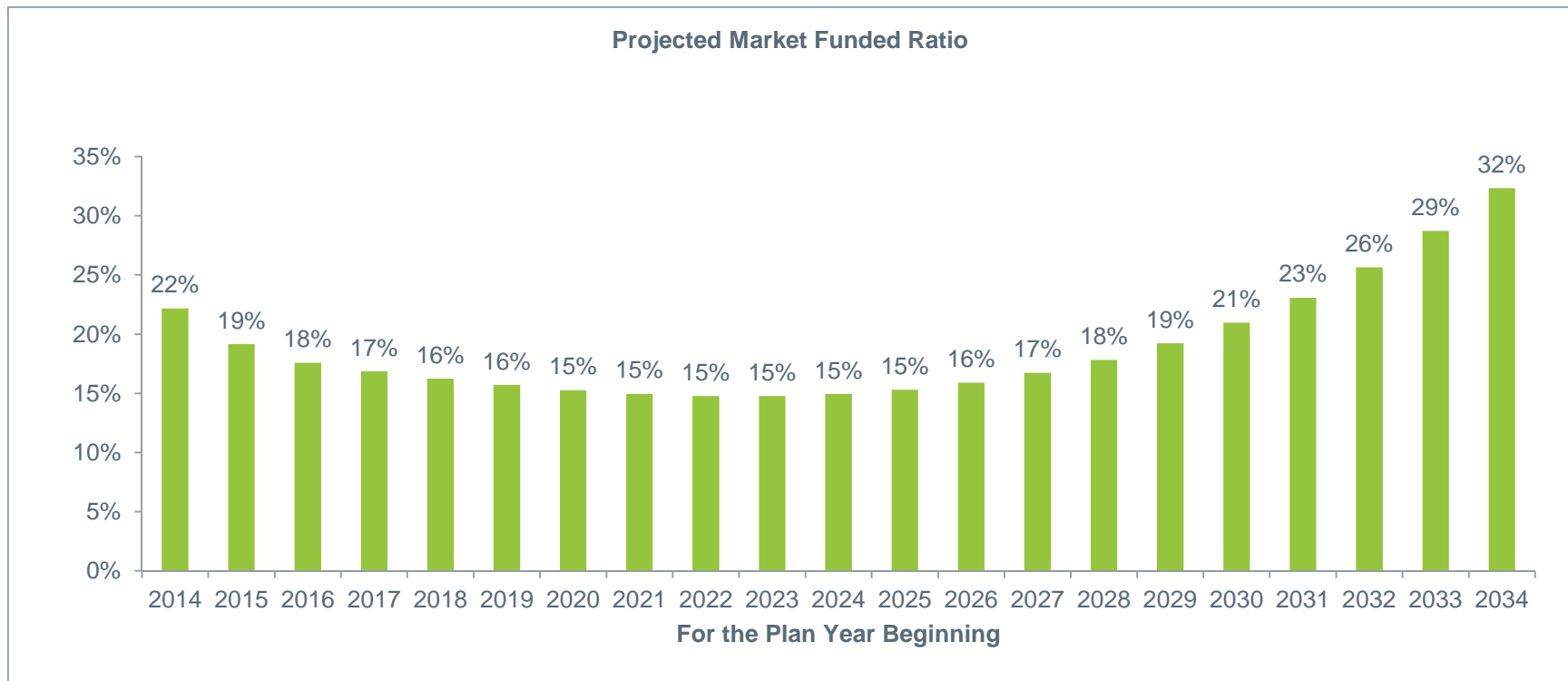
- The payout ratio is quickly approaching restrictive levels



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Deterministic Summary Results

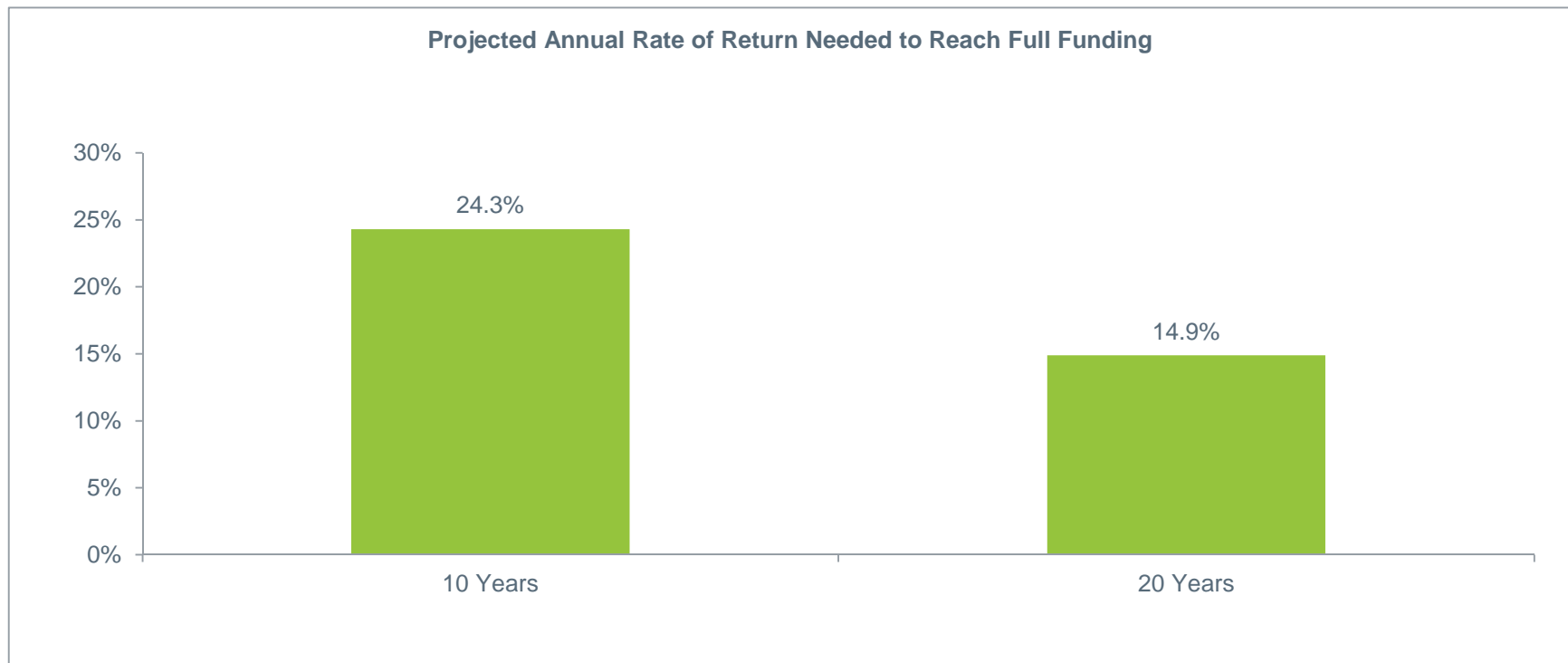
- The funded ratio will likely improve very slowly beginning in about 10 years



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Deterministic Summary Results

- Investing out the current situation is not possible



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Deterministic Summary Results

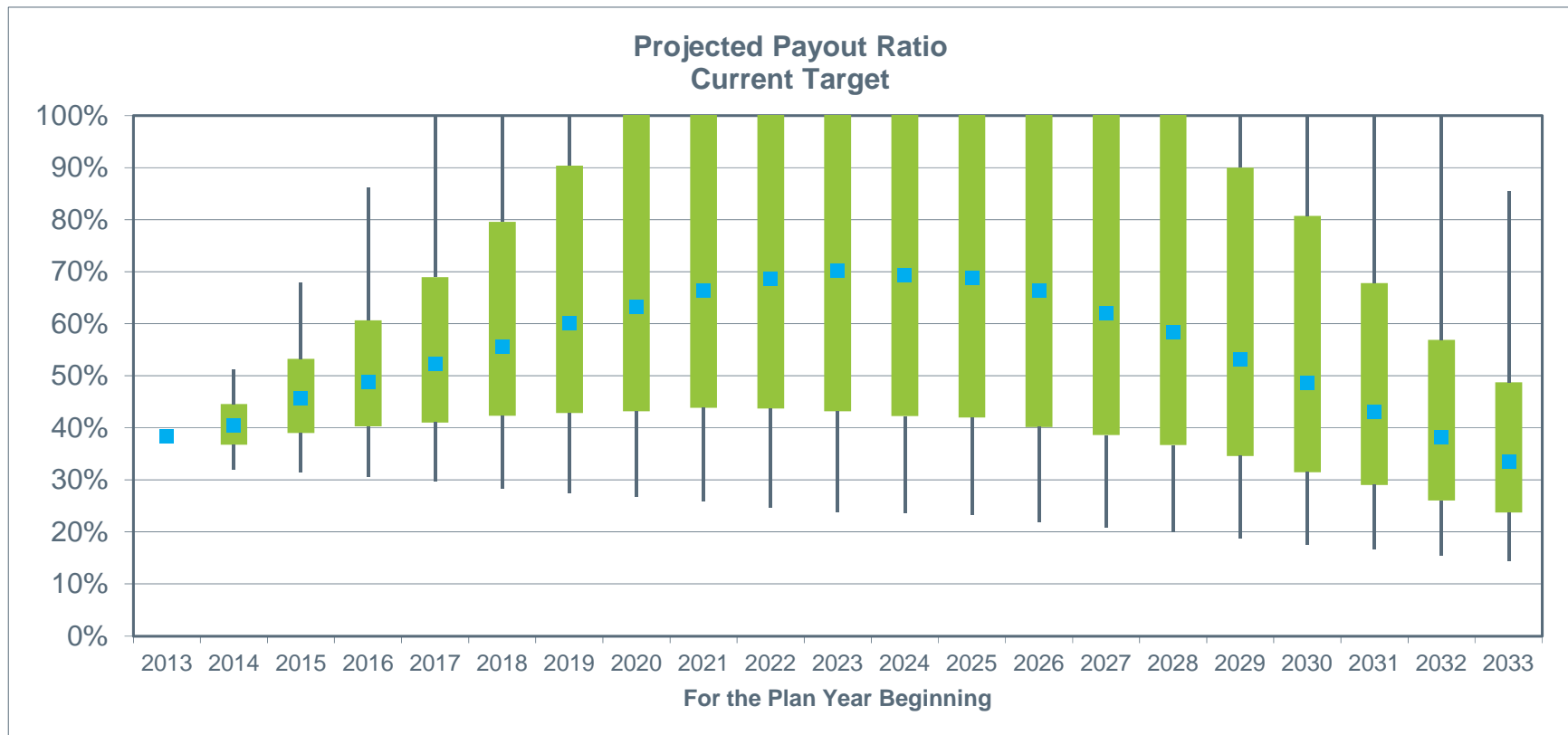
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

	Value in 2034			
	Actuarially Assumed Rate of Return	Reduced Return (100 bps)	Impact of Reduced Return	
Projected Payout Ratio	27%	31%	4%	▲
Projected Employer Contributions (millions)	\$1,192	\$1,241	\$49	▲
Projected Benefit Payments/Projected Total Contributions	85%	82%	-3%	▼
Projected Actuarial Accrued Liabilities (billions)	\$13.1	\$13.1	(\$0.0)	▼
Projected Market Value of Assets (billions)	\$4.2	\$3.7	(\$0.5)	▼
Projected Deficit (billions)	\$8.9	\$9.4	\$0.5	▲
Projected Market Funded Ratio	32%	28%	-4%	▼
	20 Year Cumulative Total			
Projected Cumulative Employer Contributions (billions)	\$17.6	\$17.9	\$0.4	▲

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Stochastic Summary Results

- Peak median payout ratios are above 50%



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Stochastic Summary Results

- There is very little probability of full funding in 20 years under any investment approach
- There is a significant chance of being worse off in 20 year than today
- There is at least a modest probability of depleting assets during the projection period

20 Years	Probability of Full Funding in 2034	Probability of < 22% (Current) Funding in 2034	Probability of Asset Depletion by 2034	Maximum 1 Year Investment Loss	Maximum 1 Year Employer Contribution
Current Target	0%	36%	5%	-38%	56%
Conservative Portfolio	0%	62%	5%	-22%	58%
Potential Portfolio 1	0%	38%	5%	-32%	57%
Potential Portfolio 2	1%	35%	6%	-41%	56%
Potential Portfolio 3	2%	34%	7%	-46%	56%
Aggressive Portfolio	3%	33%	8%	-51%	56%

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Stochastic Summary Results

- Improvement is minimal regardless of investment strategy
- The ultra-conservative portfolio is likely to end the projection period worse off than today and with the highest contributions and payout ratios
- A diversified return seeking portfolio maximizes outcomes

20 Years	Market Funded Ratio in Year 20			Cumulative Employer Contributions in Year 20			Payout Ratios		
	50th	5th	95th	50th	5th	95th	Year 20	2014-2034	
							Median	Peak	Trough
Current Target	26%	11%	57%	\$18	\$19	\$16	33%	100%	14%
Conservative Portfolio	20%	10%	33%	\$19	\$20	\$18	44%	100%	25%
Potential Portfolio 1	25%	11%	51%	\$18	\$19	\$16	35%	100%	16%
Potential Portfolio 2	27%	11%	62%	\$18	\$20	\$15	33%	100%	14%
Potential Portfolio 3	28%	11%	72%	\$18	\$20	\$14	31%	100%	12%
Aggressive Portfolio	30%	10%	88%	\$18	\$20	\$13	30%	100%	10%

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Conclusions

- The Plan faces severe challenges with a shortfall of \$9 billion
- Investing to significantly improved financial health is not possible
- There is between a 5% and 8% chance of fully depleting the assets during the next 20 years
- To the extent possible, continued diversification of Plan assets is desirable and should be the focus
- The Plan will face liquidity constraints in the near future making investments in illiquid assets classes difficult to maintain
 - A heavy reliance on illiquid investments risks turning even normal asset value declines into disruptive events
 - Active liquidity management and planning must be a priority

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